Recommended Approval: Assistant Division Chief 3/1/12 Date Division Chief 03/01/2012 Date	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved: Director 03/09/12 Date	LABORATORY METHOD OF POLISHING AGGREGATES USING THE CIRCULAR TRACK POLISHING MACHINE	MSMT 215

SCOPE:

The procedure is used to prepare then polish aggregate samples using the Circular Track Polishing Machine.

REFERENCES:

Circular Track Polishing Machine – Apparatus Specification and Operation Manual: North Central Superpave Center – Purdue University, November 2008

E660 Standard Practice for Accelerated Polishing of Aggregates or Pavement Surfaces Using a Small-Wheel, Circular Track Polishing Machine

E1911 Standard Test Method for Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester

D3319 Standard Practice for the Accelerated Polishing of Aggregates Using the British Wheel

MSMT 216 Measuring Frictional Properties of Aggregates Using the Dynamic Friction Tester (DFT)

MATERIALS AND EQUIPMENT:

1. The Circular Track Polishing Machine

2. Three patterned pneumatic tires type 2.80/2.50 with a cold tire pressure of 240 ± 34 kPa (35 ± 5 psi)

3. Circular stainless steel casting mold with an outside diameter of 14 inches, inside diameter of 8 ¼ inches and a height of 1 inch.

4. Square stainless steel mold with dimensions of 508 mm × 508 mm x 76mm (20.0 × 20.0 in x 3.0 in) for holding the prepared sample during polishing and testing.

5. Resin - Polylite® Polyester 32-773 or equivalent as a bonding agent
6. Wollastonite - NYAD 400 Extender Pigment

7. Silica - Amorphous Fumed, 150 grit size

8. Hardener - Methyl Ethyl Ketone Peroxide

9. Mold release agent - # 2 Green Wax or equivalent

10. Glass beads

11. Oven

12. Vented hood

13. Miscellaneous supplies, including disposable cups, spatula, and stirring rods

14. 7 lbs of -½ to + ⅜ inch aggregate

PROCEDURE:

SAMPLE PREPARATION

1. Sieve the aggregate to be used for testing through a ½ inch sieve and retain the material on the ⅜ inch sieve. Sieve enough material to obtain at least 7 lbs. of aggregate per sample.

2. Thoroughly wash the aggregates obtained from Step 1 and dry to a constant weight at a temperature of 110 ± 5°C (230 ± 9°F).

3. Clean then coat the casting mold with the mold release agent. The casting mold is depicted in Figure 1.

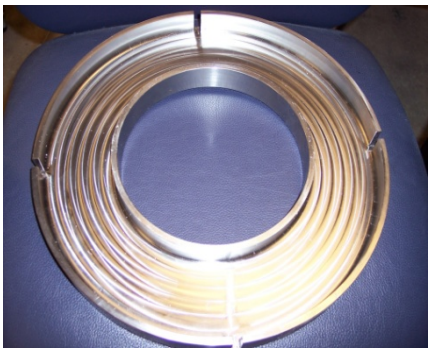

Figure 1- Casting mold and mold with placed aggregate.

4. Place a single layer of aggregate by hand into the bottom of the stainless steel mold. Place the aggregate with a flat surface down, as densely as possible. If the aggregate is flat, elongated or unusually shaped, select pieces of aggregates with adequate dimensions to ensure satisfactory epoxy bonding.

5. After placing the aggregate, fill the spaces between the aggregate with glass beads. Pour the beads to fill one-fourth to one-half of the aggregate depth to ensure the epoxy does not seep to the bottom of the mold, thus being exposed on the finished polishing surface.

6. Prepare the epoxy mix under a properly vented hood using the following quantities:

Material	**Quantity**
Wollastonite[1]	120 gm
Silica	11 gm
Resin	296 gm
Hardener	4 gm

Note 1: Do not increase the Wollastonite content above the recommended limit (120 gm)

7. Pour the epoxy onto the placed aggregate under the vented hood; then use a spatula to spread the epoxy evenly into the mold.

8. Coat the bottom of the capping mold (or a weighted steel plate) with release agent; then place it on top of the casting mold to act as a weight and to ensure the back of the specimen is flat.

9. Allow the mold to dry under the vented hood for 12 to 24 hours. Then carefully remove the capping mold and make certain the epoxy has sufficiently hardened before removing the specimen from the casting mold.

10. Remove the specimen from the casting mold by first inverting the mold. Then, using a screwdriver, lightly tap the specimen from the mold using the slots provided. The finished specimen should appear similar to Figure 2.

11. Write the following information on the back of the specimen with a permanent marker: Quarry Name and Location, Contract Number, Log Number, Specimen Number and Date. Also, write the Log Number and Specimen Number on the side of the specimen.

Figure 2 - Finished specimen ready for test.

EQUIPMENT SETUP

Perform the following checks prior to polishing:

1. The ambient temperature should be 68 ± 4°F (20 ± 2°C).

2. No water should be introduced during polishing.

3. The tire tread should be free of any visible contamination:

    a. Clean contamination from the tires using a sharp knife, if necessary.

    b. Gently remove the contamination to ensure that the tire is not cut.

    c. Replace cut tires if necessary.

    d. Tire replacement due to wear is recommended when the tread depth is at 2 mm minimum, or at approximately one-half million revolutions, whichever comes first.

4. Ensure that all three wheels contain a cold tire pressure of 240 ± 34 kPa (35 ± 5 psi).

INITIAL FRICTION VALUE

1. Place the finished specimen into the square mold, then shim the specimen using small pieces of rubber to secure it in place.

2. Once the specimen is secured, place the square mold onto its base; then thoroughly wash the specimen.

3. Perform a DFT test to obtain an initial friction value per MSMT 216 prior to polishing. Record the initial friction value on the DFT Worksheet.

POLISHING

1. After obtaining the initial friction value, raise the polisher using the three remote controlled actuators.

2. Slide the specimen to the rear of the polisher.

3. Position the specimen so that the wheels rotate on the same footprint where the initial friction value was obtained.

4. Gently lower the polisher onto the specimen using the three remote controlled actuators. Ensure that the frame legs return to the slots provided in the base.

   Note 1: The frame legs may get stuck or out of alignment with the slots after raising the polisher. Use the appropriate tools to adjust. Do not use your hands.

5. Lift the actuator legs until they no longer touch the base of the frame. Use the four side screws to hold the specimen in place during polishing, if necessary.

Figure 3 - CTPM with specimen properly placed.

6. Lock the safety door of the polisher using the safety clips.

7. Enter the number of revolutions (100,000) into the control panel located on the upper part of the polisher. One revolution corresponds to one pass made by all three wheels.

   Note 2: Additional stops for DFT readings at revolutions prior to 100,000 may be made upon request, but are not required.

8. Visually inspect the specimen throughout the testing cycle. If 20 or more aggregate become dislodged during testing, stop the test and consult the Aggregate Lab Team

Leader. The Team Leader will decide whether to continue the testing or to reject the specimen and re-test using a new specimen.

9. After the polisher completes its cycle of 100,000 revolutions, open the safety door and secure the door open to prevent unexpected closure and possible injury.

10. Lift the polisher from the specimen using the three actuators and then remove the specimen from the machine.

11. Test the specimen for surface friction properties per MSMT 216.

REPORT:

Report the initial friction value on the DFT Worksheet.