Designation: D7116 – 16 (Reapproved 2021)

Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete Pavements[1]

This standard is issued under the fixed designation D7116; 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 joint and crack sealants of the hot-applied type intended for use in sealing joints and cracks in portland cement concrete in areas that are subject to fuel spillage.

1.2 The values stated in SI units are to be regarded as the standard.

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 appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]

D36/D36M Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

D3569 Specification for Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant-Type for Portland Cement Concrete Pavements (Withdrawn 2006)[3]

D5167 Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation

D5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

D5329 Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements

2.2 *Federal Specification:*[4]

SS-S-1614A

3. General Requirements

3.1 The sealant, when in place, shall form a resilient and cohesive compound that shall effectively seal joints in concrete throughout repeated cycles of expansion and contraction, and against the infiltration of moisture, fuel, and incompressibles. It shall not, at ambient temperatures, flow from the joint or be picked up by vehicle tires. The material shall be capable of being brought to a uniform pouring consistency suitable for completely filling the joints without inclusion of large air holes or discontinuities and without damage to the material. It shall remain relatively unchanged in application characteristics for at least 6 h at the recommended application temperature in the field.

4. Classification

4.1 *Type I*—A joint sealant which is resilient and capable of maintaining an effective seal in hot to moderate climates. Material is tested for low-temperature performance at –18 °C using 50 % extension (see Specification D3569).

4.2 *Type II*—A joint sealant capable of maintaining an effective seal in hot to moderate climates. Material is tested for low-temperature performance at –18 °C using 50 % extension. Special tests are included (see Federal Specification SS-S-1614A).

4.3 *Type III*—A joint sealant capable of maintaining an effective seal in most climates experiencing moderate to cold temperatures. Material is tested for low-temperature performance at –29 °C using 50 % extension.

NOTE 1—It is the responsibility of the user agency to determine which type is most applicable to their conditions.

[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.

[4] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

5. Physical Requirements

5.1 *Maximum Heating Temperature*—The maximum heating temperature is the highest temperature to which a sealant can be heated and still conform to all the requirements specified herein. For purposes of testing as specified hereinafter, the application temperature shall be the same as the maximum heating temperature. The maximum heating temperature shall be set forth by the manufacturer, shall be shown on all containers, and shall be provided to the testing agency before any laboratory tests are begun. The maximum heating temperature shall be a minimum of 11 °C higher than the manufacturer's recommended application temperature.

5.2 The preparation requirements for each sealant are listed in Table 1.

5.3 Sealant shall conform to the requirements prescribed in Table 2.

6. Sampling and Heating

6.1 *Sampling:*

6.1.1 Samples may be taken at the plant or warehouse prior to delivery or at the time of delivery, at the option of the purchaser. If sampling is done prior to shipment, the inspector representing the purchaser shall have free access to the material to be sampled. The inspector shall be afforded all reasonable facilities for inspection and sampling which shall be conducted so as not to interfere unnecessarily with the operation of the works.

6.1.2 Samples shall consist of one of the manufacturer's original sealed containers selected at random from the lot or batch of finished material. A batch or lot shall be considered as all finished material that was manufactured simultaneously or continuously as a unit between the time of compounding and the time of packaging or placing in shipping containers.

6.1.3 Obtain the sealant portion for testing from the selected manufacturer's original sealed container in accordance with Practice D5167. The sample portion added to and heated in the melter shall weigh as specified in Table 1. Both pots of the melter described in Practice D5167 shall be used for samples exceeding 1250 g and each pot shall contain at least 625 g but not more than 850 g.

6.2 *Heating*—Heat the material in accordance with Practice D5167.

6.2.1 The oil bath in the melter shall be heated to a temperature between the sealant's maximum heating temperature and 20 °C above the sealant's maximum heating temperature. (Never allow the oil temperature to exceed 288 °C.) Add the sealant to the melter according to the instructions in Practice D5167. After the sample has been added to the melter, regulate the oil temperature within the listed temperature limits while raising the sealant's temperature to manufacturer's recommended maximum heating temperature within the required 1 h of time, as stated in Practice D5167. The heating time for each type of sealant as well as the start of the heating time shall be as specified in Table 1.

7. Test Methods

7.1 *Specimen Conditioning*—Condition all specimens at standard laboratory conditions as specified in Test Methods D5329 prior to beginning any testing. The time of conditioning shall be as specified in Table 1.

7.2 *Cone Penetration*—Determine cone penetration according to Test Methods D5329 for cone penetration, non-immersed.

7.3 *Cone Penetration, Fuel Immersed*—Use Test Methods D5329.

7.4 *Aged Cone Penetration Retention*—Use Test Methods D5329 except as stated below.

7.4.1 After conditioning, the specimen shall be placed in a forced-draft oven maintained at 70 ± 1 °C for 72 ± 1 h uncovered.

7.4.2 The specimen shall then be removed from the oven and conditioned at standard laboratory conditions for 1 h followed by conditioning in a 25 ± 0.1 °C bath for 1 to 1½ h.

7.4.3 Test for cone penetration and determine result. This is the aged cone penetration.

7.4.4 Determine the aged cone penetration retention using the following formula:

$$\text{Aged Cone Penetration Retention\%} = \frac{\text{Aged Cone Penetration}}{\text{Cone Penetration}} \times 100 \quad (1)$$

7.5 Determine the softening point according to Test Method D36/D36M.

7.6 *Bond, Non-Immersed*—Determine the bond according to Test Methods D5329 for bond, non-immersed.

