INTERNATIONAL

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Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements[1]

This standard is issued under the fixed designation D5329; 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 These test methods cover tests for hot-applied types of joint and crack sealants and fillers for portland cement concrete and asphaltic concrete pavements. There are numerous standard material specifications that use these test methods. Refer to the respective standard material specification of interest to determine which of the following test methods to use. For sample melting and concrete block preparation, see their respective standard practices.

1.2 The test methods appear in the following sections:

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1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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.*

1.5 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D5/D5M Test Method for Penetration of Bituminous Materials
D217 Test Methods for Cone Penetration of Lubricating Grease
D618 Practice for Conditioning Plastics for Testing
D1074 Test Method for Compressive Strength of Asphalt Mixtures
D1561/D1561M Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor
D1985 Practice for Preparing Concrete Blocks for Testing Sealants, for Joints and Cracks
D3381/D3381M Specification for Viscosity-Graded Asphalt Binder for Use in Pavement Construction
D5167 Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation
D6690 Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
E145 Specification for Gravity-Convection and Forced-Ventilation Ovens
E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
G151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources
G154 Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

3. Significance and Use

3.1 These test methods describe procedures for determining specification conformance for hot-applied, field-molded joint and crack sealants and fillers.

[1] These test methods are under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and are the direct responsibility of Subcommittee D04.33 on Formed In-Place Sealants for Joints and Cracks in Pavements.

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[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.

4. Sample Melting

4.1 See Practice D5167.

5. Standard Conditions

5.1 The laboratory atmospheric conditions, hereinafter referred to as standard conditions, shall be in accordance with Practice D618 (23 ± 2 °C, 50 ± 10 % relative humidity).

6. Cone Penetration, Non-Immersed

6.1 *Scope*—This test method covers determination of cone penetration of bituminous joint and crack sealers and fillers.

6.2 *Significance and Use*—The cone penetration, non-immersed is a measure of consistency. Higher values indicate a softer consistency.

6.3 *Apparatus*—Conduct this test using the apparatus described in Test Method D5/D5M, except as specified herein. Use a penetration cone in place of the standard penetration needle. The cone shall conform to the requirements given in Test Methods D217, except that the interior construction may be modified as desired. The total moving weight of the cone and attachments shall be 150.0 ± 0.1 g.

6.4 *Specimen Preparation*—Pour a portion of the sample prepared in accordance with Practice D5167 into a cylindrical, metal, flat-bottom container of essentially 60 to 75 mm in diameter and 45 to 55 mm in depth and fill flush with the rim of the container. Allow the specimen to cure under standard conditions as specified in its respective material specification.

6.5 *Procedure*—Place the specimen in a water bath maintained at 25 ± 0.1 °C for 2 h immediately before testing. Remove the specimen from the bath and dry the surface. Using the apparatus described in 6.3, make determinations at three locations on approximately 120° radii, and halfway between the center and outside of the specimen. Take care to ensure the cone point is placed on a point in the specimen that is representative of the material itself and is free of dust, water, bubbles, or other foreign material. Clean and dry the cone point after each determination.

6.6 *Report*—Average the three results and record the value as the penetration of the specimen in 1⁄10 mm units.

6.7 *Precision and Bias:*

6.7.1 For Specification D6690 Type I materials, the following precision statement is based on an interlaboratory study of twelve laboratories that tested five different Specification D6690 Type I materials.

6.7.1.1 *Within Container*—Single-operator precision (for penetration between 40 and 80): The single-operator deviation has been found to be 0.994. Therefore, results of two properly conducted tests by the same operator should not differ by more than three penetration units.

6.7.1.2 *Within Laboratories*—Single-operator precision (penetrations 40 to 80): The single-operator standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 0.924. Therefore, the results of two properly conducted tests by the same operator on the same material should not differ by more than three penetration units.

6.7.1.3 *Multilaboratory Precision*—(penetration 40 to 80): The multilaboratory standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 3.249. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than nine penetration units.

6.7.2 For Specification D6690 Type II materials, the following precision statement is based on an interlaboratory study of eleven laboratories that tested six different Specification D6690 Type II materials.

6.7.2.1 *Within Container*—Single-operator precision (for penetration between 55 and 85): The single-operator deviation has been found to be 0.974. Therefore, results of two properly conducted tests by the same operator should not differ by more than three penetration units.

6.7.2.2 *Within Laboratories*—Single-operator precision (penetrations 50 to 70): The single-operator standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 1.0865. Therefore, the results of two properly conducted tests by the same operator on the same material should not differ by more than three penetration units.

6.7.2.3 *Single-Operator Precision*—(penetrations 71 to 85): The single-operator standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 2.237. Therefore, the results of two properly conducted tests by the same operator on the same material should not differ by more than six penetration units.

6.7.2.4 *Multilaboratory Precision*—(penetration 50 to 70): The multilaboratory standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 5.2609. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than 15 penetration units.

6.7.2.5 *Multilaboratory Precision*—(penetration 71 to 85): The multilaboratory standard deviation of a single test (test result is defined as the average of three penetrations) has been found to be 16.8831. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than 48 penetration units.

7. Flow

7.1 *Scope*—This test method measures the amount of flow of bituminous joint and crack sealants when held at a 75° angle at elevated temperatures.

7.2 *Significance and Use*—This test method is a means of measuring the ability of a sealant to resist flow from the joint or crack at high ambient temperatures.

7.3 *Apparatus:*

7.3.1 *Mold*—Construct a mold (see Note 1) 40 mm wide by 60 mm long by 3.2 mm deep and place it on a bright tin panel. The tin plate must be free of dirt, oil, and so forth and be between 0.25 to 0.64 mm in thickness.

