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Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints[1]

This standard is issued under the fixed designation D5249; 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 specification covers backer material for cold- and hot-applied joint sealant for use in portland cement concrete or asphalt pavement joints.

1.2 This specification establishes basic requirements for sealant backer material, either in rod or strip form, that can withstand the temperature of hot- or cold-applied sealants without excessive deformation.

1.3 Sealant backer material serves one or more of the following purposes:

1.3.1 Limits the amount and depth of sealant applied to a joint,

1.3.2 Acts as a barrier interface to prevent backside adhesion (bond breaker), and

1.3.3 Provides a form to assist the sealant in developing a shape factor.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values in parentheses are for information purposes only.

1.5 The following safety hazards caveat pertains only to the test methods described in this specification. *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C1016 Test Method for Determination of Water Absorption of Sealant Backing (Joint Filler) Material

C1253 Test Method for Determining the Outgassing Potential of Sealant Backing

D545 Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types)

D1622 Test Method for Apparent Density of Rigid Cellular Plastics

D1623 Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

D5535 Terminology Relating to Formed-in-Place Sealants for Joints and Cracks in Pavements (Withdrawn 2009)[3]

E1 Specification for ASTM Liquid-in-Glass Thermometers

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

3. Terminology

3.1 For definitions, refer to Terminology D5535.

4. Classification

4.1 Sealant backer material is available in three types:

4.1.1 *Type 1,* shall be round rods of various diameters intended for use with cold- and hot-applied sealants.

4.1.2 *Type 2,* shall be sheets or strips of various thicknesses, laminated or skived by the manufacturer but capable of being field laminated and used with cold- and hot-applied sealants.

4.1.3 *Type 3,* shall be round rods of various diameters limited for use with cold-applied sealants.

4.2 Type 1 and Type 3 rod materials are intended for use primarily where there is a reservoir, either already existing or

[1] This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is 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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

formed, such as a contraction joint, where the rod will limit the sealant depth and prevent the sealant from bonding to the bottom of the joint reservoir (bond breaker) thus eliminating bottom-side adhesion.

4.3 Type 2 strip material is intended primarily for use where there is an opening the full depth of the pavement, such as an expansion joint for which it is desirable to have a filler material completely fill the opening and prevent or minimize the accumulation of water or incompressible materials below the sealant.

5. Ordering Information

5.1 Types 1, 2, and 3 backer material are available in a range of sizes, lengths, and diameters; they are available on reels, in coils, or in straight lengths. Consult the manufacturer for information on how to order.

5.2 Backer material must be ordered by diameter or size in relation to the joint opening, usually 25 to 35 % larger than the joint width.

6. Materials

6.1 Sealant backer material shall be easily compressed and installed in the joint reservoir. This material shall be heat resistant when used with hot-applied sealants.

7. Physical Properties

7.1 Physical properties of the sealant backer material shall conform to the requirements of Table 1.

8. Workmanship, Finish, and Appearance

8.1 The product shall be clean and free of scale or foreign matter, oil, or water which could wipe off on a joint sidewall and interfere with the proper cure or adhesion of the sealant.

9. Test Methods

9.1 *Water Absorption*—Tests for water absorption of the Types 1 and 3 backing material shall be made in accordance with Test Method C1016, Procedure B. Type 2 material shall be tested in accordance with Test Methods D545.

9.1.1 For Type 2 material:

$$WA = \frac{W \times 100}{262t} \quad (1)$$

where:

WA = water absorption by volume, %,
W = weight of water absorbed from tests made according to Test Methods D545, g, and
t = thickness of 4 in. by 4 in. specimen, inches.

9.1.2 For the purposes of this calculation, 1 g of water occupies 0.061 in.^{3} at test conditions.

9.2 *Density*—Tests for density of Types 1 and 3 materials shall be made in accordance with Test Method D1622. Tests for density of Type 2 material shall be made in accordance with Test Methods D545.

