Test Procedure for

OVERLAY TEST

TxDOT Designation: Tex-248-F

Effective Date: February 2014

1. SCOPE

1.1 This test method determines the susceptibility of bituminous mixtures to fatigue or reflective cracking.

1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

2. APPARATUS

2.1 *Overlay Tester (OT)*—an electro-hydraulic system that applies repeated direct tension loads to specimens. The device automatically measures and records load, displacement, and temperature every 0.1 sec.

2.1.1 The machine features two blocks: one is fixed, and the other slides horizontally. The sliding block applies tension in a cyclic triangular waveform to a constant maximum displacement of 0.06 cm (0.025 in.) The sliding block reaches the maximum displacement and then returns to its initial position in 10 sec. (one cycle).

2.1.2 Additionally, the device includes:

- a controlled temperature chamber,
- a linear variable differential transducer (LVDT) to measure the displacement of the block,
- an electronic load cell to measure the load resulting from the displacement,
- aluminum or steel base plates to restrict shifting of the specimen during testing,
- a mounting jig to align the two base plates for specimen preparation, and
- a 4.2-mm thick spacer bar.

2.1.3 Refer to the manufacturer's specifications for equipment range and LVDT and load cell accuracy.

2.2 *Single or Double Blade Saw.*

2.3 *Cutting Template*, as shown in Figure 1.

Note 1—This is not required when using a double blade saw.

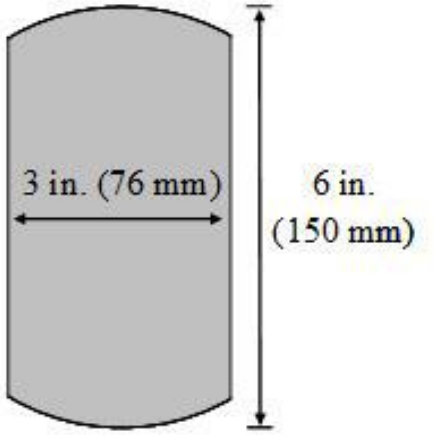

Figure 1—Cutting Template

2.4 *Apparatus* used in Tex-207-F.

2.5 *Temperature Chamber or Heating Oven* (optional), capable of maintaining 25 ± 0.5°C (77 ± 1°F).

2.6 *Vacuum Device* (optional), such as CoreDry.

2.7 *Spatula and Dish*, disposable, for mixing epoxy.

2.8 *Weights*, 10 lb. (4.5 kg) each.

Note 2—As shown in Figure 2, one weight must rest on top of each specimen without overlapping the sides.

2.9 *3/8-in. Socket Drive Torque Wrench*, with a 3-in. extension, capable of applying a 15 lb.-in. torque.

Figure 2—Weighted Specimens

3. MATERIALS

3.1 *Two-Part Epoxy*, with a minimum 24-hr. tensile strength of 4.1 MPa (600 psi) and 24-hr. shear strength of 13.8 MPa (2,000 psi) when tested in accordance with Tex-614-J.

3.2 *Paint or Permanent Marker*.

3.3 *Lubricant* (optional), such as grease or oil.

4. SPECIMENS

4.1 *Laboratory-Molded Specimens*—Prepare three specimens in accordance with Tex-241-F. Specimen diameter must be 6 in. (150 mm), and height must be 4.5 ± 0.2 in. (115 ± 5 mm). Test specimens within 5 days of molding.

Note 3—Cure warm-mix asphalt (WMA) mixtures at 275°F for 4 hr. ± 5 min. before molding. WMA is defined as HMA that is produced within a target temperature discharge range of 215°F and 275°F using WMA additives or processes.

4.1.1 Density of the trimmed test specimen must be 93 ± 1%, except for Permeable Friction Course (PFC) mixtures.

Note 4—Laboratory-molded specimens with 91 ± 1% density usually result in trimmed test specimens that meet the 93 ± 1% density requirement. This is only a guide; use prior experience and knowledge of the specific materials.

Note 5—Mixture weights for laboratory-molded specimens that achieve the density requirement typically vary between 4200 and 4500 g.

4.1.2 For PFC mixtures, mold test specimens to 50 gyrations (Ndesign).

Note 6—Select the mixture weight for the molded PFC specimen based on the weights used in the mix design.

4.2 *Core Specimens*—Specimen diameter must be 6 ± 0.1 in. (150 ± 2 mm), and height must be a minimum of 1.5 in. (38 mm). There is not a specific density requirement for core specimens.

