

DETERMINATION OF MACROTEXTURE OF PAVEMENT SURFACE

Scope: This method provides a field procedure for determining the macrotexture depth of pavement surfaces. This method is a modification of ASTM E965.

Use: This method is used to evaluate macrotexture depth of milled and chip sealed pavement surfaces.

Reference

Documents: ASTM E965 *Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique*

WYDOT T-211 Macrotexture Report

- Apparatus:**
1. Test material; solid glass spheres having minimum 90 percent roundness meeting requirements of ASTM E965. An acceptable supplier is Potters Industries LLC, 5650 Hwy 279 North, Brownwood, TX 76801 (phone 325-752-6711; product number P-010 US 60-80, Technical Quality Glass Spheres #602602)
 2. Sample container; cylindrical metal or plastic container with minimum internal volume of 250 ml, no inner lip on container edge, tight fitting lid
 3. Spreader tool; ice hockey puck
 4. Brushes; stiff wire brush and a soft bristle brush only on mill surfaces. Do not use wire brushes on chip seals.
 5. Wind screen; Sonatube suggested, approximately 3 feet high, cut in half lengthwise (see Figure 1). Alternative wind screens are acceptable such as hinged plywood windbreak or inverted plastic bucket (5 gallon) with bottom cut out (inside diameter limited to 11-inch maximum).



Figure 1, Wind Screen (Sonatube)

6. Ruler; 12 inch standard ruler with 0.1 inch increments or tape measure.
7. Graduated cylinder, 100-mL, Pyrex® glass, with 1-mL graduation lines, funnel top and detachable, hexagonal plastic base (part #70075)

For WYDOT testers, above items are available through the Purchasing Program (307-777-4406).

Procedure: Lab/Office Preparation (test samples, reports):

1. Use one sample container for each test; each testing location requires 3 tests spaced 3 feet from each other (total of 3 sample containers per testing location). Use 3 ounce tin with tight fitting lid for 100 mL sample; use 6 ounce tin with tight fitting lid for 200 mL sample.
2. Fill graduated cylinder with test material; use 200 ± 2 mL when testing milled pavements (i.e., fill cylinder twice), use 100 ± 1 mL when testing chip sealed pavements.
3. Gently tap the side of the graduated cylinder to level the top surface of the test material; visually verify quantity; add or empty material as necessary.
4. Pour applicable volume of test material, either 100 mL or 200 mL, in the sample container; close/seal with lid; label quantity on lid with marker pen
5. Repeat Steps 1 through 4 to prepare a sufficient quantity of samples for testing all surfacing location(s).
6. Prepare necessary test report(s) for recording measurements prior to field testing. Use Form T-211, and at the top of each report mark an ('X') in the appropriate box to select each of the following criteria:
 - a. Surfacing Type, either 'Milled Pavement' or 'Chip Sealing';
 - b. If chip sealing, then Aggregate Size, either $\frac{3}{8}$ inch or $\frac{1}{2}$ inch;
 - c. Sample Size, either 100 mL or 200 mL;

The report form automatically generates the appropriate cross reference table based on surfacing type, aggregate size, and sample size.

Field Testing/Measurements:

1. Test finished pavement surface(s) as follows:
 - a. One test per mile for milled surfaces receiving pavement overlay
 - b. One test per frequency as specified for chip sealed surfaces
2. Determine a random, representative testing location on pavement surface to measure macrotexture depth.
3. Inspect testing location to ensure it is dry and homogeneous, free of unique or localized features such as cracks, joints, striping, and patching.

