



Standard Test Method for Determining Fracture Energy of Asphalt-Aggregate Mixtures Using the Disk-Shaped Compact Tension Geometry¹

This standard is issued under the fixed designation D7313; 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 covers the determination of fracture energy (G_f) of asphalt-aggregate mixtures using the disk-shaped compact tension geometry. The disk-shaped compact tension geometry is a circular specimen with a single edge notch loaded in tension. The fracture energy can be utilized as a parameter to describe the fracture resistance of asphalt concrete. The fracture energy parameter is particularly useful in the evaluation of mixtures with ductile binders, such as polymer-modified asphalt concrete, and has been shown to discriminate between these materials more broadly than the indirect tensile strength parameter (AASHTO T322, Wagoner²). The test is generally valid at temperatures of 10°C (50°F) and below, or for material and temperature combinations which produce valid material fracture, as outlined in 7.4.

1.2 The specimen geometry and terminology (disk-shaped compact tension, DC(T)) is modeled after Test Method E399 for Plane-Strain Fracture Toughness of Metallic Materials, Appendix A6, with modifications to allow fracture testing of asphalt concrete.

1.3 The test method describes the testing apparatus, instrumentation, specimen fabrication, and analysis procedures required to determine fracture energy of asphalt concrete and similar quasi-brittle materials.

1.4 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.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

D8 Terminology Relating to Materials for Roads and Pavements

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D6373 Specification for Performance Graded Asphalt Binder

D6925 Test Method for Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyratory Compactor

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E399 Test Method for Linear-Elastic Plane-Strain Fracture Toughness K_{Ic} of Metallic Materials

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E1823 Terminology Relating to Fatigue and Fracture Testing

2.2 AASHTO Standard:

AASHTO T322 Standard Method of Test for Determining the Creep Compliance and Strength of Hot Mix Asphalt (HMA) Using the Indirect Tensile Test Device⁴

3. Terminology

3.1 *Definitions*—Terminologies E1823 and D8 are applicable to this test method.

3.1.1 *crack mouth*—portion of the notch that is on the flat surface of the specimen, that is, opposite the notch tip (see Fig. 3).

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.

Current edition approved Dec. 1, 2013. Published January 2014. Originally approved in 2007. Last previous edition approved in 2007 as D7313 – 07a. DOI: 10.1520/D7313-13.

² Wagoner, M. P., Buttlar, W. G., Paulino, G. H., and Blankenship, P., "Laboratory Testing Suite for Characterization of Asphalt Concrete Mixtures Obtained from Field Cores," *Journal of the Association of Asphalt Paving Technologists*, 2006.

³ 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.

⁴ 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>.