



Designation: D 3581 – 9602

## Standard Specification for Joint Sealant, Hot-Applied, Jet-Fuel-Resistant Type, for Portland Cement Concrete and Tar-Concrete Pavements<sup>1</sup>

This standard is issued under the fixed designation D 3581; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers one type of thermoplastic, hot-applied, jet-fuel-resistant joint sealant for use in sealing joints and cracks in pavements.

1.2 Units—The values stated in SI units are to be regarded as standard. The values in parentheses are for information only. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance to 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 and health practices and determine the applicability of regulatory limitations prior to use.* Specific precaution statements are given in the Appendix.

### 2. Referenced Documents

2.1 *ASTM Standards:*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee ~~D-4~~ 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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D 5167 Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation<sup>2</sup>

D 5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints<sup>2</sup>

D 5329 Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements<sup>2</sup>

**■** ~~2.2 Federal Standard:~~

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.03.

~~UU-P-63~~ Paper, Blotting<sup>3</sup>

### 3. Physical Properties

3.1 ~~Safe~~Maximum Heating Temperature—The ~~safe~~ maximum heating temperature is the highest temperature to which the sealing compound can be heated and still conform to all the requirements specified herein. For purposes of testing as specified hereinafter, the pouring temperature shall be the ~~safe~~ maximum heating temperature. The ~~safe~~ maximum heating temperature shall be set forth by the manufacturer and shall be shown on all containers and shall be provided to the testing agency before any laboratory tests are begun (see Appendix).

3.2 *Penetration*—At ~~77~~ 25 ± 0.2°F (25.0 ± 0.1°C); ~~0.2°F~~, 150 g, 5 s:

3.2.1 *Nonimmersed*—The penetration shall not exceed 130.

3.2.2 *Immersed*—The penetration shall not exceed 155 and the increase shall be not more than 25 over the nonimmersed penetration.

3.3 *Flow*—The flow shall not exceed 30 at ~~140~~ 60 ± 2°F (60 ± 1°C) 1°C (140 ± 2°F) for 5 h.

3.4 *Bond*—At ~~0~~ -18 ± 2°F (-17.8 ± 1°C) 1°C (0 ± 2°F) for three complete cycles:

3.4.1 *Nonimmersed*—When the joint sealant is tested for bond, not more than one specimen out of three shall develop any crack, separation, or other opening in the sealing compound or between the sealing compound and the concrete blocks.

3.4.2 *Fuel-Immersed*—When the joint sealant is fuel-immersed and tested for bond, not more than one specimen out of three shall evidence a complete cohesive failure of the material, or the gross area of bare concrete exposed on the face of any one concrete block shall not exceed an area of 160 mm<sup>2</sup> (¼ in.<sup>2</sup>(1.61 cm<sup>2</sup>)).

3.4.3 *Water-Immersed*—When the joint sealant is water-immersed and tested for bond, not more than one specimen out of three shall develop any cracks, separation, or other opening in the joint sealant or between the sealant and the concrete blocks.

3.5 *Solubility*—The dry weight of material shall not vary more than ± 2.0 %, and there shall be no defects that will affect the material as a joint sealant.

### 4. General Requirements

4.1 The joint sealant shall be composed of a mixture of materials with or without rubber that will form an adhesive compound resistant to the solvent actions of jet fuels and lubricating oils. The joint sealant shall effectively seal cracks and joints in pavements against the infiltration of moisture and jet fuel throughout repeated cycles of expansion and contraction and shall not flow from the joint or be picked up by vehicle tires. The joint sealant shall have a uniform pouring consistency suitable for completely filling the joints without inclusion of large air holes or discontinuities. The pouring temperatures shall not exceed ~~450°F (232°C)~~; 230°C (450°F). The pouring temperature and the ~~safe~~ maximum heating temperature of each lot or batch of material shall be determined by the manufacturer and shall be shown on the label.

### 5. Sampling and Heating

5.1 Samples shall be taken at point of manufacture or warehouse prior to delivery. It shall be the responsibility of the manufacturer to determine that the samples taken are representative of the batches or lots proposed for shipment.