4. If localized features are present, move up-station at the same transverse offset until a suitable testing location is found.
5. Gently clean an area of about 1 foot square for sample location using the stiff-wire brush to remove and residue, debris or loosely bonded material. Be careful not to dislodge bonded material. After using the stiff wire brush, gently brush sample location with the soft bristle brush to remove any remaining debris.
6. Place the wind screen on the pavement surface to protect the sample location from air turbulence.
7. Hold the sample container with test material above pavement at sample location at a height not greater than 4 inches.
8. Pour appropriate, measured volume of test material from the container onto pavement surface forming a conical pile.
9. Place the spreader tool (ice hockey puck) lightly on top of conical pile of test material being careful not to compact the test material.
10. Move the spreader tool (ice hockey puck) in a slow, circular motion to disperse the test material in a circular area and to create a defined crest around the perimeter.
11. Continue spreading the test material until it is well dispersed and the spreader tool (ice hockey puck) rides on top of the high points of the pavement surface.
12. Measure and record, to the nearest 0.1 inch, the diameter of the circular area; four times at intervals of 45 degrees as shown below. Measure diameter of circular area from top (crest) of slope on one side, through the center, and to top (crest) of slope on other side of circular area.
13. Add all four diameter measurements and divide by 4 to determine average diameter of circular area covered by test material.
14. Use cross reference table at bottom of Macrotexture Report, Form T-211, to determine the macrotexture depth of pavement surface at the sample location. Use average diameter rounded to nearest 0.1 inch to determine which row in cross reference table. Record macrotexture depth to nearest 0.001 inch.
15. Repeat steps 5 through 14 with a new sample of test material at two more locations spaced 3 feet from each other (3 sample locations will form a triangle with 3 foot sides).
16. Add all three results and divide by 3 to determine average macrotexture depth. Report average macrotexture depth to nearest 0.001 inch.

Calculations:

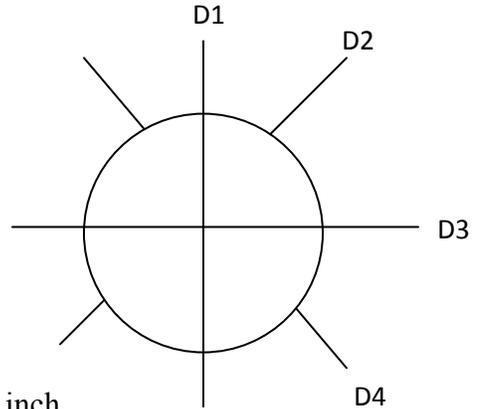
Calculate average diameter of circular area covered by test material at sample location,

$$D_a = (D_1 + D_2 + D_3 + D_4) / 4$$

Where:

D_a = Average diameter of test material area, inch

D_1, D_2, D_3, D_4 = Diameters of the test material area, nearest 0.1 inch



Report:

Record macrotexture depth of pavement surface on Form T-211, Macrotexture Report. Report macrotexture depth to nearest 0.001 inch. For chip sealed surfaces, also record percent embedment depth on Form T-211, Macrotexture Report. Report percent embedment depth to nearest 1 percent.



**WYOMING DEPARTMENT OF TRANSPORTATION
MATERIALS TESTING LABORATORY
MACROTEXTURE REPORT**

Form T-211
Rev. (10-17)

Project Number: ERP Project Number Project Name: Project Name
Resident Engineer: Engineer Name Town: Engineer Town
Contractor: Contractor Name Tested By: Tester Name

Milled Pavement

Chip Sealing

Test Sample Size

Aggregate Size (nominal maximum)

100 mL 200 mL

¾ inch ½ inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	07/18/17	MP 3.29	5.3	5.2	5.3	5.4	5.30	0.277	N/A
2			5.3	5.4	5.2	5.2	5.28	0.277	N/A
3			5.2	5.3	5.4	5.4	5.33	0.277	N/A
Sub-Test Average =								0.277	
1	07/19/17	MP 4.21	5.2	5.3	5.4	5.5	5.35	0.266	N/A
2			5.4	5.5	5.5	5.3	5.43	0.266	N/A
3			5.5	5.3	5.2	5.5	5.38	0.266	N/A
Sub-Test Average =								0.266	
Sub-Test Average =									

