Designation: C794 – 06

Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants[1]

This standard is issued under the fixed designation C794; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers a laboratory procedure for determining the strength and characteristics of the peel properties of a cured-in-place elastomeric joint sealant, single- or multicomponent, for use in building construction.

1.2 The values stated in metric (SI) units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 The committee with jurisdiction over this standard is not aware of any comparable standards published by other organizations.

1.4 *This standard does not purport to address all of the safety problems, 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C33 Specification for Concrete Aggregates

C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

C150 Specification for Portland Cement

C717 Terminology of Building Seals and Sealants

C1442 Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus

G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

3. Terminology

3.1 The definitions given in Terminology C717 on terms relating to building seals and sealants and in Terminology G113 on terms relating to natural and artificial weathering tests are applicable to this test method.

4. Summary of Test Method

4.1 This test method consists of preparing test specimens by embedding a strip of cloth in a thin layer of the sealant being tested, on several substrate materials, curing these specimens for a certain length of time under specified conditions, then placing them in a tension-testing machine in such a way that the embedded cloth is peeled back from the substrate at 180°, and measuring the force exerted as well as the nature of the separation of the sealant from the substrate.

5. Significance and Use

5.1 There are differences in opinion among those concerned with sealant technology whether or not this adhesion-in-peel test is intended to simulate the conditions encountered by a sealant in normal use. Nevertheless, since it represents a test to destruction, the value of the test denotes the ability of the cured sealant to maintain a bond to the substrate under severe conditions.

5.2 Many sealant manufacturers utilize the adhesion-in-peel test for determining the adhesive characteristics of sealant/primer combinations with unusual or proprietary substrates.

6. Apparatus and Materials

6.1 *Testing Machine* with tension grips capable of pulling at the rate of separation of 51 mm (2 in.)/min, and having a chart indicator calibrated in 0.45-kg (1-lb) units.

6.2 *Standard Substrates*:

6.2.1 *Aluminum Alloy*, Type 6063-T5 or 6061-T6, with a clear anodized finish of not less than 0.0075-mm (0.3-mil) thickness over a scale-free finish; 2 pieces, 152 by 76 by 6.3 mm (6 by 3 by ¼ in.).

6.2.2 *Mortar Slabs*, prepare two cement mortar slabs, each 152 by 76 by 9.5 mm (6 by 3 by ⅜ in.) in size, using one part of high early strength Portland cement conforming to Type III of Specification C150 for Portland Cement, to two parts by weight of clean, uniformly graded, concrete fine aggregate (sand) conforming to Specification C33, for Concrete Aggregates. Use sufficient water to produce a flow of 100 ± 5 when tested in accordance with the procedure for the determination

[1] This test method is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.30 on Adhesion.

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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.

of consistency of cement mortar described in Test Method C109/C109M. After curing 1 day in moist air and 6 days in saturated lime water at 23 ± 2°C (73 ± 3°F), prepare the surface of 152 by 76 mm (6 by 3 in.) of each slab by wet grinding either side with a belt sander using No. 60 aluminum carbide sanding belt or using an iron lap with No. 60 silicon carbide (or aluminum oxide) grain until the aggregate is uniformly exposed. Return the slabs to saturated lime water storage until needed.

6.2.2.1 Slabs may be prepared and shipped to other locations for use. The slabs may be shipped dry and shall be returned to saturated lime water storage on arrival until needed.

6.2.2.2 Prior to use, wet grind the previously ground surface to remove any laitance, rinse thoroughly under running tap water, and dry the slabs overnight at 105 to 110°C (220 to 230°F). Clean the slabs by vigorous brushing with a stiff-bristled fiber brush to remove any film or powder. Condition the slabs at standard conditions for not less than 1 day and not more than 7 days.

6.2.3 *Plate Glass*, polished, clear, 152 by 76 by 6.3 mm (6 by 3 by ¼ in.).

NOTE 1—Because of the fact that adhesive properties of a joint sealant are related to the nature of the substrate, it is strongly recommended that whenever possible the peel test be made with the substrates that are to be used in the building under consideration in addition to or in place of the specified substrates described in 6.2.1, 6.2.2, and 6.2.3. Such substrates include brick, marble, limestone, granite, stainless steel, plastic, quarry tile, and others. For practical reasons the specimen dimensions may be changed from the standard sizes provided the thickness of the sealant remains as specified.

6.3 *Spacer Strips*, four, of hard wood, metal, or glass as follows: two 152 by 76 by 6.3 mm (6 by 3 by ¼ in.) for preparing the test specimens on aluminum and glass, and two of the same length and width but 9.3 mm (⅜ in.) thick for preparing the test specimens on mortar.

