

Tex-242-F, Hamburg Wheel-tracking Test

Overview

Use this test method to determine the premature failure susceptibility of bituminous mixtures due to weakness in the aggregate structure, inadequate binder stiffness, or moisture damage. This test method measures the rut depth and number of passes to failure.

Apparatus

Use the following apparatus:

- ◆ Wheel-tracking Device
 - An electrically powered device capable of moving a steel wheel with a diameter of 203.6 mm (8 in.) and width of 47 mm (1.85 in.) over a test specimen.
 - The load applied by the wheel is 705 ± 22 N (158 ± 5 lbs.).
 - The wheel must reciprocate over the test specimen, with the position varying sinusoidally over time.
 - The wheel shall make approximately 50 passes across the test specimen per minute.
 - The maximum speed of the wheel must be approximately 0.305 m/s (1.1 ft/sec) and will be reached at the midpoint of the slab.
- ◆ Temperature Control System
 - A water bath capable of controlling the test temperature within ± 2 °C (4 °F) over a range of 25 to 70 °C (77 to 158 °F).
 - This water bath must have a mechanical circulating system to stabilize temperature within the specimen tank.
- ◆ Rut Depth Measurement System
 - A Linear Variable Differential Transducer (LVDT) device capable of measuring the rut depth induced by the steel wheel within 0.01 mm, over a minimum range of 20 mm.
 - The system shall be mounted to measure the rut depth at the midpoint of the wheel's path on the slab.
 - Rut depth measurements must be taken at least every 100 passes of the wheel.
 - This system must be capable of measuring the rut depth without stopping the wheel. This measurement must be referenced to the number of wheel passes.

- ◆ Wheel Pass Counter
 - A non-contacting solenoid that counts each wheel pass over the test specimen.
 - The signal from this counter must be coupled to the rut depth measurement, allowing the rut depth to be expressed as a fraction of the wheel passes.
- ◆ Specimen Mounting System
 - A stainless steel tray which can be mounted rigidly to the machine in the water bath.
 - This mounting must restrict shifting of the specimen during testing.
 - The system must suspend the specimen, allowing free circulation of the water bath on all sides.
 - The mounting system shall be designed to provide a minimum of 2 cm (0.79 in.) of free circulating water on all sides of the sample.

Materials

Use the following materials:

- ◆ Two high-density polyethylene molds shaped according to plan view in the Figure ‘Top View of Test Specimen Configuration for the Hamburg Wheel-Tracking Device’ to secure circular, cylindrical test specimens.
- ◆ Capping compound able to withstand 890 N (200 lb.) load without cracking

Specimen

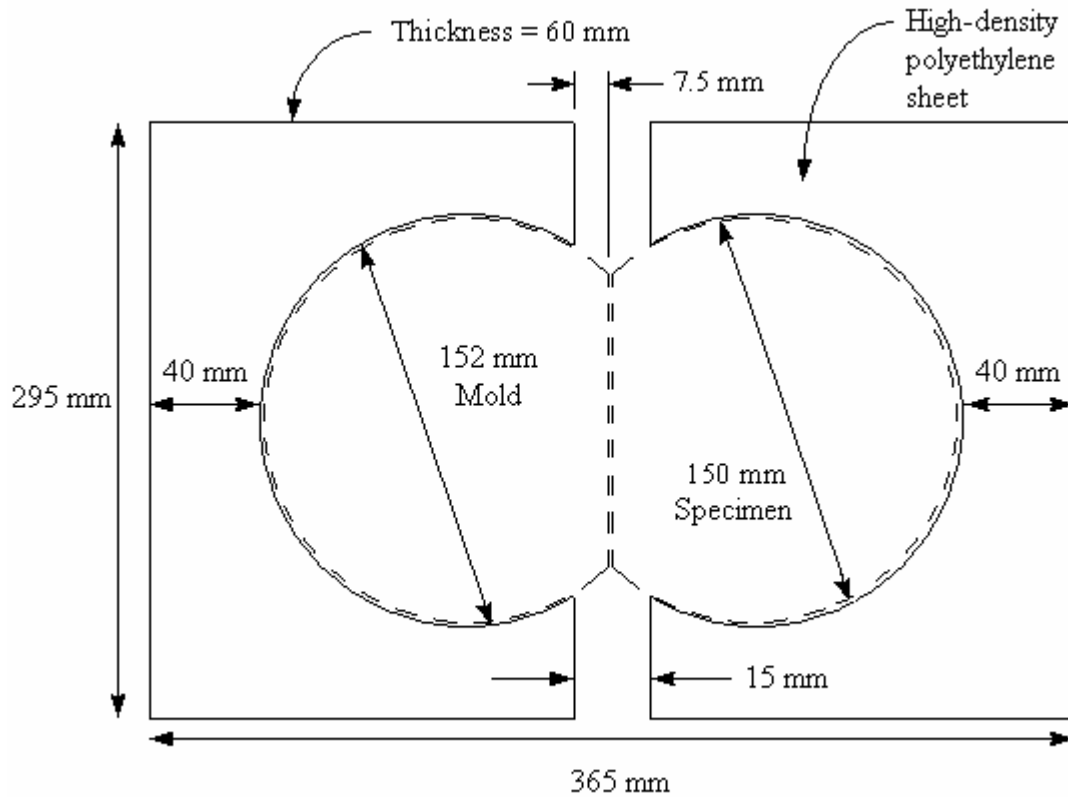
- ◆ Laboratory Molded Specimen
 - Prepared according to test methods “Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures” and “Tex-241-F, Superpave Gyratory Compacting of Test Specimens of Bituminous Mixtures.”
 - Specimen diameter shall be 150 mm (6 in.) and specimen height should be 62 ± 2 mm (2.4 ± 0.1 in).
 - Density of test specimens must be $93 \pm 1\%$.
- ◆ Core specimen
 - diameter of 150 ± 2 mm (6 ± 0.1 in.) or 254 ± 2 mm (10 ± 0.1 in.).