9.3 *Tensile Strength*—Tests for tensile strength of Types 1 and 3 materials shall be made in accordance with Test Method D1623.

9.4 *Compression Deflection and Recovery*—Type 2 material shall be tested in accordance with Test Methods D545. Types 1 and 3 materials shall be tested in accordance with the following procedure.

9.4.1 *Significance and Use*—This test method covers a procedure for measuring the force necessary to compress the backer material, and the percentage recovery of original dimensions after removal of the compression load.

9.4.2 *Apparatus:*

9.4.2.1 An apparatus shall be provided having a flat compression plate larger than the specimen to be tested, connected to a force measuring device, and mounted in such a manner that the specimen can be deflected (compressed) at a speed of 0.5 to 2 in./min. The apparatus shall be arranged to support the specimen on a level horizontal plate. The apparatus shall be capable of measuring the distance between the movable plate and the stationary plate.

9.4.2.2 *Calipers,* capable of measuring 0.001 in.[4]

9.4.3 *Test Specimens:*

9.4.3.1 Test specimens shall be 6 ± 0.125 in. lengths of the backer material.

9.4.3.2 Each test requires a minimum effective area of 3.0 in.^{2}. When the effective area of a single length is less than 3 in.^{2}, multiple lengths shall be used in a single test. When rod-shaped backer material is less than ¾ in. in diameter, multiple lengths are required for each test (see Table 2).

9.4.4 *Number of Test Specimens*—Test three specimens for each sample. The values reported shall be the mean of those observed.

TABLE 1 Physical Property Requirements

Property	Type 1	Type 2	Type 3
Density, lb/ft^3 (kg/m^3), max	6 (96.1)	4 (64.1)	6 (96.1)
Tensile strength, psi (kgf/cm^2), min	20 (1.41)	N/A	20 (1.41)
Water absorption, by volume, %, max	0.5	0.5	0.5
25 % Compression deflection force, psi (kgf/cm^2), max	15 (1.06)	15 (1.06)	15 (1.06)
Compression recovery, %, min	90	90	90
Heat resistance, °F	392 ± 5	392± 5	N/A
°C	200 ± 2.8	200 ± 2.8	N/A
Maximum shrinkage, %	10 %	10 %	N/A

[4] Brown and Sharp Model 579-1 or equivalent has been found suitable. 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.

TABLE 2 Multiple Specimen Requirements for Rod-Shaped Backer Materials for Compression Recovery Testing

Rod Diameter	Specimens Required for Each Test
¾ in. or larger	1
⅜ to ⅝ in.	2
< ⅜ in.	3

9.4.5 *Procedure:*

9.4.5.1 Place the test specimen in the center of the supporting plate of the apparatus. Materials that are supplied in coils often have a tendency to curl. Place these samples between the plates in such a manner that the arc formed by the sample is in the vertical plane.

9.4.5.2 Bring the compression plate into contact with the specimen so that the entire length of the test specimen is in contact with both plates. No light should be visible anywhere between the rod and the plate, except within ½ in. of the end of the sample.

9.4.5.3 Measure the original diameter of the rod by measuring the separation of the plates of the apparatus with the calipers. Compress the rod 25 ± 0.5 % of this thickness at 0.5 in./min. Record the reading of the load immediately.

9.4.5.4 Hold the specimen at the specified deflection for 30 s.

9.4.5.5 Remove the load at a rate of 0.5 in./min. Carefully observe the specimen during the last 10 % of plate travel. Stop plate when contact is not maintained with the specimens. This may be observed when, except within ½ in. of the ends, light is visible along the length of the rod. Immediately measure and record the loss in diameter.

9.4.6 *Calculation:*

9.4.6.1 Calculate the 25 % compression deflection force, *CD*, per unit area of specimen, expressed in pounds force per square inch (kilograms of force per centimeter square) as follows:

$$CD = F/A \tag{2}$$

where:

F = force required to compress the specimen 25 % as measured in 9.4.5.3, lbf (kgf), and
A = effective area of specimen compression contact surface, in.^{2}, (cm^2).

