



Designation: D8458 – 22

Standard Test Method for Evaluation of Fatigue Performance of Asphalt Mixtures Using the Three-Point Bending Cylinder (3PBC) Test¹

This standard is issued under the fixed designation D8458; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method provides a procedure to determine the fatigue life (number of cycles to failure, N_f) of asphalt mixtures, and also the reduction in dynamic modulus ($|E^*|$) with loading cycles, using cylindrical samples subjected to three-point cyclic bending. The results obtained from this test can be used to calibrate Viscoelastic Continuum Damage (VECD) models to obtain a damage characteristic curve, which in turn can be used to obtain fatigue lives (N_f) at a variety of temperatures, strain levels, and frequencies (a separate standard practice is being drafted for this procedure). Even though this test method is intended primarily for displacement (strain) controlled fatigue testing, certain sections may provide useful information for force-controlled tests.

1.2 The test method describes the testing apparatus, instrumentation, specimen fabrication, and analysis procedures required to determine the number of cycles to failure of asphalt concrete.

1.3 The text of this test method references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the test method.

1.4 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.26 on Fundamental/Mechanistic Tests.

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2. Referenced Documents

2.1 *ASTM Standards*:²

- D8 Terminology Relating to Materials for Roads and Pavements
- D979/D979M Practice for Sampling Asphalt Mixtures
- D3549/D3549M Test Method for Thickness or Height of Compacted Asphalt Mixture Specimens
- D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- D5361/D5361M Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
- D6373 Specification for Performance-Graded Asphalt Binder

2.2 *AASHTO Standards*:³

- R 30 Practice for Mixture Conditioning of Hot Mix Asphalt (HMA)
- R 83 Preparation of Cylindrical Performance Test Specimens Using the Superpave Gyrotory Compactor (SGC)
- T 378 Standard Method of Test for Determining the Dynamic Modulus and Flow Number for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)
- M 320 Standard Specification for Performance-Graded Asphalt Binder
- M 332 Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test

3. Terminology

3.1 *Definitions*:

3.1.1 *dynamic modulus, $|E^*|$* —the amplitude of the complex modulus that defines the relationship between the stress and strain of viscoelastic materials. The $|E^*|$ is simply the peak-to-peak stress divided by peak-to-peak strain in a cyclic test run at a constant frequency.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.