MICROSILICA CONCRETE **(10-12-01)**

1.0 DESCRIPTION

This work consists of furnishing and placing a concrete overlay containing microsilica over conventional existing concrete or repair concrete on bridge decks and approach pavement. Complete this work in accordance with this Special Provision, applicable parts of the Standard Specifications, and in accordance with the manufacturers' instructions.

2.0 MATERIALS

Use materials that meet the requirements for the respective items in the Standard Specifications except the following:

A. Aggregate – Use coarse aggregate that meets the gradation for standard size No. 78M.

B. Microsilica – Use Microsilica that meets the requirements of Tables 1 and 1A of AASHTO M307. Furnish a manufacturer's certification showing test results conducted on microsilica for use on this project.

C. Concrete with Microsilica – Use concrete with microsilica that is a workable mixture having the following properties:

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Minimum Compressive Strength of Concrete at 3 Days, psi (MPa)	3000 (20.7)
Minimum Cement Content, lbs/yd^3 (kg/m^3)	608 (361)
Minimum Microsilica, lbs/yd^3 (kg/m^3)	50 (30)
Air Content of Plastic Mix (%)	5.5 - 9.0
Slump, in (mm)	5 – 7 (127 – 178)
Maximum Water/Cementitious Ratio	0.40

Add water to the mix to produce an initial slump of 1 to 3 inches (25 to 76 mm). At the job site, add high-range water reducer in the amount recommended by the manufacturer to produce a 5 to 7 inch (127 to 178 mm) slump. Furnish a certification showing the test results and a statement that the high-range water reducer meets AASHTO M194, Type F or G.

Design the mix and submit it to the Engineer on M & T Form 312. Along with Form 312, submit laboratory data in accordance with Paragraph 4 of Section 1000-4(A) of the Standard Specifications.

3.0 EQUIPMENT

Prior to beginning any work, obtain approval for all equipment to be used for deck preparation, mixing, placing, furnishing, and curing of the microsilica concrete.

Use the following types of Surface Preparation Equipment:

Use sandblasting equipment capable of removing all clay, salt deposits, oil and grease

deposits, and all other foreign matter. Provide traps or separators to remove oil and water from the compressed air. Use traps or separators of adequate size and drain them periodically during operations.

Use adequate hand tools for placing and leveling concrete down to approximately the correct level for striking-off with the screed.

Use a finishing machine that meets the approval of the Engineer and the requirements of this Special Provision. Use a self-propelled finishing machine capable of forward and reverse movement under positive control. Use a machine with at least two finishing devices, one that is a vibrating screed and the other either a vibrating screed, oscillating screed, or one or more rotating cylindrical drums 48 inches (1.2 m) long or less and operating between 1500 and 2500 vpm. Make certain the finishing machine can finish the surface to within 1 foot (0.3 m) of the edges of the area being placed. Raise all screeds when the finishing machine is moving backwards over the screeded surface.

Use screeds with a vibration frequency that is variable between 3000 and 6000 vpm with positive controls. Use screeds with a metal covered bottom face not less than 4 inches (100 mm) wide. Provide screeds with positive control of the vertical position.

Use supporting rails for travelling of the finishing machine rigid enough to eliminate deflection from the weight of the machine.

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4.0 PREPARATION OF SURFACE

Blast clean all surfaces within the 48 hours prior to placing the overlay unless otherwise approved.

Thoroughly soak the clean surface for at least 2 hours prior to placing the microsilica concrete. After soaking the surface for at least 2 hours, cover it with a layer of white opaque polyethylene film that is at least 4 mils (0.100 mm) thick. Immediately prior to placing the microsilica concrete, remove standing water from the surface.

5.0 PLACING AND FINISHING

Prior to placing microsilica material, install a bulkhead of easily compressible material at expansion joints to the required grade and profile. Placing material across expansion joints and sawing it later is not permitted.

Place and fasten screed rails in position to ensure finishing the new surface to the required profile. Do not treat screed rails with parting compound to facilitate their removal.

