Standard Method of Test for

Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)

AASHTO Designation: T 314-12 (2021)[1]

Technically Revised: 2012 **Reviewed but Not Updated: 2021** **Editorially Revised: 2021**

Technical Subcommittee: 2b, Liquid Asphalt

AASHTO

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1. SCOPE

1.1. This test method covers the determination of the failure strain and failure stress of asphalt binders by means of a direct tension test. It can be used with unaged or aged material using T 240 (RTFOT) or R 28 (PAV), or both. The test apparatus is designed for testing within the temperature range from +6 to –36°C.

1.2. This test method is limited to asphalt binders containing particulate material having dimensions less than 250 μm.

1.3. This test method is not valid for specimens exhibiting a failure strain of greater than 10 percent considered outside the brittle–ductile range.

1.4. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.*

1.5. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 320, Performance-Graded Asphalt Binder
- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- R 28, Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)
- R 49, Determination of Low-Temperature Performance Grade (PG) of Asphalt Binders
- T 240, Effect of Heat and Air on a Moving Film of Asphalt Binder (Rolling Thin-Film Oven Test)

2.2. *ASTM Standards*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E4, Standard Practices for Force Verification of Testing Machines
- E77, Standard Test Method for Inspection and Verification of Thermometers

2.3. *ISO Standard*:

- ISO 10012, Measurement Management Systems—Requirements for Measurement Processes and Measuring Equipment

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *asphalt binder*—an asphalt-based cement that is produced from petroleum residue either with or without the addition of particulate organic modifiers of size less than 250 µm.

3.2. *Description of Terms Specific to This Standard*:

3.2.1. *brittle*—type of failure in a direct tension test where the stress–strain curve is essentially linear up to the point of failure and the failure is by sudden rupture of the test specimen without appreciable reduction in cross section of the specimen.

3.2.2. *brittle-ductile*—type of failure in a direct tension test where the stress–strain curve is curvilinear and the failure is by sudden rupture of the test specimen. Limited reduction in cross-section of the specimen occurs before rupture.

3.2.3. *ductile*—type of failure in a direct tension test where the specimen does not rupture but fails by flow at large strains.

3.2.4. *tensile strain*—axial strain resulting from the application of a tensile load and calculated as the change in length of the effective gauge length caused by the application of the tensile load divided by the original unloaded effective gauge length.

3.2.5. *tensile stress*—axial stress resulting from the application of a tensile load and calculated as the tensile load divided by the original area of cross-section of the specimen.

3.2.6. *failure*—point at which the tensile load reaches a maximum value as the test specimen is pulled at a constant rate of elongation.

3.2.7. *failure stress*—the tensile stress on the test specimen when the load reaches a maximum value during the test method specified in this standard.

3.2.8. *failure strain*—the tensile strain corresponding to the failure stress.

3.2.9. *gauge section*—the central portion of the specimen where the cross-section does not change with length. For this geometry, the gauge section is 18 mm in length (see Figure 1).