Designation: D 6690 – 01

Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements[1]

This standard is issued under the fixed designation D 6690; 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 and Asphaltic Concrete Pavements.

1.2 The values stated in SI units are the standard.

1.3 This standard does not purport to cover the properties required of sealants for use in areas of Portland Cement concrete or asphaltic pavement subject to jet fuel or other fuel spillage such as vehicle and/or aircraft refuel and maintenance areas.

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 and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1190 Specification for Concrete Joint Sealer, Hot-Applied Elastic Type[2]

D 3405 Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements[2]

D 5167 Practice for Melting of Hot-Applied Joint and Crack sealant and Filler for Evaluation[2]

D 5249 Specification for Backer Material for use with Cold and Hot-Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints[2]

D 5329 Test Methods for Sealants and Fillers, Hot-Applied for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements[2]

2.2 *Federal Specification:*[3]

SS-S-1410C

3. General Requirements

3.1 The sealant shall be composed of a mixture of materials that will form a resilient and adhesive compound capable of effectively sealing joints and cracks in concrete and asphaltic pavements against the infiltration of moisture and foreign material throughout repeated cycles of expansion and contraction with temperature changes, and that will 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 and crack sealant capable of maintaining an effective seal in moderate climates. The material is tested for low temperature performance at -18°C using 50 % extension (formerly Specification D 1190).

4.2 *Type II*—A joint and crack sealant capable of maintaining an effective seal in most climates. Material is tested for low temperature performance at -29°C using 50 % extension (formerly Specification D 3405).

4.3 *Type III*—A joint and crack sealant capable of maintaining an effective seal in most climates. Material is tested for low temperature performance at -29°C using 50 % extension. Special tests are included (formerly Federal Spec SS-S-1401C).

4.4 *Type IV*—A joint and crack sealant capable of maintaining an effective seal in climates experiencing very cold temperatures. Material is tested for low temperature performance at -29°C using 200 % extension.

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

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

[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] *Annual Book of ASTM Standards*, Vol 04.03.

[3] Available from U.S. Government Printing Office, Washington, DC 20402.

on all containers and shall be provided to the testing agency before any laboratory tests are begun.

5.2 The sealant shall conform to the requirements prescribed in Table 1.

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 D 5167. The sample portion added to and heated in the melter shall weigh 800 ± 50 g for Types I, II, IV, and 1600 ± 50 g for Type III. Both pots of the melter described in Practice D 5167 shall be used for Type III.

6.2 *Heating*—Heat the material in accordance with Practice D 5167.

6.2.1 The oil bath in the melter shall be heated to a temperature between the sealant's maximum heating temperature and 42°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 D 5167. 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 hour of time, as stated in Practice D 5167. Immediately upon reaching the maximum heating temperature, pour samples for testing, except for Type III which shall be heated for 3 h from the time of first addition to the melter.

7. Test Methods

7.1 *Specimen Conditioning*—Condition all specimens at standard laboratory conditions for 24 ± 4 h as specified in test Method D 5329 prior to beginning any testing.

7.2 *Cone Penetration*—Determine cone penetration according to Method D 5329 for Cone Penetration, non-immersed.

7.3 *Flow*—Determine the flow according to Method D 5329 for Flow. Test the specimen for 5 h.

7.4 *Bond, Non-Immersed*—Determine the bond according to Test Method D 5329 for Bond, non-immersed.

7.4.1 After final scrubbing and blotting specified in test Method D 5329, air dry the blocks on their 12.7 mm × 25.4 mm ends at standard laboratory conditions for 1 h ± 10 min. prior to pouring bond specimens.

7.4.2 Immediately after conditioning the blocks as in 7.4.1, assemble the blocks with spacers as specified in test Method D 5329 so the opening between the blocks will form a cured sealant block that is 25.4 mm ± 0.1 mm wide for Type I and 12.7 ± 0.1 mm wide for Type II , Type III and Type IV.

7.4.3 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 1 for the Specific Type of Sealant. Immediately extend the specimen to the prescribed percentage in Table 1 using the apparatus and rate described in D 5329.

7.4.4 Re-compress and re-extend according to test Method D 5329 for the total number of cycles prescribed in Table 1. The required cycles shall be completed within a 5 day period from the time of pouring for Type II, III, and IV, and a 7 day period for Type I.

7.5 *Bond, Water Immersed, Type III Only*—Determine the Bond according to ASTM D 5329. Prepare the specimens as in section 7.4 except after conditioning, immerse in water for 96 hours as described in D 5329. Testing shall be completed in 5 days from removal from the water for Types III.

7.6 *Resilience*—Use test Method D 5329 for Resilience.

7.7 *Oven Aged Resilience*—Age specimen @ 70°C for 168 h. Use test method D 5329.

7.8 *Asphalt Compatibility*—Test asphalt compatibility according to test Method D 5329.

TABLE 1

Cone Penetration at 25°C	Type I 90 max.	Type II 90 max.	Type III 90 max.	Type IV 90-150
Flow at 60°C, mm	5.0 max.	3.0 max.	3.0 max.	3.0 max.
Bond, non-immersed	Two out of three 25.4 mm specimens pass[A] 5 cycles at 50 % ext. at -18°C	Three 12.7 mm Specimens pass[A] 3 cycles at 50 % ext. at -29°C	Three 12.7 mm Specimens pass[A] 3 cycles at 50 % ext. at -29°C	Three 12.7 mm Specimens pass[A] 3 cycles at 200 % ext. at -29°C
Bond, water immersed	--	--	Three 12.7 mm specimens pass[A] 3 cycles at 50 % ext. at -29°C	--
Resilience, %	--	60 min.	60 min.	60 min.
Oven Aged Resilience,%	--	--	60 min.	--
Asphalt Compatibility	Pass[B]	Pass[B]	Pass[B]	Pass[B]

[A] The development at any time during the test procedure of a crack, separation, or other opening that at any point is over 6 mm deep, in the sealant or between the sealant and concrete block shall constitute failure of the test specimen. The depth of the crack, separation or other opening shall be measured perpendicular to the side of the sealant showing the defect.

[B] There shall be no failure in adhesion, formation of an oily exudate at the interface between the sealant and asphaltic concrete or other deleterious effects on the asphaltic concrete or sealant when tested at 60°C.

8. Packaging and 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 (20°F) higher than the minimum application temperature.

9. Keywords

9.1 hot applied; joint sealant

APPENDIX

(Nonmandatory Information)

X1.

X1.1 Some if not all, 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. Thermostatic control for the heat transfer medium shall be provided and shall have sufficient sensitivity to maintain sealant temperature within the manufacturer's specified application temperature range. Temperature indicating devices shall have intervals no greater than 5°F (2.8°C) and shall be calibrated as required to assure accuracy. The melter shall have a continuous sealant agitation and mixing system to provide uniform viscosity and temperature of material being applied. If equipped with an application system to deliver sealant to the pavement, the melter shall incorporate a recirculation pump or other means of maintaining sealant temperature in the delivery system. Sealant that has been damaged due to overheating, reheating or prolonged heating may experience poor adhesion, softening or bleeding, difficult application, or jelling in the melter. 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 the methods of testing materials covered by this specification. Flow in excess of 3.0 mm for Type II, III, and IV, and 5.0 mm for Type I 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.

X1.3 When material covered by this specification is used for maintenance or resealing of joints that have 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.

X1.4 The use of a backer 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 the sealant and achieve the desired shape factor, and to support the sealant against indentation and sag. Backup 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 the suitable backer materials. Refer to Specification D 5249 for recommended backer materials.

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 ⅛ to ¼ in. (3 to 6 mm) below the adjacent pavement surface.