Remarks: _____

Tested By: _____ Checked By: _____
Date: _____ Date: _____

Macrotexture Depth Based on 100 mL of Test Material and Average Diameter

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
2.5	1.243	N/A	4.5	0.384	N/A	6.5	0.184	N/A
2.6	1.149	N/A	4.6	0.367	N/A	6.6	0.178	N/A
2.7	1.066	N/A	4.7	0.352	N/A	6.7	0.173	N/A
2.8	0.991	N/A	4.8	0.337	N/A	6.8	0.168	N/A
2.9	0.924	N/A	4.9	0.324	N/A	6.9	0.163	N/A
3.0	0.863	N/A	5.0	0.311	N/A	7.0	0.159	N/A
3.1	0.809	N/A	5.1	0.299	N/A	7.1	0.154	N/A
3.2	0.759	N/A	5.2	0.287	N/A	7.2	0.150	N/A
3.3	0.713	N/A	5.3	0.277	N/A	7.3	0.146	N/A
3.4	0.672	N/A	5.4	0.266	N/A	7.4	0.142	N/A
3.5	0.634	N/A	5.5	0.257	N/A	7.5	0.138	N/A
3.6	0.600	N/A	5.6	0.248	N/A	7.6	0.135	N/A
3.7	0.568	N/A	5.7	0.239	N/A	7.7	0.131	N/A
3.8	0.538	N/A	5.8	0.231	N/A	7.8	0.128	N/A
3.9	0.511	N/A	5.9	0.223	N/A	7.9	0.124	N/A
4.0	0.486	N/A	6.0	0.216	N/A	8.0	0.121	N/A
4.1	0.462	N/A	6.1	0.209	N/A	8.1	0.118	N/A
4.2	0.440	N/A	6.2	0.202	N/A	8.2	0.116	N/A
4.3	0.420	N/A	6.3	0.196	N/A	8.3	0.113	N/A
4.4	0.401	N/A	6.4	0.190	N/A	8.4	0.110	N/A



**WYOMING DEPARTMENT OF TRANSPORTATION
MATERIALS TESTING LABORATORY
MACROTEXTURE REPORT**

Project Number: ERP Project Number Project Name: Project Name
 Resident Engineer: Engineer Name Town: Engineer Town
 Contractor: Contractor Name Tested By: Tester Name

Milled Pavement **Chip Sealing**
 Test Sample Size Aggregate Size (nominal maximum)
 100 mL 200 mL 3/8 inch 1/2 inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	07/18/17	MP 3.29	7.4	7.6	7.5	7.5	7.50	0.276	N/A
2			7.3	7.6	7.5	7.7	7.53	0.276	N/A
3			7.4	7.5	7.4	7.5	7.45	0.276	N/A
Sub-Test Average =								0.276	
1	07/19/17	MP 4.21	7.6	7.5	7.7	7.8	7.65	0.262	N/A
2			7.6	7.8	7.6	7.7	7.68	0.262	N/A
3			7.7	7.5	7.8	7.6	7.65	0.262	N/A
Sub-Test Average =								0.262	
Sub-Test Average =									

Remarks: _____

Tested By: _____ Checked By: _____
 Date: _____ Date: _____

Macrotexture Depth Based on 200 mL of Test Material and Average Diameter

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
4.7	0.703	N/A	6.7	0.346	N/A	8.7	0.205	N/A
4.8	0.674	N/A	6.8	0.336	N/A	8.8	0.201	N/A
4.9	0.647	N/A	6.9	0.326	N/A	8.9	0.196	N/A
5.0	0.622	N/A	7.0	0.317	N/A	9.0	0.192	N/A
5.1	0.597	N/A	7.1	0.308	N/A	9.1	0.188	N/A
5.2	0.575	N/A	7.2	0.300	N/A	9.2	0.184	N/A
5.3	0.553	N/A	7.3	0.292	N/A	9.3	0.180	N/A
5.4	0.533	N/A	7.4	0.284	N/A	9.4	0.176	N/A
5.5	0.514	N/A	7.5	0.276	N/A	9.5	0.172	N/A
5.6	0.496	N/A	7.6	0.269	N/A	9.6	0.169	N/A
5.7	0.478	N/A	7.7	0.262	N/A	9.7	0.165	N/A
5.8	0.462	N/A	7.8	0.255	N/A	9.8	0.162	N/A
5.9	0.446	N/A	7.9	0.249	N/A	9.9	0.159	N/A
6.0	0.432	N/A	8.0	0.243	N/A	10.0	0.155	N/A
6.1	0.418	N/A	8.1	0.237	N/A	10.1	0.152	N/A
6.2	0.404	N/A	8.2	0.231	N/A	10.2	0.149	N/A
6.3	0.392	N/A	8.3	0.226	N/A	10.3	0.146	N/A
6.4	0.379	N/A	8.4	0.220	N/A	10.4	0.144	N/A
6.5	0.368	N/A	8.5	0.215	N/A	10.5	0.141	N/A
6.6	0.357	N/A	8.6	0.210	N/A	10.6	0.138	N/A



