METHODS OF SAMPLING AND TESTING
MT 310-17
METHOD OF DETERMINING THE MACRO-TEXTURE OF A PAVEMENT SURFACE
(Modified ASTM E965)

1 Scope

1.1 This method describes the procedures for determining the average macro-texture depth of micro-milled concrete surfaces and micro-milled and cold-milled plant mix surfaces.

1.2 This standard does not purport to address all the safety concerns associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

2 Reference Documents

AASHTO
M 247 Glass Beads Used in Pavement Markings

ASTM
E965 Measuring Pavement Macrotexture Depth Using a Volumetric Technique

MT Materials Manual
MT 606 Procedure for Selecting Sampling locations by random sampling technique

METHOD A – COLD-MILLED PLANT MIX SURFACES

3 Apparatus

3.1 *Filler* – Type 1 glass beads in accordance with AASHTO M 247.

3.2 *Spreader* – A flat, stiff, hard disk made from methyl methacrylate (Plexiglas) with a thickness of 0.5 ± 0.1 inch, diameter of 8 ± 2 inch and a round handle affixed in the center

3.3 *Graduate* – A conical or cylindrical shape graduate, 250 ml capacity

3.4 *Brushes* – A stiff wire brush and a soft bristle brush

3.5 *Container* – A small sample container with a secure and easily removable cover, at least 200 ml capacity

3.6 *Screen* – A shield to protect the test area location from air turbulence created from wind or traffic.

4 Test Material Preparation

4.1 Prepare one sample container for each test area location.

4.1.1 Fill the graduate with 200 ± 2 ml of filler.

4.1.2 Gently tap the side of the graduate to level the surface of the filler.

4.1.3 Place the measured volume of filler in the container.

4.1.4 Label the container with type and quantity of filler.

5 Procedure

5.1 *Test Area*

5.1.1 Randomly select a test area location(s) on the milled pavement surface in accordance with MT 606.

5.1.2 Inspect the test area location and ensure it is a dry, homogeneous site, free of unique or localized features such as cracks, joints, stripping and patching.

5.1.3 If localized features are present, move up-station at the same transverse offset until a suitable site is found.

5.1.4 Gently clean an area of about 1 foot by 1 foot for the test area location using the stiff wire brush to remove any residue, debris or loosely bonded material. Be careful not to dislodge bonded material. After using the stiff wire brush, gently brush the test area location with the soft bristle brush to remove any remaining debris.

5.1.5 Place the screen on the milled pavement surface to protect the test area location from air turbulence.

5.2 *Test Measurement*

5.2.1 Hold the container with filler no more than 4 inches above the pavement at the test area location.

5.2.2 Pour the measured volume of filler from the container onto the milled pavement surface in a conical pile.

5.2.3 Place the spreader lightly on top of the conical pile of filler being careful not to compact the filler.

5.2.4 Move the spreader in a slow, circular motion to disperse the filler in a circular area and to create a defined crest around the perimeter.

5.2.5 Continue spreading the filler until it is well dispersed and the spreader rides on top of the high points of the milled pavement surface.

5.2.6 Measure and record the diameter of the circular area four times, at intervals of 45º and to the nearest 0.1 inch, as shown in Figure 1.

5.2.7 Measure the diameter of the circular area from the top (crest) of the slope on one side, through the center, and to the top (crest) of the slope on the other side of the circular area.

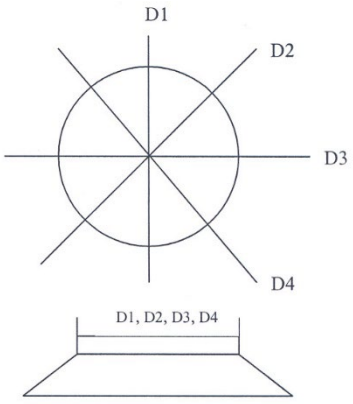


Figure 1: Typical Measuring Pattern

5.2.8 Calculate the average diameter of the circular area covered by the filler (Equation 9.1).

5.2.9 Determine the macro-texture thickness of the milled pavement surface by using the cross reference table in Section 9.3 below.

5.3 Remove the filler material from the location using the soft bristle brush and repeat Subsection 5.2 two more times.

METHOD B – MICRO-MILLED CONCRETE AND PLANT MIX SURFACES

6 Apparatus

6.1 *Filler* – Type 1 glass beads in accordance with AASHTO M 247

6.2 *Spreader* – A flat, stiff hard disk with a thickness of 1.0 ± 0.5 inch, diameter of 4 ± 2 inch

6.3 *Graduate* – A conical or cylindrical shape graduate, 250 ml capacity

6.4 *Brushes* – A stiff wire brush and a soft bristle brush

6.5 *Container* – A small sample container with a secure and easily removable cover, at least 50 ml capacity

6.6 *Screen* – A shield used to protect the test area from air turbulence created from wind or traffic

7 Test Material Preparation

7.1 Prepare one sample container for each test area location.

7.1.1 Fill the graduate with 25 ± 2 ml of filler.

7.1.2 Gently tap the side of the graduate to level the surface of the filler.

7.1.3 Place the measured volume of filler in the container.

7.1.4 Label the container with type and quantity of filler.

8 Procedure

8.1 *Test Area*

8.1.1 Randomly determine a test area location on the milled pavement surface in accordance with MT 606.

8.1.2 Gently clean an area of about 1 foot by 1 foot for the test area location using the stiff wire brush to remove any, residue, debris or loosely bonded material. Be careful not to dislodge bonded material. After using the stiff wire brush, gently brush the test area location with the soft bristle brush to remove any remaining debris.