7.6.1 After final scrubbing and blotting specified in Test Methods D5329, air dry the blocks on their 25.4 mm by 50.8 mm ends at standard laboratory conditions for 1 h ± 10 min prior to pouring bond specimens.

7.6.2 Immediately after drying the blocks as in 7.6.1, assemble the blocks with spacers as specified in Test Methods D5329 so the opening between the blocks will form a cured sealant block that is 12.7 ± 0.1 mm wide.

7.6.3 After pouring material into the block opening, condition the specimen as in 7.1. After conditioning, remove spacers and trim off excess material with a hot knife, being careful not to pull sealant from the block. Condition the test specimens not less than 4 h at the temperature specified in Table 2 for the specific type of sealant. Immediately extend the specimen to

TABLE 1 Preparation Requirements

	Type I	Type II	Type III
Sample Size	2550 ± 50 g	1600 ± 50 g	1600 ± 50 g
Start and Duration of Heating Time	6 h from the start of addition of material	3 h from the start of addition of material	3 h from the start of addition of material
Conditioning Time Before Testing	72 ± 2 h	24 ± 4 h	72 ± 2 h

TABLE 2 Physical Requirements

	Type I	Type II	Type III
Cone Penetration	130 maximum	130 maximum	160 maximum
Cone Penetration, Fuel Immersed	Not more than the Cone Penetration	155 maximum and not more than ± 25 from the Cone Penetration	Not more than the Cone Penetration
Aged Cone Penetration Retention	--	--	70.0 % minimum of the value of the Cone Penetration
Softening Point	93 °C minimum	93 °C minimum	93 °C minimum
Bond, Non-Immersed	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[A]	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[B]	12.7 mm wide specimen, pass 3 cycles @ –29 ± 1 °C, 50 % extension[B]
Bond, Water Immersed	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[A]	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[B]	12.7 mm wide specimen, pass 3 cycles @ –29 ± 1 °C, 50 % extension C[B]
Bond, Fuel Immersed	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[C]	12.7 mm wide specimen, pass 3 cycles @ –18 ± 1 °C, 50 % extension[C]	12.7 mm wide specimen, pass 3 cycles @ –29 ± 1 °C, 50 % extension[C]
Resilience	60 % minimum	--	45 % minimum
Oven-Aged Resilience	60 % minimum	--	--
Tensile Adhesion	500 % minimum	--	--
Artificial Weathering	Pass 160 h[D]		Pass 160 h[D]
Flexibility	Pass[E]		

[A] No specimen shall develop any crack, separation, or other opening in the sealant compound or between the sealant and the concrete blocks.
[B] At least two out of three specimens shall exhibit no crack, separation, or other opening in the sealant or between the sealant and the concrete blocks. The third specimen shall exhibit no crack, separation, or other opening in the sealant or between the sealant and the concrete block exceeding 6 mm in depth, and shall exhibit no total area of bare concrete exposed on the face of either concrete block exceeding 160 mm.
[C] No specimen shall develop any crack, separation, or other opening in the sealant compound or shall develop any separation between the sealant and the concrete deeper than 6 mm when measured perpendicular to the sealant surface and down the interface of the block in the area showing the effect.
[D] After exposure, the sealant show not flow, show tackiness, the presence of an oil-like film or reversion to a mastic-like substance, form surface blisters, either intact or broken, form internal voids, have surface crazing, cracking, or hardening, or loss of rubber-like properties. Evidence of physical change in the surface of the material by visual and tactile examination shall constitute failure of the test.
[E] When conditioned in a forced-draft oven maintained at 70 ± 1 °C for 72 ± 2 h and bent at 90 degrees over a 6.4 mm (0.25 in.) diameter mandrel, the specimen shall have no indication of surface crazing or cracking.

the prescribed percentage in Table 2 using the apparatus and rate described in Test Methods D5329.

7.6.4 Recompress and re-extend according to Test Methods D5329 for the total number of cycles prescribed in Table 2. The required cycles shall be completed within a five-day period from the time of pouring.

7.7 *Bond, Water Immersed*—Determine the water-immersed bond according to Test Methods D5329. Prepare the specimens as in 7.6 except after conditioning, immerse in water for 96 h as described in Test Methods D5329. Testing shall be completed in five days from removal from the water.

7.8 *Bond, Fuel Immersed*—Determine according to Test Methods D5329. Prepare specimens as in 7.6.

7.9 *Resilience*—Use Test Methods D5329 for resilience.

7.10 *Oven-Aged Resilience*—Age specimen at 70 °C for 168 h. Use Test Methods D5329.

7.11 *Tensile Adhesion*—Use Test Methods D5329.

7.11.1 Test specimens are to be assembled with concrete blocks and spacers to enclose an opening between the blocks in which the sealant will be poured which is 12.7 ± 0.13 mm in width.

7.12 *Artificial Weathering*—Test artificial weathering according to Test Methods D5329.

7.13 *Flexibility*—Use Test Methods D5329.

8. Packaging and Package Marking

8.1 The sealing compound shall be delivered in the manufacturer's original containers. Each container shall be legibly marked with the name of the manufacturer, the trade name of the sealant, the manufacturer's batch or lot number and specification number and type, the minimum application temperature, and the maximum heating temperature. The maximum heating temperature must be at least 11 °C higher than the minimum application temperature.

9. Keywords

9.1 hot applied; jet fuel resistant; joint sealant