MICRO-SURFACING IN-PLACE
TECHNICAL SPECIFICATIONS

1.01.01 DESCRIPTION

Provide a Micro-Surfacing system in accordance with these provisions and the scope of work. The Micro-Surfacing system SHALL BE WARRANTED FOR ONE (1) YEAR AFTER FINAL ACCEPTANCE OF THE PROJECT.

1.01.02 LOCATION

Plans and profiles will not be furnished for the location. The basic estimate of quantities of work to be done is based on observations and available data. The estimated quantities are approximate and should be used only as a guide. The Contractor must make his own investigation of the conditions that will be encountered on the jobsite.

The proposed pavements to receive the Micro-Surfacing system treatment are per the following list:

ROAD	LENGTH (FEET)	AREA (SY)
ADELAIDE TERRACE	1069	2851
ALDER AVENUE	735	2123
ANDREWS STREET	650	1589
ARLENE STREET	581	1291
BEN-PORT TERRACE	475	1267
BISHOP STREET	634	1691
COLE STREET	898	2395
CROSS STREET	376	1253
DE-RUYTER STREET	745	2152
HARPSWELL STREET	475	1372
HORNFICHER TERRACE	581	1549
IRVING AVE	1287	3432
LISLE STREET	500	1556
MARVIN STREET	317	845
NATHANIEL STREET	709	1576
PIERCE STREET	1267	3379
ROSEN AVENUE	694	1851
SILBRO DRIVE	634	1832
STONERIDGE DRIVE	1357	4222
VIEW STREET	1151	3325
WEAVER STREET	979	3046
WHEELER LANE	1162	3615
WILMOT STREET	971	3237
TOTAL:	18,247	51,449

The City of Torrington reserves the right to add or delete from the above list.

1.02 MATERIALS REQUIREMENTS

GENERAL: Use an asphalt emulsion, polymer modifier, 100 percent crushed mineral aggregate, mineral filler, water, and optional additives.

1.02.01 AGGREGATE

GENERAL: The mineral aggregate used shall be of the type and grade specified for the particular use of the Micro-Surfacing. The aggregate shall be a manufactured crushed stone such as granite, slag, limestone, chat, or other high quality aggregate or combination thereof. To assure the material is totally crushed, 100% of the parent aggregate shall be larger than the largest stone in the gradation used.

QUALITY TESTS: The aggregate shall meet the following criteria:

Test	Quality	Spec.
AASHTO T 176 (ASTM D 2419)	Sand Equivalent	60, min.
AASHTO T 104 (ASTM C 88)	Soundness	15%, max. for sodium sulphate 10%, max. for magnesium sulphate
AASHTO T 96 (ASTM C 131)	Abrasion	40%, max.

GRADING: The mix design aggregate gradation, including mineral filler, shall be tested in accordance with AASHTO T27 (ASTM C136) and AASHTO T11 (ASTM C117), and shall be within one of the following bands:

	Type II	Type III	
Sieve Size	Percent Passing	Percent Passing	Stockpile Tolerance
3/8 (9.5 mm)	100	100	
#4 (4.74 mm)	90-100	70-90	+ or - 5%
#8 (2.36 mm)	65-90	45-70	+ or - 5%
#16 (1.18 mm)	45-70	28-50	+ or - 5%
#30 (600 um)	30-50	19-34	+ or - 5%
#50 (330 um)	18-30	12-25	+ or - 4%
#100 (150 um)	10-21	7-18	+ or - 3%
#200 (75 um)	5-15	5-15	+ or - 2%

The job mix gradation shall be within the gradation band for the desired type. After the job mix gradation has been submitted, the percent passing each sieve should not vary by more than the

stockpile tolerance and still remain within the gradation band. The percent passing shall not go from the high end to the low end of the range for any two consecutive screens.

