

MICRO-MILLING

****From Bethel-Brookfield IM SURF(54)**

- xx. DESCRIPTION. This work includes micro-milling of existing asphaltic concrete pavement to remove wheel ruts and other surface irregularities, and to restore proper grade and/or transverse slope of pavement as indicated in the Plans and as directed by the Engineer.

The work under this Section shall meet the requirements of these provisions, the Plans, and Section 210 of the Standard Specifications.

- xx. GENERAL REQUIREMENTS. The micro-milled surface shall provide a texture suitable for use as a temporary riding surface until the wearing course is placed.

- xx. EQUIPMENT. Use power-driven, self-propelled micro-milling equipment possessing the size and shape to allow traffic safe passage through areas adjacent to the work.

Micro-milling equipment shall meet the following requirements:

- (a) Equipped with a cutting mandrel with carbide or PCD (polycrystalline diamond) tipped cutting teeth designed for micro-milling bituminous pavement to close tolerances.
- (b) Equipped with grade and slope controls operating from a string line or ski and based on mechanical or sonic operation.
- (c) Capable of removing pavement to an accuracy of 3 mm (1/8 inch).
- (d) Furnished with a lighting system for night work, as necessary.
- (e) Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.
- (f) The grinding and texturing mandrel shall have four wraps of flighting with a weld on or quick change block system that accepts carbide or PCD tipped cutting bits. The carbide or PCD bits on the wraps at 0 degrees and 180 degrees repeat each other. Likewise, the carbide or PCD bits at 90 degrees and 270 degrees also repeat each other, creating a double hit drum. Tips of the carbide or PCD teeth are to be spaced at a maximum 8 mm (0.3125 inch) axial distance between the tips of each tooth.
- (g) The carbide or PCD cutting teeth and height of the tooth holder blocks are to be uniform so that the cutting radius of the mandrel shall be within ± 0.5 mm (± 0.020 inch).

- xx. CONSTRUCTION REQUIREMENTS. Follow the Plans to micro-mill the designated areas and depths including bridge decks, shoulders, and ramps, as required. Micro-milling operations shall be performed as per design with each travel lane being milled full width in a maximum of two passes of the milling equipment.

Full and partial depth patching of the pavement shall be completed and cured prior to micro-milling operations. Joint and crack resealing shall follow micro-milling operations.

The final pavement surface shall have a transverse pattern of 8 mm (0.31 inch) center to center of each strike area. The target difference between the ridge and valley (RVD) measurement of the mat surface shall not exceed 0.5 mm (0.02 inch).

Prior to commencement of the work, the Contractor shall construct a test section that is 300 m (1000 feet) in length with a uniformly textured surface and cross section as approved by the Engineer.

Work shall be halted and the Contractor shall submit a written plan of action detailing what steps will be taken to improve operations if any of the specified requirements are exceeded in the test section. If directed by the Engineer, the Contractor will construct another 300 m (1000 feet) test section. This test section shall be located in a different area than the initial section using the approved corrective action. This designated section shall be micro-milled to conform to the same requirements as those required in the initial test section. The Contractor shall not be allowed to start continual micro-milling until an acceptable test section is obtained.

The following additional requirements shall be met:

- (a) Ensure micro-milling methods produce a uniform surface and maintain a constant cross slope between extremities in each lane.
- (b) Provide positive drainage to prevent water accumulation, as shown on the Plans or as directed by the Engineer.
- (c) Bevel back the longitudinal vertical edges greater than 50 mm (2 inches) produced by the removal process and left exposed to traffic. Bevel the vertical edges back at least 75 mm (3 inches) for each 50 mm (2 inches) of material removed. Use an attached mold board or other approved method.
- (d) Taper the transverse edges 3 m (10 feet) to avoid creating a traffic hazard and to produce a smooth surface when removing material at ramp areas and ends of milled sections.
- (e) Protect with a temporary asphaltic concrete tie-in (paper joint) vertical edges at other areas such as bridge approach slabs, drainage structures, and utility appurtenances greater than 13 mm (1/2 inch) left open to

traveling vehicles. Place the temporary tie-in at a taper rate of at least 6 to 1 horizontal to vertical distance.

- (f) Substantially all of the pavement surface shall be textured. Extra depth micro-milling of isolated low spots will not be necessary if it requires lowering of the overall profile of the pavement. The accumulated total of excluded areas shall not exceed 5 percent of the total area to be milled. In all cases, the maximum depth of concrete/asphaltic pavement removal shall be 50 mm (2 inches). The operation shall result in a pavement that conforms to the required cross slope.
- (g) For removal of faulted concrete, micro-milling shall be performed in the direction opposite to the normal traffic flow.
- (h) Teeth in the milling drum that become dislodged, broken, or unevenly worn shall be replaced immediately. When only changing intermittent teeth, an existing "sample" carbide or PCD tooth is to be removed from the machine and measured to determine amount of wear and/or gage height. Replacement teeth shall be matched to existing height of the "sample" carbide or PCD tooth, ± 0.5 mm (± 0.02 inch), to insure even micro-milling.

The surface of the milled area shall be swept clean prior to being opened to traffic.

The Contractor shall repave any micro-milled areas within 28 calendar days of milling or when directed by the Engineer, provided that any micro-milled area that is not repaved the same day as it is micro-milled has proper and adequate tapers installed before the end of the working day in which the micro-milling is performed. Should the area remain unpaved for a period of more than 28 calendar days without the approval of the Engineer, no payment whatsoever will be made for the micro-milling. If the Contractor places temporary pavement to avoid the above non-payment for micro-milling, temporary pavement and subsequent micro-milling will be at the Contractor's expense. Traffic cones will be placed along the longitudinal drop-off as directed by the Engineer.

- xx. QUALITY CONTROL/ACCEPTANCE. The Contractor shall ensure the micro-milling operation produces a uniform pavement texture true to line, grade, and cross section.

Micro-mill additional depth to eliminate excessive scabbing of the in-place material as directed by the Engineer.

Micro-milled pavement surfaces are subject to visual and straightedge inspections. Ensure a 3 m (10 foot) straightedge is kept at the micro-milling operation to measure surface

irregularities of the milled pavement surface. Any areas exceeding 5 mm (0.20 inch) between the ridge and valley of the mat surface shall require the underlying layer be removed and replaced with material as directed by the Engineer at no additional cost to the Agency. All corrective work shall be performed in a minimum 300 m (1000 foot) section.

Ensure the cross slope is uniform and no depressions or slope misalignments greater than 6 mm (1/4 inch) per 3.6 m (12 feet) exist when the slope is tested with a straightedge placed perpendicular to the center line.

- xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Micro-milling Bituminous Concrete Pavement) to be measured for payment will be the number of square meters (square yards) from which bituminous pavement has been removed to the depth shown on the Plans.

- xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Micro-milling Bituminous Concrete Pavement) will be paid for at the Contract unit price per square meter (square yard). Payment will be full compensation for furnishing all labor, tools, and equipment, including the vacuum sweeper, necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.675 Special Provision (Micro-milling Bituminous Concrete Pavement)	Square Meter (Square Yard)