6.4 *Glass Rod*, about 12.7 mm (½ in.) in diameter and about 305 mm (12 in.) long.

6.5 *Stainless Steel or Brass Rods*, two, 1.6 mm (1⁄16 in.) in diameter, about 305 mm (12 in.) long.

6.6 *Masking Tape*, paper, roll, 25.4 mm (1 in.) wide.

6.7 *Airplane*[3]*/Wire*[4] *Cloth* Grade A, desized, 4.28 oz/yd, 80/84 count, 6 pieces at least 178 mm (7 in.) long and 76 mm (3 in.) wide, or suitable wire cloth,[4] 30-mesh, 0.254-mm (10-mil) thickness.

6.8 *Putty Knife*, stiff, about 38 mm (1½ in.) wide.

6.9 *Knife*, with sharp razor-type blade.

6.10 *Exposure Apparatus*—The exposure apparatus shall be one of the three types of laboratory accelerated weathering devices described in Practice C1442, that use either xenon arc, fluorescent UV or open flame carbon arc radiation. Consult Practice C1442 for the differences in test parameters among the devices. Because of differences in test conditions, test results may differ with the type of device used. The choice of device shall be by mutual agreement among the interested parties.

7. Test Specimens and Cure Procedures

7.1 Two test specimens shall be prepared on aluminum, two on cement mortar, two on glass, and two on each of any other substrate materials specified, using the following procedures:

7.1.1 Condition not less than 250 g of sealant (and sufficient portion of other components, if a multicomponent) in a closed container for 24 h at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity.

7.1.2 Clean the test surfaces of all metal and glass substrates with methyl ethyl ketone or similar solvent followed by a thorough cleaning with a detergent solution (Note 3), a final rinse with distilled or deionized water, and air dry. Clean masonry surfaces with a dry stiff fiber bristle brush.

7.1.3 Apply primer to the clean dry test surfaces only when specified and supplied by the sealant manufacturer and agreed upon by the purchaser.

7.1.4 Place a strip of masking tape 25 mm (1 in.) wide across the test surface of the substrate so that the lower edge of the tape is parallel and at least 76.2 mm (3 in.) from the lower short edge of the substrate (Fig. 1*A*).

7.1.5 Spread a portion of the conditioned compound, after being mixed thoroughly for 5 min (if multicomponent), over the 102 by 76-mm (4 by 3-in.) area, which includes the masking tape, to a depth slightly more than 1.6 mm (1⁄16 in.), as shown in Fig. 1*B*.

7.1.6 Smear one piece of cloth with the compound at one end over an area of 102 by 76 mm (4 by 3 in.), forcing it into both sides of the cloth with a putty knife until the sealant has thoroughly penetrated the cloth.

7.1.7 Lay the impregnated cloth over the layer of compound and place the spacer bars of proper thickness (see 6.3) on each side of the specimen.

7.1.8 Place a 1.6-mm (1⁄16-in.) metal rod lengthwise on top of each spacer strip and squeegee the compound to 1.6 mm (1⁄16 in.) thick by rolling the glass rod over the metal rods (starting from the taped end), and simultaneously pressing on the cloth and sealant beneath it. Trim off the excess amount that is squeezed out (Fig. 1*C*).

7.1.9 Cure the specimens containing multicomponent compounds 14 days at 23 ± 2°C (73.4 ± 3.6°F). Cure those containing single component compounds 21 days as follows (Note 4): 7 days at 23 ± 2°C (73 ± 3.6°F), 50 ± 5 % relative humidity; 7 days at 37.8 ± 2°C (100 ± 3.6°F) and 95 ± 5 % relative humidity; and finally 7 days at 23 ± 2°C (73 ± 3.6°F) and 50 ± 5 % relative humidity.

7.1.10 After the specimen has cured for about 7 days, coat the cloth with a layer of the compound about 1.6 mm (1⁄16 in.) thick to help minimize cloth failure (Fig. 1*D*).

7.1.11 Immediately following the full curing period (see 7.1.9 and Note 4), make four cuts with a sharp blade lengthwise of the specimen, cutting completely through to the substrate surface, and remove excess material so as to leave two 25.4-mm (1-in.) wide strips of cloth-covered sealant separated by a space about 9.5 mm (⅜ in.) wide (Fig. 1*E*)

[3] Available from Reeves Brothers, Inc., 1271 Ave. of Americas, New York, NY 10020.

[4] Available from Tetko Inc., 333 South Highland Ave., Briarcliff Manor, NY 10510. Also available from McMaster Carr Supply Co., P.O. Box 4355, Chicago, IL 60680.