
Standard Method of Test for Measuring Interfacial Fracture Energy of Hot-Poured Asphalt Crack Sealant Using a Blister Test

AASHTO Designation: T 371-22¹

Technically Revised: 2022

Technical Subcommittee: 4e, Joints and Bearings



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1. SCOPE

- 1.1. The blister test is used to determine the interfacial fracture energy (IFE) of hot-poured asphalt crack sealant at the application temperature as specified in M 338 and PP 85.
- 1.2. The blister test is a fracture test. The objective of the test is to apply tensile forces using hydrostatic pressure to delaminate sealant from a substrate. A thin film of sealant is poured on the top of a substrate (usually aluminum) disk that has a hole at the center. Hydrostatic pressure is applied through this hole at a constant flow rate causing delamination between the sealant film and substrate. Sealant deformation and applied hydrostatic pressure are recorded as a function of time. The amount of energy required to achieve complete delamination is called interfacial fracture energy and can be calculated from the pressure-deformation curve. This energy is considered a measure of bonding potential.
- 1.3. *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 and follow appropriate health and safety practices and to determine the applicability of regulatory limitations prior to use.*
- 1.4. *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 338, Performance-Graded Hot-Poured Asphalt Crack Sealant
 - M 339M/M 339, Thermometers Used in the Testing of Construction Materials
 - PP 85, Grading or Verifying the Sealant Grade (SG) of a Hot-Poured Asphalt Crack Sealant
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
 - R 95, Accelerated Aging of Hot-Poured Asphalt Crack Sealant Using a Vacuum Oven

- T 314, Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)

2.2. *ASTM Standards:*

- D5167, Standard Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E77, Standard Test Method for Inspection and Verification of Thermometers
- E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers

2.3. *International Electrotechnical Commission Standard:*

- IEC 60751:2008, Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors

3. TERMINOLOGY

3.1. *Definitions:*

- 3.1.1. *hot-poured asphalt crack sealant*—hot-poured modified asphaltic material used to seal pavement cracks and joints.

Note 1—Based on the references, hot-poured asphalt crack sealant is typically applied at a temperature of 160°C or above.

- 3.1.2. *interfacial fracture energy (IFE)*—the energy required to separate hot-poured asphalt crack sealant from a substrate.

4. SUMMARY OF METHOD

- 4.1. Hot-poured asphalt crack sealant material is homogenized following the procedure given in ASTM D5167. For each test, including four replicates, cut 320 g of sealant and heat to the manufacturer's recommended pouring temperature. Sealant will be poured in the mold assembled on top of an annular-shaped disk of substrate. An aluminum plug will be inserted into the hole of the substrate to close it. The sealant will be poured on top of the plugged substrate to provide a film of 4.6-mm thickness. Hydrostatic pressure is applied through the hole to cause delamination between the sealant film and the substrate. Sealant deformations and applied hydrostatic pressure can be recorded as a function of time. The amount of energy required for complete delamination is called interfacial fracture energy and can be calculated from the pressure-deformation curve. This energy can be considered an indication of bonding potential.

5. SIGNIFICANCE AND USE

- 5.1. This procedure is designed to measure the adhesion potential of hot-poured sealant to aggregate.
- 5.2. Sealants must be homogenized (ASTM D5167) before measuring adhesion by this method.

6. APPARATUS

- 6.1. *Direct Tension Test (DTT) Device*—Modified T 314 direct tension test (DTT) machine or an equivalent system with environmental chamber and motor or screw driven actuator;

- 6.2. *Test Chamber*—Test chamber that can reach $-40 \pm 0.5^{\circ}\text{C}$;
- 6.3. *Laboratory Oven*—Any standard laboratory oven capable of producing and maintaining temperatures up to $200^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The oven(s) shall be properly standardized and capable of operation at the temperatures required, between 160 to 220°C , within $\pm 2^{\circ}\text{C}$. The thermometer for measuring the temperature within the oven(s) shall meet the requirements of M 339M/M 339 with a temperature range of at least 160 to 220°C , and an accuracy of $\pm 0.5^{\circ}\text{C}$ (see Note 2).
- Note 2**—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E1137M Pt-100 RTD platinum resistance thermometer, Special Order; or IEC 60751:2008 Pt-100 RTD thermometer, Special Order.
- 6.4. *Release Agent*—A proper release agent to prevent the crack sealant from sticking to indicated test specimen mold setup pieces. A silicon-based release agent is recommended.
- 6.5. *Test Specimen Mold Setups*—Four aluminum molds, four plugs, and four rubber bands. (See Figures 1, 2, and 3.)