Separate screed rails and/or construction dams from the newly placed material by passing a pointing trowel along their inside face. Carefully make this trowel cut for the entire depth and length of rails or dams after the microsilica concrete has sufficiently stiffened and cannot flow back.

Prior to placement of overlay, brush a portion of the silica fume concrete onto the prepared

surface. Carefully give all vertical and horizontal surfaces a thorough, even coating and ensure the brushed material does not dry before it is covered with the additional material required for the final grade. Remove excess coarse aggregate that remains after brushing.

Construction joints other than those shown on the plans are not permitted.

When a tight, uniform surface is achieved, transversely texture the surface in accordance with Subarticle 420-16(B) of the Standard Specifications. Do not allow more than 15 feet (4.5 m) of exposed microsilica concrete ahead of or behind the screed. In the event of a delay of 10 minutes or more, temporarily cover all exposed microsilica concrete with wet burlap and white opaque polyethylene or use a fog mist.

Have fogging equipment on the site that is capable of applying a fine fog mist in sufficient quantity to curb the effects of rapid evaporation of mixing water from the microsilica concrete on the bridge floor resulting from wind, high temperature, or low humidity, or a combination of these factors. Do not apply moisture from the nozzle under pressure directly upon the concrete and do not allow moisture to accumulate on the surface in a quantity sufficient to cause a flow or wash the surface. Apply the fog mist when necessary or when directed by the Engineer.

After texturing the surface and as soon as the surface supports burlap without deformations, cover the surface with a single layer of clean, wet burlap.

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Do not place microsilica concrete before the burlap is saturated and approved by the Engineer. Drain excess water from the wet burlap before placement.

Within 1 hour of covering with wet burlap, place a layer of 4 mil (0.100 mm) white opaque polyethylene film and insulating materials on the wet burlap. Make sure that the film and insulation meet the requirements of paragraphs two and three of Subarticle 420-9(C).Cure the surface for 72 hours. After 72 hours, unless otherwise specified, apply liquid membrane curing compound conforming to Article 1026-2. Completely dry the curing compound before opening to traffic.

6.0 LIMITATIONS OF OPERATIONS

The mixer is not permitted on the bridge deck unless otherwise approved.

No traffic is permitted on the finished microsilica concrete surface until the total specified curing time is completed and until the concrete reaches the minimum specified compressive strength.

Do not place microsilica concrete if the temperature of the concrete surface on which the overlay is to be placed is below 40°F (4°C) or above 85°F (29°C). Measure the surface temperature by placing a thermometer under the insulation against the surface.

Prior to placing microsilica concrete, the Engineer determines the air temperature and wind speed. Do not place microsilica concrete if the ambient air temperature is below 45°F (7°C) or above 85°C (29°C), or if the wind velocity is in excess of 10 mph (16 km/h). If

working at night, provide approved lighting.

Do not place microsilica concrete if the National Weather Service predicts the air temperature at the site to be below 35°F (2°C) during the next 72 hours.

Stop all placing operations during periods of precipitation. Take adequate precautions to protect freshly placed microsilica concrete from sudden or unexpected precipitation. Keep an adequate quantity of protective covering at the worksite to protect freshly placed pavement from precipitation.

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7.0 METHOD OF MEASUREMENT

The quantity of "Microsilica Concrete" paid for will be the number of cubic yards (cubic meters) of microsilica concrete satisfactorily placed in the completed deck.

The quantity of "Placing and Finishing Microsilica Concrete Overlay" will be measured for payment by the number of square yards (square meters) of surface satisfactorily covered.

8.0 BASIS OF PAYMENT

The pay item "Microsilica Concrete" will be paid for at the contract unit price bid per cubic yard (cubic meter) which price will be full compensation for furnishing all microsilica concrete.

The pay item "Placing and Finishing of Microsilica Concrete Overlay" will be paid for at the contract unit price bid per square yard (square meter), which price will be full compensation for furnishing all labor, materials, tools, equipment and incidentals required to complete the work in accordance with this Special Provision and applicable parts of the Standard Specifications.