MICRO-SURFACING SPECIFICATIONS

1. DESCRIPTION

Micro-surfacing is a tough and durable thin overlay material which can restore the original service properties to worn but structurally sound pavements. Its properties are based on a blend of select crushed aggregate and a sophisticated chemical formulation of asphalt cement, cationic emulsifiers, adhesives, and latex. This specification covers all materials, equipment, construction and application procedures for rutfilling and/or surfacing of existing paved surfaces. The micro-surfacing shall be a mixture of cationic latex modified asphalt emulsion, mineral aggregate, mineral and field control additives, and water, properly proportioned, mixed and spread on the paved surface in accordance with this specification and as directed by the Engineer.

2. MATERIALS

2.1 Emulsified Asphalt

The emulsified asphalt shall be a quick-set latex modified cationic type CSS-1H emulsion and shall conform to the requirements specified in AASHTO M208 and ASTM 2397. It shall pass all applicable storage and settlement tests. The latex shall be milled into the emulsion. The cement mixing test shall be waived for this emulsion.

2.1.1 Special Residue Properties

Distillation of residue will be at a temperature of 350 degrees F for 20 minutes. Softening point of the residue shall be 140 degrees F minimum. Viscosity, absolute at 140 degrees F, shall be 8,000 poise minimum.

2.2 Aggregate

2.2.1. General

The mineral aggregate used shall be of the type and grade specified for micro-surfacing. The aggregate shall be manufactured crushed stone such as granite, slag, limestone, chat, or other high quality aggregate or combination thereof.

2.2.2 Aggregate Physical Requirements

Grading. The aggregate including natural fines when tested by AASHTO methods T11 or T27 or ASTM C117 or C136, should met the referenced gradation requirements.

Deleterious Substances. To limit the permissible amount of clay like fines in an aggregate, a sand equivalent value of 65 or higher is required when tested by ASTM 2419.

Soundness. The aggregate shall have a weighted loss of not more than 15% when the sodium sulfate test is used or 20% when the magnesium sulfate test is used.

Hardness. The aggregate wear, from resistance to abrasion, shall be a maximum of 35% when using AASHTO T96 or ASTM C131 test methods.

2.3 Water

The water shall be potable and shall be free of harmful soluble salts.

2.4 Modifier

Special quick-setting emulsifier agents shall be milled into the asphalt emulsion. **The emulsified asphalt shall be so formulated that when the paving mixture is applied at thickness of one inch with the relative humidity at not more than 50% and the ambient air temperature of at least 75 degrees F. the material will cure sufficiently so that rolling traffic can be allowed in one hour with no damage to the surface, as verified by the Engineer.**

2.5 Additives

A mineral additive shall be introduced to the mineral aggregate and may be any recognized brand of nonairentrained portland cement or hydrated lime that is free of lumps, or other approved mineral additive. It may be accepted upon visual inspection. The amount of mineral additive needed shall be determined by the laboratory mix design and will be considered as part of the material gradation requirement.
A liquid field control additive is introduced and blended with water to provide effective control of the required quick-set properties. This additive shall be made available by the chemical supplier or emulsion manufacturer and certifiable as being compatible with the mixture.

3. ENGINEERING

3.1 General

Before work commences, the contractor shall submit a signed mix design covering the specific material to be used on the project. This design shall be performed by a qualified laboratory. Once the materials are approved, no substitution will be permitted unless first tested and approved by the laboratory preparing the mix design .

3.2 Mix Design

The qualified laboratory shall develop the job mix design and present certified test results for the contractors approval. Compatibility of the aggregate and emulsion shall be verified by the mix design. **The job mix formula shall provide a minimum Marshall stability of 1,800 pounds and a flow of 6 to 16 units when tested according to the ASTM 1559 or AASHTO 245**

procedure as modified. All component material used in the mix design shall be representative of the material proposed by the contractor for use on the project.

3.3 Specifications

The Engineer shall approve the design mix and all micro-surfacing materials and methods prior to use. The component materials shall be within the following limits.

Residual Asphalt	5% to 9% by dry weight of aggregate
Mineral Additive	0.5% to 3% by dry weight of aggregate
Latex Modifier	As required to provide specified properties
Field Control Additive	As required to provide the specified properties
Water	As required to produce consistency

Aggregate - Recommended Gradations:

	Type II	Type III
Screen Size	% Passing	% Passing
3/8"	100	100
#4	90-100	70-90
#8	65-90	45-65
#16	40-65	30-50
#30	25-45	19-34
#50	15-30	12-25
#100	10-21	7-18
#200	5-13	4-12

Suggested Application Rate:
Type II - Urban and Residential Streets
Airport Runways: 18-22 lbs per sq. yd.
Type III- Primary and Interstate Routes:
25-30 lbs per sq. yd.
Wheel Ruts: Application rates as required.