5. PROCEDURE

5.1 *Preparing Specimens:*

5.2 Obtain three cylindrical specimens meeting the requirements of Section 4.

Note 7—Test roadway cores for informational purposes only.

5.2.1 Refer to the sawing device manufacturer's instructions for trimming specimens.

5.2.2 When using a single blade saw, use a cutting template to trace the location of the cuts in paint or permanent marker.

5.2.3 Cutting the specimens perpendicular to the top surface, trim the sides to produce specimens 3 ± 0.02 in. (76 ± 0.5 mm) wide, as shown in Figure 3. When using a single blade saw, follow the lines traced using the template. Discard the cuttings.

5.2.4 Trim the top and bottom of each specimen to produce a sample with a height of 1.5 ± 0.02 in. (38 ± 0.5 mm), as shown in Figure 4. Discard the cuttings.

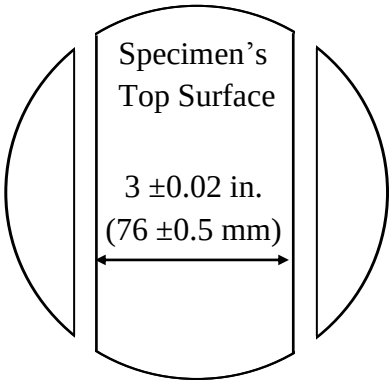

Figure 3—Trimmed Specimen (Top View)

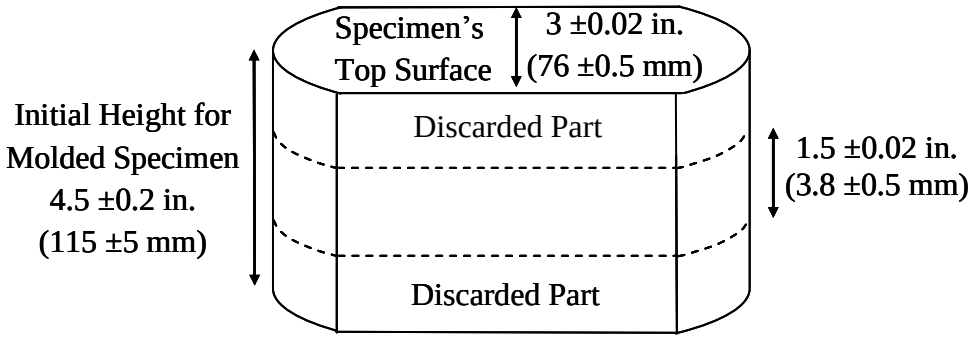

Figure 4—Trimmed Specimen (Side View)

5.2.5 Calculate the density of the trimmed laboratory-molded specimens in accordance with Tex-207-F, in the following order.

Note 8—Do not measure the density of trimmed PFC specimens.

5.2.5.1 Calculate the weight of the specimens in water.

5.2.5.2 Calculate the saturated surface dry (SSD) weight of the specimens in air.

5.2.5.3 Dry the trimmed specimens using one of the following methods.

- Air dry to remove excess moisture, and then use a vacuum device to dry the specimens.
- Oven dry at 40 ± 3°C (104 ± 5°F) to constant weight.

Note 9—Specimens take approximately 8 hr. to oven dry. Do not oven dry for more than 24 hr.

5.2.5.4 Relative density must be 93 ± 1%. Discard and prepare a new specimen if the trimmed specimen does not meet the density requirement.

Note 10—The density for specimens trimmed from roadway cores is for informational purposes only.

5.3 *Mounting and Conditioning Specimens:*

5.3.1 Ensure the base plates and spacer bar are clean, removing any dirt or epoxy from previous samples.

5.3.2 Mount and secure the base plates to the mounting jig. Insert the spacer bar between the plates as shown in Figure 5.

Note 11—If desired, apply a small amount of lubricant on the spacer bar to facilitate its removal.

Note 12—The gap between the two base plates is 4.2 mm.

Figure 5—Mounting Jig, Base Plates, and Spacer Bar

5.3.3 Prepare approximately 12 g of the two-part epoxy for each test specimen following the manufacturer's instructions. Do not prepare epoxy for more than three specimens in one batch.

5.3.4 Spread the epoxy onto a large side of the trimmed specimen.

Note 13—Complete Sections 5.3.4–5.3.7 in under 2 min.