**WYOMING DEPARTMENT OF TRANSPORTATION
MATERIALS TESTING LABORATORY
MACROTEXTURE REPORT**

Form T-211
Rev. (10-17)

Project Number: ERP Project Number Project Name: Project Name
 Resident Engineer: Engineer Name Town: Engineer Town
 Contractor: Contractor Name Tested By: Tester Name

Milled Pavement Chip Sealing
 Test Sample Size: 100 mL 200 mL Aggregate Size (nominal maximum): 3/8 inch 1/2 inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	06/02/17	MP 50.1	9.0	8.8	8.4	8.8	8.75	0.100	73
2			9.2	9.8	9.6	9.2	9.45	0.086	77
3			8.6	9.6	8.6	9.1	8.98	0.096	74
Sub-Test Average =								0.094	75
1	06/03/17	MP 50.73	6.8	8.6	7.6	7.2	7.55	0.135	64
2			7.1	7.8	6.7	7.0	7.15	0.150	60
3			6.7	7.9	7.4	8.0	7.50	0.138	63
Sub-Test Average =								0.141	62
1	06/04/17	MP 51.85	8.9	8.9	8.6	9.0	8.85	0.098	74
2			8.9	10.1	9.4	8.4	9.20	0.092	75
3			8.8	9.0	8.3	9.4	8.88	0.098	74
Sub-Test Average =								0.096	74

Remarks: _____

Tested By: _____ Checked By: _____
 Date: _____ Date: _____

Percent Embedment Depth Based on 100 mL of Test Material, Average Diameter, and 3/8 inch aggregate

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
4.6	0.367	2	6.6	0.178	53	8.6	0.105	72
4.7	0.352	6	6.7	0.173	54	8.7	0.103	73
4.8	0.337	10	6.8	0.168	55	8.8	0.100	73
4.9	0.324	14	6.9	0.163	57	8.9	0.098	74
5.0	0.311	17	7.0	0.159	58	9.0	0.096	74
5.1	0.299	20	7.1	0.154	59	9.1	0.094	75
5.2	0.287	23	7.2	0.150	60	9.2	0.092	75
5.3	0.277	26	7.3	0.146	61	9.3	0.090	76
5.4	0.266	29	7.4	0.142	62	9.4	0.088	77
5.5	0.257	31	7.5	0.138	63	9.5	0.086	77
5.6	0.248	34	7.6	0.135	64	9.6	0.084	78
5.7	0.239	36	7.7	0.131	65	9.7	0.083	78
5.8	0.231	38	7.8	0.128	66	9.8	0.081	78
5.9	0.223	41	7.9	0.124	67	9.9	0.079	79
6.0	0.216	42	8.0	0.121	68	10.0	0.078	79
6.1	0.209	44	8.1	0.118	69	10.1	0.076	80
6.2	0.202	46	8.2	0.116	69	10.2	0.075	80
6.3	0.196	48	8.3	0.113	70	10.3	0.073	81
6.4	0.190	49	8.4	0.110	71	10.4	0.072	81
6.5	0.184	51	8.5	0.108	71	10.5	0.070	81



**WYOMING DEPARTMENT OF TRANSPORTATION
MATERIALS TESTING LABORATORY
MACROTEXTURE REPORT**

Project Number: ERP Project Number Project Name: Project Name
 Resident Engineer: Engineer Name Town: Engineer Town
 Contractor: Contractor Name Tested By: Tester Name

Milled Pavement

Chip Sealing

Test Sample Size

Aggregate Size (nominal maximum)

