Designation: D5893/D5893M – 16 (Reapproved 2021)

Standard Specification for Cold-Applied, Single-Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements[1]

This standard is issued under the fixed designation D5893/D5893M; 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 cold-applied, single-component, chemically curing silicone sealants that are based on polymers of polysiloxane structures and are intended for use in sealing joints and cracks in portland cement concrete highway and airfield pavements. The specification includes both non-sag and self-leveling types of sealants.

1.1.1 This specification does not purport to cover the properties required of sealants for use in areas of portland cement concrete pavements subject to jet fuel or other fuel spillage, such as vehicle or aircraft refueling and maintenance areas, or a combination thereof.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. 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 nonconformance with the standard.

1.3 The following safety hazards caveat pertains only to the test methods portion, Section 9, of 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.* Specific precautionary statements are given in Appendix X1.

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]

C639 Test Method for Rheological (Flow) Properties of Elastomeric Sealants

C661 Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer

C679 Test Method for Tack-Free Time of Elastomeric Sealants

C792 Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants

C793 Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants

C1183/C1183M Test Method for Extrusion Rate of Elastomeric Sealants

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D618 Practice for Conditioning Plastics for Testing

D1985 Practice for Preparing Concrete Blocks for Testing Sealants, for Joints and Cracks

D2202 Test Method for Slump of Sealants

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

D5535 Terminology Relating to Formed-in-Place Sealants for Joints and Cracks in Pavements (Withdrawn 2009)[3]

3. Terminology

3.1 *Definitions*—Refer to Terminology D5535 for definitions of the following terms used in this specification: backer material, chemically curing sealant, joint, and sealant.

[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. Classification

4.1 Sealants meeting the requirements of this specification shall be classified according to type as one of the following:

4.1.1 *Type NS (Non-Sag)*—A single-component sealant that resists sagging after application in horizontal joints and requires tooling or forming into the joint to achieve the desired application configuration.

4.1.2 *Type SL (Self-Leveling)*—A single-component sealant that is self-leveling and has sufficient flow characteristics to form a smooth and level surface in horizontal joints without tooling or forming after application.

5. General Requirements

5.1 The sealant shall be a uniform mixture with a consistency that is appropriate for application to joints in portland cement concrete pavements through pressure-fed application units or by hand caulking guns. The sealant shall cure by means of a chemical reaction of the components to form an elastomeric seal that seals joints in concrete throughout repeated cycles of thermal expansion and contraction and against the infiltration of moisture and incompressibles.

5.2 When stored in the original, unopened containers at conditions recommended by the manufacturer, the sealant shall be capable of meeting the specification requirements for at least six months after the original purchase.

5.3 After specified curing in the laboratory, the color of the cured sealant shall be as agreed upon by the purchaser and the manufacturer.

5.4 The sealant is intended for use in appropriately prepared, clean, dry, and frost-free portland cement concrete joints or cracks in new pavements or pavements that are being resealed.

6. Physical Requirements

6.1 *Cure Evaluation*—The sealant shall cure throughout a 12.7 by 12.7-mm [0.5 by 0.5-in.] cross section within 21 days when evaluated in accordance with 9.1. At 21 days ± 4 h of curing, the sealant shall not show the presence of any uncured material, as indicated by sealant that has not changed from a liquid to a solid state.

6.2 *Rheological Properties:*

6.2.1 When tested in accordance with Test Method D2202, Type NS sealant shall not slump more than 7.6 mm [0.30 in.].

6.2.2 When tested in accordance with Test Method C639 for Type I sealant, Type SL sealant shall exhibit a smooth, level surface with no indication of bubbling.

6.3 *Extrusion Rate*—When tested in accordance with Test Method C1183/C1183M for Type S sealants, the extrusion rate shall not be less than 20 mL/min [1.22 $in.^3$/min].

6.4 *Tack-Free Time*—The sealant shall be tack-free, with no transfer of the sealant to the polyethylene, when tested at 5 h ± 10 min in accordance with Test Method C679.

6.5 *Effects of Heat Aging*—The sealant shall not lose more than 10 % of its original weight or show any cracking or chalking when tested in accordance with Test Method C792.

6.6 *Bond*—The sealant shall be tested in accordance with 9.6 at −29 ± 1 °C [−20 ± 2 °F] for five complete cycles of 100 % extension each. All three specimens shall meet the following requirements for bond:

6.6.1 *Non-Immersed*—No specimen shall develop any crack, separation, or other opening in the sealant or between the sealant and the concrete test blocks.

6.6.2 *Water-Immersed*—No specimen shall develop any crack, separation, or other opening in the sealant or between the sealant and the concrete test blocks.

6.6.3 *Oven-Aged*—No specimen shall develop any crack, separation, or other opening in the sealant or between the sealant and the concrete test blocks.

6.7 *Hardness:*

6.7.1 When tested in accordance with Test Method C661 at −29 ± 1 °C [−20 ± 2 °F], using a Type A-2 durometer, the hardness shall not exceed 25.

6.7.2 When tested at standard laboratory conditions and in accordance with Test Method C661 at 23 ± 2 °C [73.4 ± 3.6 °F], using a Type 00 durometer, the hardness shall not be less than 30.

6.8 *Flow*—When tested in accordance with 9.8 at 93.3 ± 1 °C [200 ± 2 °F] for 72 h ± 30 min, there shall be no flow.

6.9 *Rubber Properties in Tension:*

6.9.1 *Ultimate Elongation*—When tested at standard laboratory conditions and in accordance with Test Methods D412 using Die C, at 23 ± 2 °C [73.4 ± 3.6 °F], and using a 500 ± 20 mm/min [20 ± 2 in./min] elongation rate, the ultimate elongation of the sealant shall not be less than 600 %.

6.9.2 *Tensile Stress at 150 % Elongation*—When tested at standard laboratory conditions and in accordance with Test Methods D412 using Die C, at 23 ± 2 °C [73.4 ± 3.6 °F], and using a 500 ± 20 mm/min [20 ± 2 in./min] elongation rate, the tensile stress at 150 % elongation shall not exceed 310 kPa [45 psi].

6.10 *Effects of Accelerated Weathering*—After 5000 h of exposure in accordance with 9.10, the sealant shall 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, or have surface crazing, chalking, cracking, hardening, or loss of rubber-like properties. The sealant shall not experience any cracking or crazing when subjected after weathering to bending at –26 ± –2 °C [–15 ± 3.6 °F] as described in Test Method C793. Evidence of physical change in the surface of the material by visual and tactile examination shall constitute failure of this test. The accelerated weathering test shall be repeated every five years or when a formula change is made.

6.11 *Resilience*—When tested in accordance with 9.11, the resilience of the sealant shall not be less than 75 %.

7. Sampling

7.1 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 conducted prior to shipment, the inspector representing the purchaser shall have free access to the material to be sampled. The inspector shall be afforded all