Certified test reports for all tests shall be signed, dated and submitted to the Engineer prior to the submission of the final mix design. All aggregate used on the project must be representative of the aggregate tested. The Contractor is responsible for maintaining quality control during the process of producing, hauling and stockpiling the aggregate.

A sample of aggregate may be taken from the job location stockpile by the City's Independent Materials Testing Division. The City may evaluate the sample based on five gradation tests according to AASHTO T2 and ASTM D75. The average of the five mix tests should be within the gradation tolerances. If the tests show the material to be out of the gradation tolerances, the Contractor will be notified. The Contractor should take corrective action to bring the aggregate into specifications. The Contractor is ultimately responsible for satisfying the construction criteria in section 1.03 and warranty performance criteria in section 1.04 regardless of what action is or is not taken.

1.02.02 ASPHALT EMULSION

GENERAL: The emulsified asphalt shall be a quick-set polymer modified CSS-1H emulsion and shall conform to the requirements specified in AASHTO M208 and ASTM D2397. The polymer material shall be milled or blended into the asphalt or blended into the emulsifier solution prior to the emulsification process.

The cement-mixing test shall be waived for this emulsion.

QUALITY TESTS: The emulsion shall meet the requirements of AASHTO M208 or ASTM D2397 for CSS-1H plus the following:

Test	Quality	Spec.
AASHTO T 59 (ASTM D 244)	Residue after Distillation	62%, min.

The temperature for this test should be held below 280 F. Higher temperatures may cause the polymers to break down.

TESTS ON ASPHALT RESIDUE

ASTM D 2170	Kinematic Viscosity @ 275 F	650 cSt/sec., min.
AASHTO T 53 (ASTM D36)	Softening Point	135 F, min.
AASHTO T 49 (ASTM D 2397)	Penetration @ 77 F	50-90

Certified Test reports for all tests shall be signed, dated and submitted to the Engineer prior to the submission of the final mix design.

Each load of emulsified asphalt shall be accompanied with a certificate of analysis/compliance to assure that it is the same as that used in the mix design.

1.02.03 MINERAL FILLER

Mineral filler, if required, shall be any recognized brand of non-airentrained portland cement or hydrated lime that is free from lumps. The type and amount of mineral filler needed shall be determined by a laboratory mix design and shall be considered as part of the mineral gradation requirement. The type and quantity of mineral filler used shall be documented and submitted to the Engineer.

1.02.04 WATER

The water shall be potable and free of harmful soluble salts. The Contractor shall be responsible for ensuring that the pH of the job site water is in the same range as the system emulsion/aggregate mix.

1.02.05 POLYMER MODIFIER

The minimum amount and type of polymer modifier shall be determined by the laboratory performing the mix design. The minimum amount required shall be based on the bitumen weight content and shall be certified by the emulsion supplier. The certified test report shall be signed, dated and submitted to the Engineer.

1.02.06 ADDITIVES

Additives may be added to the emulsion mix or any of the component materials to provide the control of the quickset properties and increase adhesion. They must be included as part of the mix design and certified as to their compatibility with the other components of the mix. The certified test report shall be signed, dated and submitted to the Engineer.

1.02.07 MIX DESIGN

At least seven (7) days before the Micro-Surfacing commences, the Contractor shall submit to the Engineer a signed complete mix design prepared and certified by a laboratory capable of performing the required ISSA tests. Compatibility of the aggregate, polymer modified emulsion, mineral filler, and other additives shall be verified by the mix design. The mix design shall be made with the same aggregate gradation that the Contractor will provide on the project. After the mix design has been submitted, no substitution will be permitted, without notifying the City. Required tests and values are as follows:

Test	Description	Spec.
ISSA TB-139	Wet Cohesion @	
	30 minutes (set)	12 kg-cm, min.
	60 minutes (traffic)	20 kg-cm, min.
ISSA TB-109	Asphalt Content,	50 g/S.F., max.
	Loaded Wheel Test	(538 g/S.M.)