100 mL 200 mL

¾ inch ½ inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	07/10/17	MP 5.62	11.7	11.6	11.8	11.5	11.65	0.114	70
2			11.6	11.8	11.7	11.9	11.75	0.112	70
3			11.4	11.6	11.7	11.6	11.58	0.115	69
Sub-Test Average =								0.114	70
1	07/11/17	MP 6.53	10.8	10.9	11.0	11.1	10.95	0.128	66
2			10.9	10.8	10.6	10.7	10.75	0.133	65
3			10.7	10.9	10.8	11.0	10.85	0.131	65
Sub-Test Average =								0.131	65
Sub-Test Average =									

Remarks: _____

Tested By: _____ Checked By: _____
 Date: _____ Date: _____

Percent Embedment Depth Based on 200 mL of Test Material, Average Diameter, and ¾ inch aggregate

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
6.5	0.368	2	8.5	0.215	43	10.5	0.141	62
6.6	0.357	5	8.6	0.210	44	10.6	0.138	63
6.7	0.346	8	8.7	0.205	45	10.7	0.136	64
6.8	0.336	10	8.8	0.201	46	10.8	0.133	65
6.9	0.326	13	8.9	0.196	48	10.9	0.131	65
7.0	0.317	15	9.0	0.192	49	11.0	0.128	66
7.1	0.308	18	9.1	0.188	50	11.1	0.126	66
7.2	0.300	20	9.2	0.184	51	11.2	0.124	67
7.3	0.292	22	9.3	0.180	52	11.3	0.122	67
7.4	0.284	24	9.4	0.176	53	11.4	0.120	68
7.5	0.276	26	9.5	0.172	54	11.5	0.118	69
7.6	0.269	28	9.6	0.169	55	11.6	0.115	69
7.7	0.262	30	9.7	0.165	56	11.7	0.114	70
7.8	0.255	32	9.8	0.162	57	11.8	0.112	70
7.9	0.249	34	9.9	0.159	58	11.9	0.110	71
8.0	0.243	35	10.0	0.155	59	12.0	0.108	71
8.1	0.237	37	10.1	0.152	59	12.1	0.106	72
8.2	0.231	38	10.2	0.149	60	12.2	0.104	72
8.3	0.226	40	10.3	0.146	61	12.3	0.103	73
8.4	0.220	41	10.4	0.144	62	12.4	0.101	73



**WYOMING DEPARTMENT OF TRANSPORTATION
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MACROTEXTURE REPORT**

Form T-211
Rev. (10-17)

Project Number: ERP Project Number Project Name: Project Name
Resident Engineer: Engineer Name Town: Engineer Town
Contractor: Contractor Name Tested By: Tester Name

Milled Pavement Chip Sealing
Test Sample Size Aggregate Size (nominal maximum)
 100 mL 200 mL 3/8 inch 1/2 inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	07/22/17	MP 5.62	7.1	7.2	7.4	7.3	7.25	0.146	71
2			7.2	7.5	7.3	7.5	7.38	0.142	72
3			6.8	7.0	7.1	6.9	6.95	0.159	68
Sub-Test Average =								0.149	70

1	07/22/17	MP 6.53	6.6	6.7	6.9	6.8	6.75	0.168	66
2			6.7	6.9	6.6	6.6	6.70	0.173	65
3			6.9	6.8	7.1	6.9	6.93	0.163	67
Sub-Test Average =								0.168	66

Sub-Test Average =									

Remarks: _____

Tested By: _____ Checked By: _____
Date: _____ Date: _____

Percent Embedment Depth Based on 100 mL of Test Material, Average Diameter, and 1/2 inch aggregate

