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SEALANT SPECIFICATIONS

USA Standard Specification for Two-Component Elastomeric Sealing Compounds for the Building Trade

Proprietary Sponsor: American Society for Testing and Materials
1916 Race Street
Philadelphia, Pa. 19103

Foreword

On February 26, 1959, the Building Trade Specification Committee, composed of representatives of companies manufacturing polysulfide-base sealants, submitted a specification for a sealing compound to the American Standards Assn. for consideration under the General Acceptance Method of ASA procedure. Based on the recommendations of a general conference held in Pittsburgh on April 9, 1959, and the replies to a canvass of those who had participated in the conference and others believed to be concerned with the subject, the standard was approved by ASA on July 27, 1960, as USA Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade, A116.1-1960.

At that same time proprietary sponsorship for future revisions of the standard was assigned to the American Society for Testing and Materials.

Responsibility for this work in ASTM rests with Committee C-24 on Building Joint Sealants. Subcommittee V of Committee C-24 prepared this revised Standard which was approved by letter ballot of the main Committee C-24 on January 26, 1967, and by the USA Standards Institute on December 7, 1967, under the Proprietary Sponsorship Method.

The membership of Subcommittee V is as follows:

Organization Represented	*Name of Representative*
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Tremco Manufacturing Co.	James Mraz (secretary)
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Contents

Section			Page
1.	Scope		1
2.	Description		1
3.	Classes		1
4.	Color		1
5.	Stability		1
6.	Requirements		1
6.1		Application Life	1
6.2		Rheological Properties	1
6.2.1		Class A (Self-Leveling) Compound	1
6.2.2		Class B (Non-Sag) Compounds	1
6.3		Adhesive Strength in Tension	1
6.3.1		Adhesive Strength After Heat-Aging and After Water Immersion	1
6.3.2		Adhesive Strength After Cycling at −15 F and 73.4 F	2
6.3.3		Adhesive Strength After Sun Lamp Exposure Through Glass	2
6.4		Adhesion in Peel	2
6.5		Resistance to Crazing	2
6.6		Staining of Concrete and Masonry	2
6.7		Hardness	2
6.7.1		Hardness After Cure at Standard Conditions	2
6.7.2		Hardness After Heat Aging	2

6.8 Weight Loss After Heat Aging 2
6.9 Recovery 2
7. Physical Tests 2
7.1 Test for Application Life 2
7.2 Test for Rheological Properties 2
7.2.1 Class A (Self-Leveling) Compounds 2
7.2.2 Class B (Non-Sag) Compounds 3
7.3 Tests for Adhesive Strength in Tension 3
7.3.1 Test Surfaces 3
7.3.2 Construction of Test Assemblies 4
7.3.3 Method of Testing 5
7.3.4 Testing Procedures 5
7.3.4.1 Adhesive Strength After Heat Aging and Water Immersion 5
7.3.4.2 Adhesive Strength After Cycling at −15 F and 73.4 F 5
7.3.4.3 Adhesive Strength After Sun Lamp Exposure 5
7.4 Test for Adhesion in Peel 6
7.4.1 Test Surfaces 6
7.4.2 Construction of Test Assemblies 6
7.4.3 Testing Procedure 6
7.5 Testing for Crazing 6
7.6 Test for Staining of Concrete and/or Masonry 7
7.7 Tests for Hardness 7
7.7.1 Hardness at Standard Conditions 7
7.7.2 Hardness after Heat Aging 7
7.8 Test for Weight Loss After Heat Aging 7
7.9 Recovery 7

USA Standard Specification for Two-Component Elastomeric Sealing Compounds for the Building Trade

1. Scope

1.1 This specification covers performance properties of two-component elastomeric sealing compounds, including curing agents, in sealing, caulking, or glazing applications in buildings. Use of primer under certain conditions, when recommended by the manufacturer, is acceptable. Where a primer is recommended by a manufacturer for a specific surface, all tests on that surface shall include that primer.

2. Description

2.1 Materials covered in this specification are two-component elastomeric sealing compounds consisting of a base compound and a curing agent. The compounds are stable separately and, when properly mixed, convert to a rubber-like solid which meets the requirements herein specified. The selection of the base polymer, fillers, and other components shall be optional with the supplier, but shall be suitable for the application intended.

3. Classes

3.1 The sealing compound shall be supplied in two classes as follows:

3.1.1 Class A (Self-Leveling) (Type I)[1] shall be a compound which, when properly mixed, has sufficient flow to give a smooth, level surface when applied in a horizontal joint at 40 ± 1.8 F (4.5 ± 1 C).