	Sand Adhesion	
ISSA TB-100	Asphalt Content, Wet Track Abrasion Loss	
	1-hour soak	50 g/S.F., max. (538 g/S.M.)
	6-day soak	75 g/S.F., max. (807 g/S.M.)
ISSA TB-114	Wet Stripping	Pass (90%, min.)
ISSA TB-147A	Lateral Displacement	5%, max.
	Specific Gravity after 1000 cycles of 125 lbs.	2.10, max.
ISSA TB-144	Classification	(AAA, BAA)
	Compatibility	11 grade points, min.
ISSA TB-113	Mix Time @ 77 F	Controllable to 120 sec., min.

The mixing test and set time test should be checked at the highest temperatures expected during construction (approx. 100 F).

The laboratory shall report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). The report must clearly show the proportions of aggregate, mineral filler (min. and max.), water (min. and max.), additive(s) (usage), and polymer modified asphalt emulsion based on the dry weight of the aggregate.

All the component materials used in the mix design shall be representative of the materials proposed by the Contractor to be used on the project.

The percentages of each individual material required shall be shown in the laboratory report. Adjustments may be required during construction, based on field conditions. The Engineer must be notified of all adjustments.

The component materials should be within the following limits:

Residual Asphalt	5.5% to 9.5% by dry weight of aggregate
Mineral Filler	0% to 3% by dry weight of aggregate
Polymer Based Modifier	Minimum of 3% solids based on bitumen weight content
Additive	As required to provide specified properties

Water	As required to produce proper mix consistency

1.02.08 APPROVAL/ACCEPTANCE

All approvals/acceptances by either the Engineer or the City's Independent Materials Testing Division, referred to or implied in this section, are only to verify that the materials meet the listed material specifications. Approval or acceptance, express or implied, does not affect the Contractor's responsibilities under the construction requirements in section 1.03 and warranty performance requirements in section 1.04.

1.03 CONSTRUCTION REQUIREMENTS

Surface Preparation.

The City of Torrington Street Department Maintenance forces will sweep the roadway prior to the commencement of work. Whether this is sufficient in preparing the roadway for Micro-Surfacing is entirely up to the Contractor. Sweeping by the City in no way effects the Contractor's responsibilities under the Construction Requirements, Section 1.03, and Warranty Requirements, Section 1.04.

Immediately prior to applying the Micro-Surfacing, the surface should be thoroughly cleaned of all vegetation, loose aggregate and soil, particularly soil that is bound to the surface. If water is used, cracks should be allowed to dry thoroughly before Micro-Surfacing. Manholes, valve boxes, drop inlets, catch basins and all other service entrances shall be protected from the Micro-Surfacing. The Contractor is solely responsible for ensuring that the surface is free from all deleterious materials. The Contractor's responsibility under the construction and warranty requirements will remain in effect regardless of what surface preparation is or is not performed.

The existing cracks in the pavement surface will not be treated with a crack sealer.

Machine Calibration

Machine calibration must be performed by an independent lab. The tests shall be performed with the same materials that will be used on the job and within the presence of the Engineer prior to commencing work. The Engineer will also inspect all the equipment to be used on the job at this time.

Weather Limitations.

The Micro-Surfacing should not be applied if either the pavement or air temperature is below 50 degrees F and falling. Micro-Surfacing should not be applied when there is a danger that the finished product will freeze before 24 hours. The Contractor is solely responsible for ensuring that the temperature requirements are satisfied. The Contractor's responsibility under the construction requirements in section 1.03 and warranty performance requirements in section 1.04 will remain in effect regardless of the temperature at which the Micro-Surfacing is applied.

Storing Equipment/Materials

The contractor will secure the best possible temporary work area for staging operations and storing materials and equipment. Routes to and from staging and/or storage sights will be approved by the City.

The Contractor must contain all wash/runoff materials, including Micro-Surfacing material, each time any equipment is cleaned/rinsed. Nothing will be allowed to reach the ground surface.