5.2 Samples for testing shall consist of not less than a total sample of ~~10 lb (4.5 kg)~~ 4.5 kg (10 lb) of solid-type sealant, or ~~1 gal (4 litres)~~ 4 litres (1 gal) of liquid sealant from each batch or lot submitted for sampling. A batch or lot shall be considered as all finished material that was manufactured simultaneously or continuously as a unit prior to packaging. Samples shall be obtained by taking approximately equal portions from three containers selected at random. Heat shall not be used in obtaining samples. Samples of solid material shall be cut with an unheated knife, and samples of liquid material may be poured from the container. Each of the three containers sampled shall be resealed and marked for identification.

5.3 *Heating*—The oil bath in the melter shall be heated to the ~~safe~~ maximum heating temperature of the sealant being tested. The total sample which is added to and heated in the melter shall weigh approximately 1200 g. The sample shall be added in accordance to the instructions provided in Practice D 5167. Once the sample has been added to the melter, the oil bath temperature may be increased to not more than ~~20°F (11°C)~~ 11°C (20°F) higher than the ~~safe~~ maximum heating temperature, to raise the sealant temperature to the ~~safe~~ maximum heating temperature within the time required in Practice D 5167. Heating at the ~~safe~~ maximum heating temperature shall continue until 90 min have elapsed since the last segment was added to the melter.

### 6. Test Methods

6.1 *Specimen Curing*—All specimens shall be cured at standard laboratory atmospheric conditions specified in Test Methods D 5329 for 24 ± 2 h prior to beginning any testing.

6.2 *Cone Penetration:*

6.2.1 *Nonimmersed*—The test shall be conducted in accordance with Test Methods D 5329 for Cone Penetration, Nonimmersed.

6.2.2 *Immersed*—The test shall be conducted in accordance with Test Methods D 5329 for Cone Penetration, Fuel-Immersed.

6.3 *Flow*—The specimen shall be tested at ~~140~~ 60 ± 2°F (60 ± 1°C) 1°C (140 ± 2°F) for 5 h in accordance with Test Methods D 5329.

6.4 *Bond, Nonimmersed*—The test shall be conducted in accordance with Test Methods D 5329 for Bond, ~~Nonimmersed and the following procedures:~~

6.4.1 After the final scrubbing and blotting specified in Test Method D 5329, the 2 × 3 in. (50.8 × 76.2 mm) surfaces of the blocks shall be placed on a 4 × 9.5 in. (100 × 240 mm) sheet of blotting paper conforming to grade A of Federal Specification UU-P-63. Initial timing shall begin when the blocks are placed on the blotting paper. Nonimmersed. The blocks bond specimens shall remain on the blotting paper for 1 ± 0.17 h.

6.4.2 At the end of the 1-h blotting time, the blocks shall be assembled with spacers as specified in Test Method D 5329 to enclose an opening between the blocks which is 0.500 12 ± 0.005 in. (12.7 ± 0.1 mm (0.500 ± 0.13 mm) 0.005 in.) in width. The specimen assemblies shall be made so that the block surfaces which were in contact with the blotting paper will be in contact with the sealant when poured.

6.4.3 After the required curing width, extended 50 % and trimming of the specimens, the specimens shall be conditioned 0 tested at -18 ± 2°F (17.8 ± 1°C (0 ± 1°C) 2°F) for not less than 4 h and then the specimens shall be immediately extended at a rate of 0.125 in. (3.2 mm) per hour to a total width of 0.25 in. (6.4 mm) resulting in 50 % extension.

6.4.4 The specimens shall be recompressed and re-extended for two additional cycles for a total of three cycles. The three required cycles Testing shall be completed within a five-day period. 5 days of the start of testing.

6.5 *Bond, Water-Immersed*—The test shall be conducted in accordance with Test Methods D 5329 for Bond, Water-Immersed and the procedures listed in 6.4.