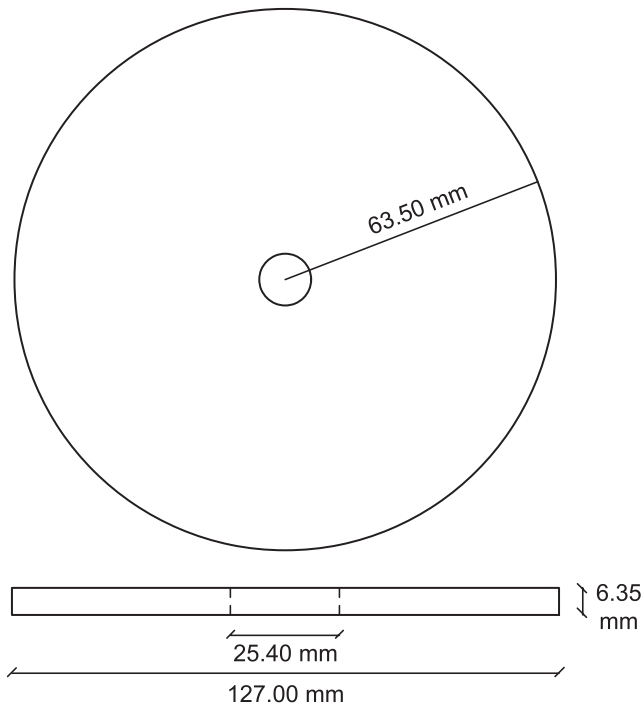


Figure 1—Schematic of the Substrate Disk

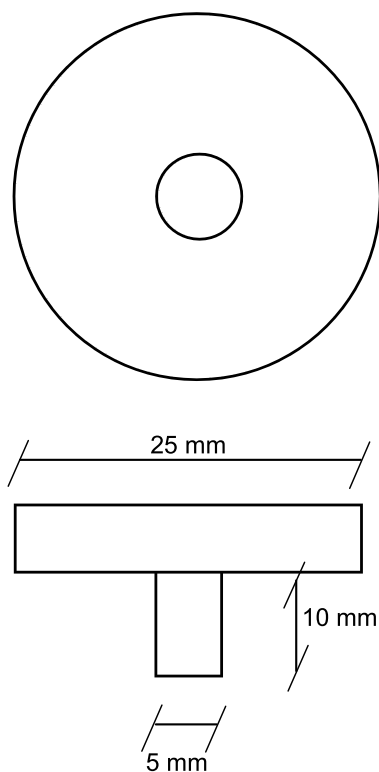


Figure 2—Schematic of the Plug

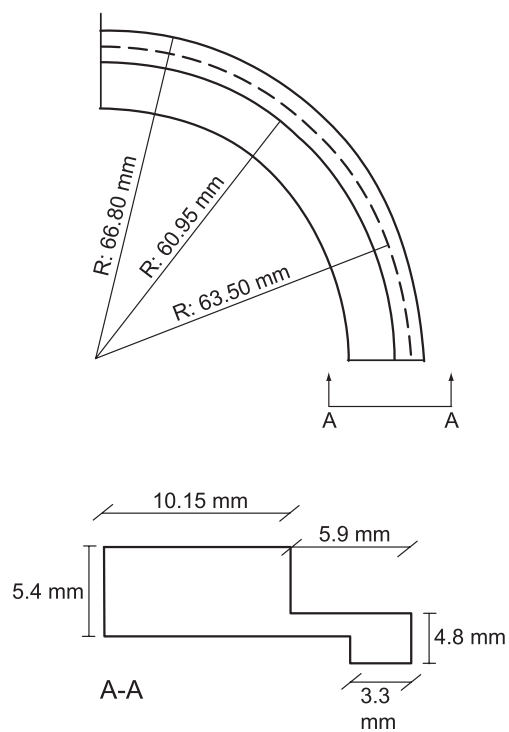


Figure 3—Schematic of One Section of the Four-Piece Mold