Procedure

Follow these steps to prepare and test the sample.

Sample Preparation and Testing	
Step	Action

1	<ul style="list-style-type: none"> ◆ Test requires 2 cylindrically molded specimens with the Superpave Gyrotory Compactor according to “Tex-241-F, Superpave Gyrotory Compacting of Test Specimens of Bituminous Mixtures.” <ul style="list-style-type: none"> • Specimens must be molded to a specified density of $93 \pm 1\%$ • Specimens must be molded to a specified height of 62 ± 2 mm (2.4 ± 0.1 in.). • Specimen weights typically vary between 2400-2600 grams to achieve density. • Specimen weights vary with different aggregate sources and with different mix types.
2	<p>Measure the relative density of specimens according to test methods “Tex-207-F, Determining Density of Compacted Bituminous Mixtures” and “Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures.”</p>
3	<ul style="list-style-type: none"> ◆ Place a specimen in the cutting template mold and use a masonry saw to cut it along the edge of the mold. The cut across the specimen should be approximately 16 mm (5/8 in.) deep. The specimen should be cut to the dimensions shown in the Figure ‘Top View of Test Specimen Configuration for the Hamburg Wheel-tracking Device’ in order to fit in the molds required for performing the test.
4	<ul style="list-style-type: none"> ◆ For specimens 150 mm (6 in.) in diameter: <ul style="list-style-type: none"> • Place the high-density polyethylene molds into the mounting tray and fit specimens into each one. • Secure the molds into the mounting tray. Do not use the high-density polyethylene molds for core specimens greater than 152 mm (6 in.) in diameter. ◆ For specimens greater than 150 mm (6 in.) in diameter: <ul style="list-style-type: none"> • Mix capping compound. • Spray the mounting tray with a light lubricant. • Place specimen in the middle of the mounting tray. • Spread the capping compound around the core specimen until level with the surface. • Allow the capping compound to dry a minimum of 24 hours.
5	<ul style="list-style-type: none"> ◆ Fasten the mounting trays into the empty water bath.
6	<p>Start the software supplied with the machine and enter the required test information into the computer.</p>
7	<ul style="list-style-type: none"> ◆ Unless otherwise specified, testing temperature shall be determined as follows: <ul style="list-style-type: none"> • $50 \pm 1^{\circ}\text{C}$ ($122 \pm 2^{\circ}\text{F}$) for hot mix asphalt placed in the top 4 inches of the pavement structure. • $50 \pm 1^{\circ}\text{C}$ ($122 \pm 2^{\circ}\text{F}$) for hot mix asphalt if 50% or more of the layer thickness falls within the top 4 inches of the pavement structure. • $50 \pm 1^{\circ}\text{C}$ ($122 \pm 2^{\circ}\text{F}$) for field cores. • $40 \pm 1^{\circ}\text{C}$ ($104 \pm 2^{\circ}\text{F}$) for hot mix asphalt not placed in the top 4 inches of the pavement structure. ◆ Fill the water bath until the water temperature is at the desired test temperature. The temperature of the water can be monitored on the computer screen. Allow the test specimen to be saturated in the water for an additional 30 minutes once the desired water temperature has been reached.
8	<p>Start the test after the test specimens have been in the water for 30 minutes at the desired test temperature. The testing device automatically stops the test when the device applies the number of desired passes or when the maximum allowable rut depth has been reached.</p>



** Not drawn to scale

Figure 2-32. Top View of Test Specimen Configuration for the Hamburg Wheel-tracking Device.

Report

For each specimen, report the air void content, anti-stripping additive used, number of passes to failure or the rut depth at the end of the test.

Archived Versions

Archived versions of Test Method “Tex-242-F, Hamburg Wheel-tracking Test” are available through the following links:

- ◆ Click on 242-0600 for the test procedure effective June 2000 through August 2000.