4. EQUIPMENT

4.1 General

All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

4.2 Mixing Equipment

The material shall be mixed by a self-propelled micro-surfacing mixing machine which shall be a **continuous flow** mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral and field control additives, and water to a revolving multi-blade twin shafted mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral and field control additives, and water to maintain an adequate supply to the proportioning controls. **The machine may be equipped with self-loading devices which provide for the loading of materials while continuing to lay micro-surfacing, thereby minimizing construction joints.**

4.3 Proportioning Devices

Individual volume or weight controls for proportioning each material to be added to the mix, i.e., aggregate, emulsified asphalt, mineral and field control additives, and water shall be provided and properly marked. These proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the materials output at any time.

4.4 Emulsion Pump

The emulsion pump shall be a heated positive displacement type.

4.5 Spreading Equipment

The surfacing mixture shall be spread uniformly by means of a mechanical type spreader box attached to the mixer, equipped with paddles to agitate and spread the materials throughout the box. A front seal shall provided to insure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of material on the surface, The spreader box and rear strike off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike off. The longitudinal joint where two passes join shall be neat appearing, uniform and lapped. All excess material shall be removed from the job site prior to opening the road. The spreader box shall have suitable means provided to side shift the box to compensate for variations in pavement width and longitudinal alignment. A **Rut Box** shall be available to prefill wheel ruts when necessary prior to overlay to eliminate puddles or runoff interruption. The box shall be readily adjustable from 4' - 6' width with hydraulically adjusted strike off screeds to attain maximum grade and profile.

4.6 Auxiliary Equipment

Suitable surface cleaning equipment, traffic control equipment, hand tools and any support equipment shall be provided as necessary to perform the work.

5. MACHINE CALIBRATION

Each mixing unit to be used in performance of the work shall be calibrated in the presence of the Engineer prior to construction, or previous calibration documentation covering the exact materials to be used may be acceptable provided they were made during that calendar year. The documentation shall include the individual calibration of each material at various settings, which can be related to the maching metering devices.

6. WEATHER LIMITATIONS

The material shall be spread only when the road surface and atmospheric temperatures are at least 45 degrees F and rising and the weather is not rainy and there is no forecast of temperatures below 32 degrees F within 48 hours from the time of placement of the mixture.

7. NOTIFICATION AND TRAFFIC CONTROL

7.1 Notification

All homeowners and businesses affected by the construction shall be notified one day in advance of the surfacing, This notification shall be in the form of a written posting stating the times and dates that construction is expected on their road.

7.2 Traffic Control

Suitable methods shall be used by the contractor to protect the micro-surface from traffic until the new surface will support traffic without damage. All traffic control methods used shall be in accordance with the Engineer's specifications and shall be employed in a safe manner.

8. SURFACE PREPARATION

8.1 General

The area to be surfaces shall be thoroughly cleaned of vegetation, loose aggregate and soil, particularly soil that is bound to the surface. Manholes, valve boxes and other service entrances will be protected form the surfacing material.

8.2 Cracks in Surface

If directed by the towns' representative the contractor shall pretreat the cracks in the pavement surface with fiber reinforced crack filler consistent with Specification No. 1B for Random Crack Sealing by Fiber Reinforced Method prior to the application of microsurfacing.

8.3 Tack Coat

If required by the plans, the contractor shall apply a tack coat consisting of one part emulsified asphalt and three parts water with a distributor at .10-.15 gallons per square yard. This emulsified asphalt should be the CSS1H emulsion grade. It is recommended that a tack coat always be applied to a concrete or brick surface.

9. STOCKPILE

Precautions shall be taken to insure that stockpiles do not become contaminated. The mineral aggregate shall be screened prior to being weighed for job site delivery. This weight shall be done by means of a scale approved by the Engineer.

10. APPLICATION

10.1 General

The surface should be pre-wetted by fogging ahead of the spreader box when required by local conditions. The rate of application of the fog spray shall be adjusted during the day to suit temperatures, surface texture, humidity, and dryness of the pavement surface.

The micro-surfacing mixture shall be of the desired consistency upon leaving the mixer and no additional materials should be added. A sufficient amount of material shall be carried in all parts of the spreader at all times so that a complete coverage is obtained. Overloading of the spreader shall be avoided. No lumping, balling, or unmixed aggregate shall be permitted.