NOTE 1—A release agent should be used to coat molds and spacers to prevent them from bonding to the sealants. Extreme care should be exercised to avoid contaminating the area where the joint sealant makes contact with the blocks. A non-toxic release agent is recommended for this purpose. Two examples that have been found suitable for this purpose are

KY jelly (available at drug stores) and a release agent prepared by grinding a mixture of approximately 50 % talc, 35 % glycerine, and 15 % by weight of a water-soluble medical lubricant into a smooth paste.

7.3.2 *Oven*—Forced-draft type conforming to Specification E145 and capable of controlling its temperature ±1 °C.

7.4 *Specimen Preparation*—Pour a portion of the sample prepared in accordance with Practice D5167 for melting samples into the mold described in 7.3. Fill the mold with an excess of material. Allow the test specimen to cool at standard conditions for at least ½ h, then trim the specimen flush with the face of the mold with a heated metal knife or spatula and remove the mold. Allow the specimen to cure under standard conditions as specified in its respective material specification.

7.5 *Procedure*—Mark reference lines on the panel at the bottom edge of the sealant. Then place the panel containing the sample in a forced-draft oven maintained for the time and at the temperature specified in its respective material specification. During the test, mount the panel so that the longitudinal axis of the specimen is at an angle of 75 ± 1° with the horizontal, and the transverse axis is horizontal. After the specified test period, remove the panel from the oven and measure the movement of the specimen below the reference lines in millimetres.

7.6 *Report*—Report the measurement obtained in 7.5 in millimetres.

7.7 *Precision and Bias:*

7.7.1 For Specification D6690 Type I materials, the following precision statement is based on an interlaboratory study of twelve laboratories that tested five different Specification D6690 Type I materials.

7.7.1.1 *Single-Operator Precision (flow 0 to 5)*—The single-operator standard deviation has been found to be 0.255. Therefore, the results of two properly conducted tests by the same operator should not differ by more than one flow unit.

7.7.1.2 *Single-Operator Precision (flow 5 to 10)*—The single-operator standard deviation has been found to be 1.024. Therefore, the results of two properly conducted tests by the same operator should not differ by more than three flow units.

7.7.1.3 *Multilaboratory Precision (flow 0 to 5)*—The multilaboratory standard deviation has been found to be 4.256. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than twelve flow units.

7.7.1.4 *Multilaboratory Precision (flow 5 to 10)*—The multilaboratory standard deviation has been found to be 5.326. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than 15 flow units.

7.7.2 For Specification D6690 Type II materials, the following precision statement is based on an interlaboratory study of eleven laboratories that tested six different Specification D6690 Type II materials.

7.7.2.1 *Single-Operator Precision (flow 0 to 1)*—The single-operator standard deviation has been found to be 0.2494. Therefore, the results of two properly conducted tests by the same operator should not differ by more than one flow unit.

7.7.2.2 *Single-Operator Precision (flow 1.1 to 4)*—The single-operator standard deviation has been found to be 0.7616. Therefore, the results of two properly conducted tests by the same operator should not differ by more than three flow units.

7.7.2.3 *Multilaboratory Precision (flow 0 to 1)*—The multilaboratory standard deviation has been found to be 0.5644. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than three flow units.

7.7.2.4 *Multilaboratory Precision (flow 1.1 to 4)*—The multilaboratory standard deviation has been found to be 2.3508. Therefore, the results of two properly conducted tests in different laboratories should not differ by more than seven flow units.

8. Bond, Non-Immersed

8.1 *Scope*—This test method is used to evaluate the bond to concrete.

8.2 *Significance and Use*—Bond to concrete is necessary for a sealant to maintain proper field performance.

8.3 *Apparatus:*

8.3.1 *Extension Machine*—The extension machine used in the bond test shall be so designed that the specimen can be extended a minimum of 12.5 mm at a uniform rate of 3.1 ± 0.3 mm per hour. It shall consist essentially of one or more screws rotated by an electric motor through suitable gear reductions. Self-aligning plates or grips, one fixed and the other carried by the rotating screw or screws, shall be provided for holding the test specimen in position during the test.[3]

8.3.2 *Cold Chamber*—The cold chamber shall be capable of maintaining the required cold test temperature within ±1 °C.

8.4 *Concrete Block Preparation*—The concrete blocks shall be prepared in accordance with Practice D1985.

8.5 *Specimen Preparation:*

8.5.1 Prepare three test specimens (three specimens × 2 = six blocks) as follows: On removal from the storage container, again scrub the 50 by 75 mm saw-cut faces of the blocks under running water. When all blocks are scrubbed, lightly blot them with an oil-free, soft, absorbent cloth or paper towel to remove all free surface water and condition them by air drying on the 25 by 50 mm ends according to the respective material specification.

8.5.2 Take these blocks and mold the test specimen between them as follows (see Fig. 1): Place four treated (see Note 1) brass or TFE-fluorocarbon spacer strips, approximately 6 mm thick, on a treated metal plate base to enclose an open space according to the width specified in the respective material specification by 50 mm long. Place the blocks on the spacer strips and space them the required width ±0.1 mm apart by means of other treated brass or TFE-fluorocarbon spacer strips, of the required width placed at such distances from the ends that an opening is of the required width by 50.0 ± 0.2 by 50.0 ± 0.2 mm is formed between the blocks with a 6.4-mm opening below the blocks.

[3] The sole source of supply of the apparatus known to the committee at this time is Applied Test Systems of Butler, PA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.