8.1.3 Place the screen on the milled pavement surface to protect the test area location from air turbulence.

8.2 *Test Measurement*

8.2.1 Hold the container with filler no more than 4 inches above the pavement at the test area location.

8.2.2 Pour the measured volume of filler from the container onto the milled pavement surface into a conical pile.

8.2.3 Place the spreader lightly on top of the conical pile of filler being careful not to compact the filler.

8.2.4 Move the spreader in a slow, circular motion to disperse the filler in a circular area and to create a defined crest around the perimeter.

8.2.5 Continue spreading the filler until it is well dispersed and the spreader rides on top of the high points of the pavement surface.

8.2.6 Measure and record the diameter of the circular area four times, at intervals of 45º and to the nearest 0.1 inch, as shown in Figure 1.

8.2.7 Calculate the average diameter of the circular area covered by the filler (Equation 9.1).

8.2.8 Determine the macro-texture thickness of the milled pavement surface by using the cross reference table in Section 9.4 below.

8.3 Repeat Subsection 8.2 two more times.

8.4 Remove the filler material from the locations and properly dispose of the material.

9 Calculations

9.1 For each test area location, perform the following calculations.

9.1.1 Calculate the average diameter of the circular area covered by the filler.

$$Da = \frac{(D1 + D2 + D3 + D4)}{4}$$

Where:
Da = Average diameter of the filler area, inches
D1, D2, D3, D4 = Diameters of the filler area, inches

9.1.2 Calculate the area of the circle covered by the filler in square inches (in^2).

$$A = \frac{\pi Da^2}{4}$$

9.1.3 Calculate the volume of filler in cubic inches (in^3).

$$V(in^3) = \frac{V(ml)}{16.387\ ml/in3}$$

9.1.4 Calculate Macro-texture Depth (inches):

$$Depth = \frac{V(in^3)}{A(in^2)}$$

9.1.5 Example:

Da = 8.0 inches

Area = π $Da^2/4$ = π $8.0^2/4$ = 50.265 in^2

Volume of filler = 25 ml

Convert ml to cubic inches = 25/16.387 = 1.525 in^3

Depth = $V(in^3)/A(in^2)$ = 1.525 in^3/50.265 in^2 = 0.030 in.

9.2 Calculate the Average Texture Depth (ATD)

9.2.1 Add the three (3) individual macro-texture depth results and divide by three.

9.2.2 Report the ATD to the nearest 0.001 inches.

9.3 Macro-Texture Thickness Based on 200 ml of Filler and Average Diameter

Average Diameter (inches)	Macrotexture Thickness (inches)	Average Diameter (inches)	Macrotexture Thickness (inches)	Average Diameter (inches)	Macrotexture Thickness (inches)
7.1	0.308	8.8	0.201	10.5	0.141
7.2	0.300	8.9	0.196	10.6	0.138
7.3	0.292	9.0	0.192	10.7	0.136
7.4	0.284	9.1	0.188	10.8	0.133
7.5	0.276	9.2	0.184	10.9	0.131
7.6	0.269	9.3	0.180	11.0	0.128
7.7	0.262	9.4	0.176	11.1	0.126
7.8	0.255	9.5	0.172	11.2	0.124
7.9	0.249	9.6	0.169	11.3	0.122
8.0	0.243	9.7	0.165	11.4	0.120
8.1	0.237	9.8	0.162	11.5	0.117
8.2	0.231	9.9	0.159	11.6	0.115
8.3	0.226	10.0	0.155	11.7	0.113
8.4	0.220	10.1	0.152	11.8	0.112
8.5	0.215	10.2	0.149	11.9	0.110
8.6	0.210	10.3	0.146	12.0	0.108
8.7	0.205	10.4	0.144	12.1	0.106

9.4 Macro-Texture Depth Based on 25 ml of Filler and Average Diameter

Average Diameter (Inches)	Macrotexture Depth (Inches)	Average Diameter (Inches)	Macrotexture Depth (Inches)	Average Diameter (Inches)	Macrotexture Depth (Inches)	Average Diameter (Inches)	Macrotexture Depth (Inches)
5	0.078	6.5	0.046	8	0.030	9.5	0.022
5.1	0.075	6.6	0.045	8.1	0.030	9.6	0.021
5.2	0.072	6.7	0.043	8.2	0.029	9.7	0.021
5.3	0.069	6.8	0.042	8.3	0.028	9.8	0.020
5.4	0.067	6.9	0.041	8.4	0.028	9.9	0.020
5.5	0.064	7	0.040	8.5	0.027	10	0.019
5.6	0.062	7.1	0.039	8.6	0.026	10.1	0.019
5.7	0.060	7.2	0.037	8.7	0.026	10.2	0.019
5.8	0.058	7.3	0.036	8.8	0.025	10.3	0.018
5.9	0.056	7.4	0.035	8.9	0.025	10.4	0.018
6	0.054	7.5	0.035	9	0.024	10.5	0.018
6.1	0.052	7.6	0.034	9.1	0.023	10.6	0.017
6.2	0.050	7.7	0.033	9.2	0.023	10.7	0.017
6.3	0.049	7.8	0.032	9.3	0.022	10.8	0.017
6.4	0.047	7.9	0.031	9.4	0.022	10.9	0.016