

**OHD L-55
METHOD OF TEST FOR
HAMBURG RUT TESTING OF
COMPACTED HOT-MIX ASPHALT (HMA)**

1. SCOPE.

- 1.1 This test method describes a procedure for testing the rutting susceptibility of hot-mix asphalt (HMA) using the Hamburg Rut Tester.
- 1.2 The method describes the testing of submerged, compacted HMA in a reciprocating rolling-wheel device. This test provides information about the permanent deformation from a moving, concentrated load. The Superpave Gyratory Compactor (SGC) is used to prepare test specimens.
- 1.3 The test method is used to determine the premature rutting susceptibility of HMA. This test method measures the rut depth and number of passes to failure.

2. APPARATUS.

- 2.1 Hamburg Wheel-Tracking Machine. An electrically powered machine capable of moving an 8 inch diameter, 1.85 inch wide steel wheel over a test specimen. The load on the wheel is 158 lb \pm 5.0 lb. The wheel shall reciprocate over the specimen, with the position varying sinusoidally over time. The wheel shall make approximately 50 passes across the specimen per minute. The maximum speed of the wheel shall be approximately 1 ft/sec and will be reached at the midpoint of the specimen.
- 2.2 Temperature Control System. A water bath capable of controlling the temperature within 2°F over a range of 77 to 158°F. This bath shall have a mechanical circulating system to stabilize the temperature within the specimen tank.
- 2.3 Impression Measurement System. An LVDT device capable of measuring the depth of the impression of the wheel within 0.0004 inch, over a minimum range of 0.8 inch. The system shall be mounted to measure the depth of the impression at the midpoint of the wheel's path on the specimen. The impression shall be measured at least every 400 passes of the wheel. This system must be capable of measuring rut depth without stopping the wheel. This measurement must be referenced to the number of wheel passes.
- 2.4 Wheel Pass Counter. A non-contacting solenoid that counts each wheel pass over the specimen. The signal from this counter shall be coupled to the wheel impression measurement, allowing for the rut depth to be expressed as a function of the wheel passes.
- 2.5 Specimen Mounting System. A stainless steel tray that can be mounted rigidly to the machine. This mounting must restrict shifting of the specimen to within 0.02 inch during testing. The system shall suspend the specimen tray, allowing for free circulation of the water bath on all sides. The mounting system shall be designed to provide a minimum of 0.8 inch of free circulating water on all sides of the specimen tray.

- 2.6. Balance. Balance of 12,000 g capacity, accurate to 0.1 gram.
- 2.7. Ovens. Ovens for heating aggregate and asphalt binders.
- 2.8. Superpave Gyratory Compactor. Superpave Gyratory Compactor (SGC) and molds conforming to T 312.
- 2.9. Bowls, spoon, spatula, etc.

3. PREPARATION OF TEST SPECIMENS.

- 3.1. Number of Test Specimens. There shall be four Superpave Gyratory specimens prepared for each test. Two gyratory specimens are used for each test specimen. The two additional gyratory specimens are reserved for retesting if required.
- 3.2. Mixture proportions are batched in accordance with the desired job-mix formula.
- 3.3. Test samples shall be conditioned at 300°F in accordance with the short-term conditioning procedure in R 30.
- 3.4. Compacting SGC Specimens. Material shall be compacted into specimens using an SGC according to T 312. Mold specimens to a thickness of 60 ± 2 mm (2.36 ± 0.08 inch) and diameter of 150 mm (6 inch). Compacted specimens shall be cooled at normal room temperature on a clean, flat surface until the specimen is cool to the touch.
- 3.5. Determine the bulk specific gravity of the specimens in accordance with OHD L-14. The target air void content shall be $7.0 \pm 1.0\%$.

4. PROCEDURE

- 4.1. Specimen Mounting. Use the provided molds or Plaster-of-Paris to mount the specimen in the mounting trays. If using Plaster-of-Paris, the plaster shall be mixed at approximately a 1:1 ratio of plaster to water. Pour the plaster to a height equal to that of the specimen so that the air space between the specimen and the tray is filled. The plaster layer underneath the specimen shall not exceed 2 mm (0.08 inch). Allow the plaster at least one hour to set. An alternative mounting material may be used, providing it can withstand 890 N (200 lb) of load without cracking.
- 4.2. Test Temperature. The test temperature shall be $122 \pm 2^\circ\text{F}$ ($50 \pm 1^\circ\text{C}$).
- 4.3. Ensure that the drain valve(s) is closed. Fill the wheel-tracking device with hot water until the float device floats to a horizontal position. The water temperature may vary and should be adjusted if necessary.
- 4.4. When the water has reached the test temperature for 30 minutes, lower the wheels onto the specimens. Ensure that the micro-control unit's LVDT readout reads between 10 mm (0.4 inch) and 18 mm (0.7 inch). To adjust the LVDT height, loosen the two screws on the LVDT mount and slide the LVDT up or down to the desired height. Tighten the screws.
- 4.5. Start the test. The steel wheel should run with a smooth movement across the test specimen. If not, retest.

NOTE: This Document has been Replaced

- 4.6. The wheel-tracking device shall shut off when 20,000 passes have occurred. The device will also shut off if a rut depth of 20 mm has been reached.
- 4.7. Turn off the machine and the main power supply. To drain the baths, open the valve(s) beneath the tanks. Raise the wheels and remove the rutted specimens and the spacers.
- 4.8. Clean the water baths, heating coils, wheels, and temperature probe with water and scouring pads or as per the manufacturer's recommendations. Remove any particles that have settled to the bottom of the baths. Clean the filter element and spacers after every test.
- 4.9. Turn the steel wheels after each test so the same section of the steel wheel surface is not in contact with the test specimen from test to test. This rotation will provide for even wear over the entire wheel. The test should run with a smooth movement across the test specimen.

5. REPORT

- 5.1. Report the rut depth to the nearest 0.01 mm at the required number of passes (10,000, 15,000, or 20,000) or report the number of passes reached when the rut depth equals 12.50 mm if less than the required number of passes.

Revision Date	Revision Description
7/14/09	Minor editorial changes throughout document.
	In Section 2.3, changed slab specimen to specimen.
	In Section 2.5, changed specimen to specimen tray in two locations.
	In Section 3.1, added a statement that two gyratory specimens were used for the test specimen and the two additional gyratory specimens were reserved for a retest.
	In Section 3.4, changed height requirements for specimens.
	In Section 4.5, added a condition that requires retest.
	Added a new Section 4.6 and renumbered the remaining sections. The new Section 4.6 defines the number of passes or rut depth required to complete the test.
	In Section 5.1, changed the reporting requirements.