6.6 *Bond, Fuel-Immersed*—The test shall be conducted in accordance with Test Methods D 5329 for Bond, Fuel-Immersed and the procedures listed in 6.4.

6.7 *Solubility*—The test shall be conducted in accordance with Test Methods D 5329 for Solubility.

## 7. Packaging and Marking

7.1 The joint sealant material shall be packaged in 5-gal (18.9-litre) sealed containers. Each container shall be clearly marked with the name and address of the manufacturer, the trade name of the sealant, specification designation, the manufacturer's batch or lot number, recommended pouring temperature, safe heating temperature, and application instructions.

## 8. Keywords

8.1 fuel-resistant; hot-applied; joint sealant; pavement; portland cement concrete; tar concrete

## APPENDIX

### (Nonmandatory Information)

#### X1. PRECAUTIONS ON USE AND APPLICATION OF CONCRETE JOINT SEALANT, HOT-APPLIED TYPE

X1.1 Some, if not all, of the known materials conforming to this specification may be damaged by heating to too high a temperature, reheating, or by heating for too long a time. Care should be exercised to secure equipment for heating and application that is suitable for the purpose and approved by the manufacturer of the material. The material should be heated in a kettle or melter constructed as a double boiler, with the space between the inner and outer shells filled with oil or other heat-transfer medium. Positive temperature control, mechanical agitation, and recirculating pumps should be provided. Direct heating must not be used. As a means of ascertaining whether or not the material covered by this specification is being or has been damaged in the field as a result of overheating, reheating, or prolonged heating, flow panel specimens may be prepared periodically by drawing off sealant directly from the melter-applicator during sealing operations and then tested for flow according to Test Methods D 5329 for materials covered by this specification. Any flow would indicate damage to material caused by improper heating procedures.

X1.2 Pavement joints in new construction for application of material covered by this specification should be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The sidewalls of the joint space to be sealed should then be thoroughly sandblasted, blown clean of loose sand by high-pressure air, and sealed by use of the melter-applicator described in X1.1. If joints are cleaned by jet waterblasting, the jet waterblast machine shall be capable of discharging water up to 10 000 psi (69 MPa) pressure and 22 gal (83 L) of water/min. Joints shall be thoroughly dry before installation of bond breaker or joint sealant material is applied.

X1.3 When material covered by this specification is used for maintenance or resealing of joints that have previously contained either similar or dissimilar sealing material, it is recommended that the joint be dry, cleaned thoroughly with a plow, router, wire brush, concrete saw, or other suitable tool or tools designed for the purpose of neatly cleaning pavement joints. Loose material should be blown out. The sidewalls of the joint space to be sealed should be thoroughly sandblasted, blown free of loose sand with high-pressure air, and then sealed with material by use of the melter-applicator described in X1.1. If joints are cleaned by jet waterblasting, the jet waterblast machine shall be capable of discharging water up to 10 000 psi (69 MPa) pressure and 22 gal (83 litres) of water/min. Joints shall be thoroughly dry before installation of bond breaker or joint sealant is applied.

X1.4 The use of a back-up material or bond breaker in the bottom of the joint to be filled with material covered by this

specification is recommended to control the depth of sealant and achieve the desired shape factor, and to support the sealant against indentation and sag. Back-up materials and bond breakers should be compatible with the material. Due to the elevated temperatures of application of material covered by this specification, care should be exercised in the selection of suitable back-up materials. Backer material shall meet the requirements of Specification D 5249.

X1.5 Care should be practiced in the application of material covered by this specification to avoid overfilling of the joint space. Joints should be filled in a neat workmanlike manner from  $\frac{1}{8}$  to  $\frac{1}{4}$  to  $\frac{1}{4}$  in. (3.2 to 6.4 mm) below the adjacent pavement surface.

X1.6 **Safety Precautions**—As this material may contain poly (vinyl chloride) and coal-tar derivative, special care must be taken when using this material. Therefore, the manufacturer shall state necessary precautions clearly on the container, and shall supply the applicator with a detailed list of precautions so that proper safe handling and application techniques may be used.

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