Stockpile

The Contractor is solely responsible for insuring that stockpiles do not become contaminated. Mineral aggregates stored or stockpiled shall be handled in such a manner so as to prevent segregation. Evidence of the weight of aggregate delivered to the site shall be furnished to the Engineer. The aggregate shall be screened for lumps and oversized materials before delivery to the mixing machine.

Disposal of Surplus Material

Surplus materials, including wash materials, obtained from any type of work performed by the Contractor, shall become the property of the Contractor and shall be disposed of by him outside the limits of the City right of way. All disposal sites shall be designated and approved by the City. Payment for this work shall be included in the general cost of the work.

Drainage

It shall be the Contractor's responsibility to maintain drainage in the same condition it is in at the start of the project. The Engineer, or his designee, and the Contractor will inspect the drainage system prior to beginning the project and again when it is completed.

Environmental Compliance

The Contractor, at all times, shall comply with Section 1.07 of the 1995 Specifications Form 814A and the Connecticut Department of Transportation Best Management Practices. During any period that a contractor is found to be in noncompliance, no new purchase orders will be issued and existing purchase orders will be cancelled or suspended at the determination of the Engineer.

Application Rate.

The Micro-Surfacing mixture shall be of proper consistency at all times so as to provide the application rate required by the surface conditions and necessary to satisfy the construction criteria in this section.

The Contractor shall furnish evidence or some means of determining the actual application rate that is used. The Engineer shall approve of the method of measurement that will be used.

Finished Surface.

Finish any 30 S.Y. of surface area to have a uniform texture and:

1. No more than four tear marks greater than 0.5 in. wide and/or 4.0 in. long,

2. No tear marks greater than 1.0 in. wide and 3.0 in. long,

3. No transverse ripples or longitudinal streaks of 0.2 in. or more in depth, as measured with a 10 foot straight edge.

Surface Friction.

Provide a uniform surface with a minimum average skid number, measured by ASTM E 274 at 40 mph, of 45. The City's Independent Materials Testing Division will perform the skid test(s) using a continuous testing method over each lane of Micro-Surfacing. The Engineer shall notify the Research and Materials section once the Micro-Surfacing has been placed. The skid test for final approval shall be conducted; at least seven (7) calendar days after the Micro-Surfacing is open to traffic.

If the average speed of 40 mph cannot be attained, the values obtained will be speed-corrected as follows:

For every one (1) mph in average speed below 40 mph, the acceptable skid number will be increased by one-half (1/2) of a skid number. For example, if the average maximum speed for a skid test is 35 mph the acceptable average skid number will be 47.5.

Joints.

Construct longitudinal and transverse joints to appear neat and uniform without buildup, uncovered areas, or unsightly appearance.

Place longitudinal joints on lane lines with less than 2.0 in. overlap on adjacent passes and no more than 0.2 in. difference in elevation between the adjacent passes as measured with a 10 foot straight edge.

Restrict transverse joints to one per mile of lane for a continuous run machine or five per 500 yds of lane for a truck mounted application. Construct transverse joints with no more than 0.1 in. difference in elevation across the joint as measured with a 10-foot straight edge.

Edges.

Place edges to appear neat and uniform along the roadway lane, shoulder, and curb lines. Place edges flush with curbs. Place edges to no more than $\pm$ 2.0 in. horizontal variance in any 30 yds., along roadway lane and shoulder. Eliminate $\pm$ 2.0 in. edge variance where feathered Micro-Surfacing is specified.

The Micro-Surfacing should be feathered down at each curb. Thickness as measured at each catch basin shall not exceed the thickness applied on the mainline.

Opening to traffic.

Place the surface treatment to sustain traffic within 1 hour after placement. All Micro-Surfacing must be completed so that it has sufficiently set-up to sustain traffic within the specified Limitation of Operations.