No streaks, such as those caused by oversized aggregate, will be left in the finished surface. If excessive oversize develops, the job will be stopped until the contractor proves to the Engineer that the situation has been corrected.

10.2 Joints

No excessive buildup, uncovered areas or unsightly appearances shall be permitted on longitudinal or transverse joints. The contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. When possible, longitudinal joints shall be placed on lane lines. Half passes and odd widths passes will be used only in minimum amounts. If half passes are used, they shall not be the last pass of any paved areas.

10.3 Mix Stability

The micro-surfacing mixture shall possess sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. It shall be free of excess water or emulsion and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

10.4 Hand Work

Areas which cannot be reached with the mixing machine shall be surfaced using hand squeegees to provide complete

and uniform coverage. The area to be handworked shall be lightly dampened prior to mix placement. Care shall be exercised to leave no unsightly appearance from handwork.

The same type finish as applied by the spreader box shall be required. Handwork shall be completed at the time of the machine applying process.

10.5 Lines

Care shall be taken to insure straight lines along curbs and shoulders. No runoff on these areas will be permitted. Lines at intersections will be kept straight to provide a good appearance.

10.6 Rolling

If required by the plans, specified areas shall be rolled by a self-propelled 10 ton pneumatic roller with a tire pressure of 50 PSI and equipped with a water spray system.

11. QUALITY CONTROL

11.1 Materials

The contractor will permit the Engineer to take samples of the aggregate and asphalt emulsion to be used in the project at the Engineer's discretion. Gradation and sand equivalent tests may be run on the aggregate and residual asphalt content test on the emulsion. Test results will be compared to specifications. Tests will be run by a qualified laboratory at the expense of the buyer. The buyer must notify the contractor immediately if any test fails to meet the specifications.

11.2 Micro-Surfacing Mixture

Samples of the mixture should be taken daily and may be taken directly from the mixing unit(s). Consistency and residual asphalt content tests may be made on the samples and compared to the specifications. Tests will be run by a qualified laboratory at the expense of the buyer. The buyer must notify the contractor immediately if any test fails to meet specifications.

The Engineer may use the recorder and measuring facilities of the unit to determine application rates, asphalt emulsion content, mineral and field control additives, and water.

11.3 Non-Compliance

If any two successive tests fail on the stockpile material, the job shall be stopped. It is the responsibility of the contractor, at his own expense, to prove to the Engineer that the conditions have been corrected. If any two successive tests on the mix from the same machine fail, the use of the machine shall be suspended. It will be the responsibility of the contractor, at his own expense, to prove to the Engineer that the problems have been corrected and that the machine is working properly.

12. PERFORMANCE

It is the intention of this Public Agency not to award a contract for Micro-Surfacing work under this or any other proposal if the bidder cannot furnish satisfactory evidence that he has the ability and experience to perform this class of work and that he has sufficient capital and equipment to enable him to prosecute the work successfully and to complete it within the time named in the contract; and that the Public Agency reserves the right to reject this or any other proposal or to award the contract as is deemed to be to the best interest of said Public Agency.

13. PERFORMANCE WARRANTY

The contractor must furnish the following warranty after completion of the work and prior to final payment:

The Contractor hereby warrants that all workmanship and all materials furnished under the contract comply fully with requirements of these Micro-Surfacing Specifications. If at any time within two years after the date of the final inspection, any unfaithful or defective work should appear, which in the opinion of the Buyer is due to inferior materials or workmanship, the Contractor warrants to do whatever is necessary to remedy the defects immediately without cost to the Buyer. The Buyer will notify the Contractor in writing of the defects and the repairs to be made, and the Contractor will begin repairs within a mutually agreed time frame.

14. MEASUREMENT AND PAYMENT

The quantity to be measured for payment will be the number of square yards of Micro-Surfacing actually completed. The accepted quantity of Micro-Surfacing will be paid for at the contract unit price per square yard of the type specified in the proposal, which shall be full compensation for furnishing, transporting, handling and placing the material specified and furnishing of all labor, tools, equipment and incidentals for the satisfactory completion of this item. Rut Filling will be paid by the ton of mixed material in place.

BID ITEMS:

Rut Filling per ton	@_____/Ton
Leveling Course and Surface Course per Square yard (2 lifts)	@_____/SY
Leveling Course and Surface Course (2 Lifts) with Crack Repair per Square Yard	@_____/SY