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
4.0	0.486	3	6.0	0.216	57	8.0	0.121	76
4.1	0.462	8	6.1	0.209	58	8.1	0.118	76
4.2	0.440	12	6.2	0.202	60	8.2	0.116	77
4.3	0.420	16	6.3	0.196	61	8.3	0.113	77
4.4	0.401	20	6.4	0.190	62	8.4	0.110	78
4.5	0.384	23	6.5	0.184	63	8.5	0.108	78
4.6	0.367	27	6.6	0.178	64	8.6	0.105	79
4.7	0.352	30	6.7	0.173	65	8.7	0.103	79
4.8	0.337	33	6.8	0.168	66	8.8	0.100	80
4.9	0.324	35	6.9	0.163	67	8.9	0.098	80
5.0	0.311	38	7.0	0.159	68	9.0	0.096	81
5.1	0.299	40	7.1	0.154	69	9.1	0.094	81
5.2	0.287	43	7.2	0.150	70	9.2	0.092	82
5.3	0.277	45	7.3	0.146	71	9.3	0.090	82
5.4	0.266	47	7.4	0.142	72	9.4	0.088	82
5.5	0.257	49	7.5	0.138	72	9.5	0.086	83
5.6	0.248	50	7.6	0.135	73	9.6	0.084	83
5.7	0.239	52	7.7	0.131	74	9.7	0.083	83
5.8	0.231	54	7.8	0.128	74	9.8	0.081	84
5.9	0.223	55	7.9	0.124	75	9.9	0.079	84



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Form T-211
Rev. (10-17)

Project Number: ERP Project Number Project Name: Project Name
 Resident Engineer: Engineer Name Town: Engineer Town
 Contractor: Contractor Name Tested By: Tester Name

Milled Pavement Chip Sealing
 Test Sample Size: 100 mL 200 mL
 Aggregate Size (nominal maximum): 3/8 inch 1/2 inch

Test #	Date of Test	Station or RM, Offset, Lane	Diameter D1 (inch)	Diameter D2 (inch)	Diameter D3 (inch)	Diameter D4 (inch)	Diameter Avg (inch)	Macro texture Depth	Percent Embedment Depth
1	07/11/17	MP 5.62	10.8	10.6	10.9	10.7	10.75	0.133	73
2			10.9	10.8	11.1	11.0	10.95	0.128	74
3			10.6	10.7	10.5	10.4	10.55	0.138	72
Sub-Test Average =								0.133	73
1	07/12/17	MP 6.53	9.5	9.3	9.4	9.6	9.45	0.172	66
2			9.6	9.8	9.7	9.4	9.63	0.169	66
3			9.8	9.7	10.0	9.9	9.85	0.159	68
Sub-Test Average =								0.167	67
Sub-Test Average =									

Remarks: _____

Tested By: _____ Checked By: _____
 Date: _____ Date: _____

Percent Embedment Depth Based on 200 mL of Test Material, Average Diameter, and 1/2 inch aggregate

Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth	Average Diameter (inch)	Macro texture Depth (inch)	Percent Embedment Depth
5.6	0.496	1	7.6	0.269	46	9.6	0.169	66
5.7	0.478	4	7.7	0.262	48	9.7	0.165	67
5.8	0.462	8	7.8	0.255	49	9.8	0.162	68
5.9	0.446	11	7.9	0.249	50	9.9	0.159	68
6.0	0.432	14	8.0	0.243	51	10.0	0.155	69
6.1	0.418	16	8.1	0.237	53	10.1	0.152	70
6.2	0.404	19	8.2	0.231	54	10.2	0.149	70
6.3	0.392	22	8.3	0.226	55	10.3	0.146	71
6.4	0.379	24	8.4	0.220	56	10.4	0.144	71
6.5	0.368	26	8.5	0.215	57	10.5	0.141	72
6.6	0.357	29	8.6	0.210	58	10.6	0.138	72
6.7	0.346	31	8.7	0.205	59	10.7	0.136	73
6.8	0.336	33	8.8	0.201	60	10.8	0.133	73
6.9	0.326	35	8.9	0.196	61	10.9	0.131	74
7.0	0.317	37	9.0	0.192	62	11.0	0.128	74
7.1	0.308	38	9.1	0.188	62	11.1	0.126	75
7.2	0.300	40	9.2	0.184	63	11.2	0.124	75
7.3	0.292	42	9.3	0.180	64	11.3	0.122	76
7.4	0.284	43	9.4	0.176	65	11.4	0.120	76
7.5	0.276	45	9.5	0.172	66	11.5	0.118	76