Loose aggregate that can be removed without harming the Micro-Surfacing should be removed by the Contractor prior to opening to traffic.

1.04 WARRANTY REQUIREMENTS

One Year Warranty:

The Micro-Surfacing system shall be warranted for one (1) year after final acceptance of the project. Warranty requirements are addressed as follows:

1.04.01 RELEASE FROM RESPONSIBILITY

The Contractor must satisfy all of the following criteria to be released from responsibility under this warranty:

1. Meet the performance requirements, described in section 1.04.03, at the completion of the warranty period.

2. Satisfy warranty work requirements of repair, replacement, traffic control, and incidentals at NO cost to the City.

1.04.02 WARRANTY WORK

The CITY will:

1. Monitor warranted pavement to determine Micro-Surfacing performance.

2. Perform all tests and/or observations.

3. Provide access to all test results.

4. Notify the contractor in writing of any required warranty work.

5. Perform necessary emergency work, including but not limited to, sweeping or pothole repairs. The City will determine if the problem requires immediate attention. The Contractor will be notified of work performed by the City and the nature of the problem. Repairs performed by the City, that are local to one small area and determined to be not related to the Micro-Surfacing will not affect the warranty as applied to the remaining section(s) of Micro-Surfacing.

The CONTRACTOR will:

1. Perform all warranty work at NO cost to the City. This includes but is not limited to supplying all material and labor for traffic control, removal of defective materials, and performing all warranty work. As long as written notification is provided within the one (1) year warranty period, the Contractor is obligated to perform warranty work even if the work extends beyond the warranty period.

2. Provide certification that the materials and mixture meet or exceed the requirements of Section 1.02 as required for the original construction.

3. Complete all warranty work of repairs, permanent replacement, traffic control, and pavement markings in accordance with the restrictions specified in the original traffic control plans.

4. Repair areas that do not meet the performance criteria in section 4.04.03 within thirty calendar days of written notification by the City. Submit the proposed repair procedure, prior to performing any repairs, to the City Engineer for review and approval.

5. Bear the expense of all work, resulting from a defect in the Micro-Surfacing, that is required to maintain the road in safe operable condition until Contractor arrives to perform the necessary repairs. Work performed by the City will not affect the Contractor's responsibility to perform the required permanent repairs under the warranty.

6. Perform all required repairs, including replacement, to meet the construction requirements in Section 1.03. Use only Micro-Surfacing for permanent repairs. Permanent repairs shall be accomplished by applying a full lane width pass over a minimum lineal length of 100 ft. or as directed by the Engineer or his designee.

7. Replace temporary repairs with permanent repairs as soon as weather allows.

8. Replace entirely any 400 yard lane segment that has repairs or defects exceeding a total of 5 percent of the area. The minimum unit of measurement for repairs or defects shall be one square foot as described in the Strategic Highway Research Program Distress Identification Manual, SHRP-P-338, 1993.

1.04.03 PERFORMANCE CRITERIA

Performance criteria, as defined in the Strategic Highway Research Program Distress Identification Manual (SHRP-P-338, 1993), shall include, but not be limited to, the following:

1. SURFACE FRICTION. Maintain a uniform surface with a minimum average skid number measured by ASTM E 274 at 40 mph, of 40, for the duration of the warranty period. The City's Independent Materials Testing Division will perform the test(s).

If the average speed of 40 mph cannot be attained, the values obtained will be speed corrected as follows:

For every one (1) mph in average speed below 40 mph, the acceptable skid number will be increased by one-half (1/2) of a skid number. For example, if the average maximum speed for a skid test is 35 mph the acceptable average skid number will be 47.5.

2. BLEEDING AND FLUSHING. Limit high severity bleeding and flushing in any 100 square yards area to no more than a total of 2 square yards during the warranty period. The minimum unit of measurement shall be one square foot. No bleeding at joints is allowed.