5.3.5 Adhere the specimens to the base plates. Ensure that each specimen is centered and aligned parallel to the edges of the base plates.

5.3.6 Weight the specimens to ensure full contact with the base plates. As shown in Figure 2, one weight must rest on top of each specimen without overlapping the sides.

5.3.7 Remove the spacer bar carefully to prevent the specimens from moving.

5.3.8 Allow the epoxy to cure per the manufacturer's recommendations.

Note 14—Generally, 8 hr. curing time provides sufficient bonding strength.

5.3.9 Remove the weights from the specimens.

5.3.10 Place the test sample assembly (specimens and base plates) in the OT temperature chamber or an oven at 25 ± 0.5°C (77 ± 1°F) for a minimum of 1 hr. before testing.

5.4 *Starting Testing Device:*

5.4.1 Turn on the OT. Turn on the computer and wait at least 1 min. to establish communication with the OT before starting the OT software.

5.4.2 Turn on the hydraulic pump using the OT software.

5.5 *Mounting Specimen Assembly to Testing Device:*

5.5.1 Enter the project name, specimen identification number, specimen density, data file name, and test remarks into the OT software.

5.5.2 Mount the specimen assembly onto the machine according to the manufacturer's instructions, with the following additional steps.

5.5.2.1 Clean the bottom of the base plates and the top of the testing machine blocks before placing the specimen assembly into the blocks.

Note 15—If these surfaces are not clean, damage may occur to the machine, the specimen, or the base plates when tightening the base plates.

5.5.2.2 While placing the assembly into the machine, ensure the device is in load mode to minimize stress to the specimen.

5.5.3 Use the torque wrench to apply 15 lb.-in. of torque to each bolt to fasten the base plates to the machine. Use a similar torqueing pattern for the replicate specimens. Figure 6 shows the recommended pattern.

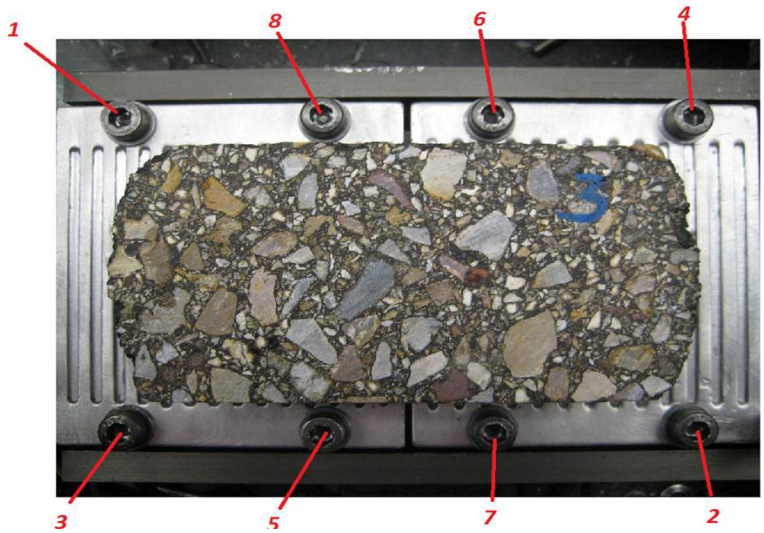

Figure 6—Suggested Torqueing Pattern

5.6 *Testing Specimens:*

5.6.1 Test laboratory-molded specimens within 5 days of molding.

5.6.2 Change the OT to displacement mode, and set the machine to test at a constant temperature of 25 ± 0.5°C (77 ± 1°F).

5.6.3 Start the test using the program's start button.

Note 16 —The test will automatically start after the specimen relaxation and temperature stabilization sequence is completed.

Note 17—The test will run until a 93% reduction of the maximum load occurs, when measured from the first opening cycle. If a 93% reduction is not reached within 1,000 cycles, the OT will stop the test.

5.6.4 Open the OT report program and record the starting and final loads, percent decline in load, and number of cycles to failure.

5.6.5 Remove the specimen assembly upon completion of the test. Turn off the OT if needed.

5.6.6 Visually count the number of cracks at the top of the specimens. Record zero, single, or multiple cracks in the comments section of the test report.

6. REPORT

6.1 Report the following for each specimen:

- trimmed specimen density,
- starting load,
- final load,
- percent decline in load,

- number of cycles to failure,
- number of observed cracks, and
- additional comments.

7. ARCHIVED VERIONS

7.1 Archived versions are available.