For rods:

$$A = 0.66\ dl \tag{3}$$

where:

d = diameter of rod, in. (cm), and
l = length of the sample, in. (cm).

9.4.6.2 Calculate the compression recovery, *CR*, as a percentage of the original diameter of thickness as follows:

$$CR = (d_o = \Delta_d)/d_o \times 100 \tag{4}$$

where:

d_o = original diameter, in. (cm), and,
Δ_d = loss in diameter, in. (cm).

9.4.7 *Report:*

9.4.7.1 Report the average compression deflection for the three specimens tested in pounds force per square inch (kilograms of force per square centimeter).

9.4.7.2 Report the average compression recovery for the three specimens tested in percent.

9.4.8 *Precision and Bias*—Precision and bias statements are being prepared. They will be added to this specification when completed (see Practice C670).

9.5 *Heat Resistance for Types 1 and 2 Backer Material:*

9.5.1 *Significance and Use*—This test method is used to determine the heat resistance of backer material.

9.5.2 *Apparatus:*

9.5.2.1 *Insulated Oil Bath,* capable of maintaining a uniform and homogeneous temperature of 392 ± 9 °F. Any commercial deep fryer is sufficient.

9.5.2.2 *Thermometer,* having a range from 170 to 500 °F (77 to 260 °C) and conforming to the requirements of Specification E1. (For example, ASTM 11C thermometer or ASTM 11F thermometer.)

Thermometric device, shall be a liquid-in-glass thermometer or Type K thermocouple with resolution of 2F (1C) and the calibration verified in accordance with Test Method E220 at least once a year. Use a liquid-in-glass thermometer conforming to Specification E1 or temperature measuring device such as platinum resistance thermometers as the reference.

9.5.2.3 *Drainage Pan or Absorbent Towel.*

9.5.2.4 *Stopwatch or Timer,* that reads out in seconds.

9.5.2.5 *Silicone Fluid,*[5] 100 cSt viscosity, or equivalent.

9.5.2.6 *Calipers,* capable of measuring 0.001 in.

9.5.2.7 *Rule,* capable of measuring 0.01 in. (1 mm).

9.5.3 *Test Specimens:*

9.5.3.1 Test specimens of the rod material shall be cut 10 to 12 in. long (Types 1 and 3).

9.5.3.2 Test specimens of the slab or sheet material shall be cut 4 by 4 in. ± 1⁄16 (102 by 102 mm) (Type 2).

9.5.4 *Procedure:*

9.5.4.1 Measure the original diameter of the rod with the calipers. Measure the thickness of the slab or sheet with the ruler.

9.5.4.2 Fill insulated oil bath to a minimum depth of 3 in. with silicone fluid.[5] Heat fluid to 392 ± 5 °F.

9.5.4.3 Holding the specimen vertically over the oil bath, immerse approximately 2 in. of the specimen in the hot oil.

9.5.4.4 Begin the dwell-time count upon immersion and leave the specimen immersed for the period of time designated in Table 3.

9.5.4.5 Remove the specimen at the end of the dwell-time period and allow it to cool in the drain pan or on absorbent towels for 1 min.

9.5.4.6 Measure the diameter of the rod or thickness of the slab after immersion. Record the change in dimensions.

9.5.4.7 Calculate the percent shrinkage as follows:

[5] Dow Corning 200 has been found suitable. 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.

TABLE 3 Specimen Dwell Time

Specimen Diameter or Thickness	Dwell Time, s
Less than 3⁄16 in.	2
Equal to or greater than 3⁄16 to less than 7⁄16 in.	3
Equal to or greater than 7⁄16 to less than 15⁄16 in.	5
Equal to or greater than 15⁄16 to less than 1⅛ in.	8
Equal to or greater than 1⅛ to less than 1⅜ in.	10
Equal to or greater than 1⅜ to less than 1¾ in.	15
Equal to or greater than 1¾ in.	20