3. SURFACE LOSS (debonding/delamination). Limit loss of surface interlock by traffic wear, debonding, or replacement in any 100 square yards area to no more than a total of 2 square yards during the warranty period. The minimum unit of measurement shall be one square foot. The normal effects of snowplows and de-icing operations on the roadway shall be considered part of "traffic wear".

4. WEATHERING AND RAVELING. Limit high severity weathering and raveling in any 100 square yards area to no more than a total of 2 square yards during the warranty period. The minimum unit of measurement shall be one square foot.

Determination of performance criteria will be made by a by the City. The decision of the City shall be binding.

1.05 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Micro-Surfacing: The furnished and applied Micro-Surfacing shall be measured by the square yard and shall be the actual number of square yards applied. The price per square yard shall be full compensation for furnishing, mixing and applying all materials, labor, equipment and tools, water requirements, test designs, cleaning, and incidentals necessary to complete the work in accordance with these specifications.

Selection of a Contractor will be based upon the overall low total cost of work within a specific area. Purchase order quantity ranges will be between 50,000 S.Y. and 100,000 S.Y.

ESCALATION CLAUSE: To compensate for liquid asphalt price fluctuations, the following has been established as criteria to determine the adjusted cost per ton:

Whenever the price of liquid asphalt increases or decreases from the base rate by $5.00 or more per ton in increments of $5.00, the contractor shall submit written documentation to the City Engineer. When a vendor supplies material under this contract that they did not manufacture, they must submit a letter from the material-producing vendor that documents the cost of the liquid asphalt used to produce the material supplied. A thirty-day allowance will be permitted against invoices already submitted by the contractor to allow for the lead- time in supplier billing.

If there is no change in the price per ton of the liquid asphalt, or if the price remains within the $5.00 increment, any contractor actively supplying product under this contract shall submit written documentation on the price of liquid asphalt to the City Engineer by the first of every month.

Written notification shall be submitted to:

City of Torrington
Engineering Department
Attn: Edward Fabbri, City Engineer
140 Main Street
Torrington, CT 06790

The City of Torrington reserves the right to audit the cost of the liquid asphalt supplied to the manufacturer and or contractor. In signing this bid, contractors accept and understand the state's rights regarding audit of the cost to purchase liquid asphalt.

In requesting payment, the vendor shall invoice the City of Torrington for the number of tons of bituminous concrete material at the bid price. An additional statement on the same invoice form will designate the adjusted cost per ton, due to liquid asphalt escalation, based on the following formula:

Pa = .052 x (B-A)

Pa = Price adjustment to be added or subtracted to or from the cost of each ton of bituminous material measured for payment.

A = Base price of liquid asphalt per ton.

B = Latest price per ton of liquid asphalt, excluding delivery costs to be filed with accounts payable in increments of $5.00 either more or less than A above.

Adjustments to the base price must be invoiced in $5.00 increments.

For the purpose of this bid, the base price of liquid asphalt per ton (A above) shall be $175.00 a ton for Performance Graded Asphalt Binders (PG).

For the purpose of this provision and formula above, the latest price per ton of liquid asphalt (B) shall be reported in $5.00 increments either more or less than the base price (A). Accordingly, with a base price of $175.00 per ton, increases in price would begin to be reported when they reach $180.00 per ton and continue in $5.00 increments. Decreases in price would begin to be reported when they reach $170.00 per ton and continue in $5.00 increments.

For the purpose of this provision, the quantity of liquid asphalt in the delivered product shall be computed at 5.2% (0.052) by weight of the applicable bituminous concrete classes.

Escalation increase or decrease in the price per ton of liquid asphalt will not be included in determining the low contractor.

The delivery costs for transporting the liquid asphalt from the supplier to the manufacturer and or contractor shall not be included in any calculations of the base price but must be listed separately on the written documentation submitted to support the adjusted cost per ton. Included in the contract is an example of the required letter.

END OF SECTION