3.1.2 Class B (Non-Sag) (Type II)[1] shall be a compound which when properly mixed permits application in vertical joints without sagging at ambient temperatures between 40 and 122 F (4.5 and 50 C).

NOTE 1: Other suitable flow characteristics may be agreed upon by the supplier and purchaser or specifier. Special non-sag properties may be required in unusually large joints in buildings and lesser flow characteristics may be required for use in sloping joints where excessive leveling is not desired.

4. Color

4.1 The color of the sealing compound may be any color agreed upon by the supplier and purchaser or specifier, provided it does not adversely affect the properties specified.

[1] These classes correspond to Types I and II of TT-S-227C (GSA-FSS).

5. Stability

5.1 The base compound and accelerator in original unopened containers shall be stable for at least 6 months from time of delivery, when stored at a temperature not exceeding 80 F (26.7 C). At the end of 6 months after time of delivery, the compound shall still meet the requirements herein specified. Separation or settling shall not be considered instability if uniformity is obtained by stirring.

6. Requirements

6.1 Application Life. A properly mixed compound shall be suitable for statisfactory application for at least 4 hours, or any period of time agreed upon by the supplier and purchaser, when maintained at a temperature of 73.4 ± 3.6 F (23 ± 2 C) and 50 ± 5 percent relative humidity. The maximum application life shall be determined as described in 7.1.

NOTE 2: Hereafter 73.4 ± 3.6 F (23 ± 2 C) and 50 ± 5 percent relative humidity will be referred to as standard conditions.

6.2 Rheological Properties

6.2.1 Class A (Self-Leveling) Compound. The flow of a properly mixed Class A compound shall be such that when tested in accordance with 7.2.1, it shall exhibit a smooth, level surface (see NOTE 1).

6.2.2 Class B (Non-Sag) Compounds. The flow of a properly mixed Class B compound shall be such that when tested in accordance with 7.2.2, it will not sag more than ¼ inch (0.64 centimeter) in vertical displacement.

6.3 Adhesive Strength in Tension. In each of the following tests the total loss in bond area (of adhesion) among the three specimens tested (for each surface) shall be less than 1 square inch (6.5 square centimeters). The losses in area shall be estimated to the nearest 0.1 square inch (0.65 square centimeter). If two of the three specimens show no failure while the third shows complete failure, the test shall be repeated.

6.3.1 Adhesive Strength after Heat-Aging and after Water Immersion. The test assemblies shall be prepared according to 7.3.1 and 7.3.2 and tested according to 7.3.3 and 7.3.4.1. The compound in the test joint shall

be capable of being extended 100 percent of its original width (from ½ to 1 inch or 1.27 to 2.54 centimeters) without failure and maintained at 100 percent extension (1 inch or 2.54 centimeters) for 24 hours at standard conditions without failure. The force required to obtain this extension shall be not less than 10 pounds per square inch (0.7 kilograms per square centimeter).

6.3.2 Adhesive Strength After Cycling at 15 and 73.4 F. The test assemblies shall be prepared according to 7.3.1 and 7.3.2 and tested according to 7.3.3 and 7.3.4.2. The compound in the test joint shall be subjected to three cycles without failure.

6.3.3 Adhesive Strength After Sun Lamp Exposure Through Glass. When the sealant is to be used against glass, test assemblies shall be prepared in accord with 7.3.1 and 7.3.2 and tested according to 7.3.3 and 7.3.4.3. The compound in the test joint shall be capable of being extended 100 percent without failure.

6.4 Adhesion in Peel. When tested as prescribed in 7.4, 7.4.1, 7.4.2, and 7.4.3, the average peel strengths for the sample when tested with glass, aluminum, and concrete, in addition to any other specified base material shall be not less than 8 pounds per inch. (1.4 kilograms per centimeter), and shall show no more than 50 percent adhesive loss on a single peel test.

6.5 Resistance to Crazing. The surface of the compound on a test panel prepared and tested according to 7.5 shall not craze more than 3 mils (0.08 millimeters) in depth.

6.6 Staining of Concrete and Masonry. When the sealant is to be used against concrete, masonry, and stone, the staining test shall be conducted on a test mortar in accordance with the American Society for Testing and Materials Method of Test for Staining and Color Change of One- or Two-part Joint Sealants (ASTM C 510 – 65),[2] and there shall be no staining on the test mortar within 14 days.

6.7 Hardness.

6.7.1 Hardness After Cure at Standard Conditions. Properly mixed compounds which have cured for 14 days at standard conditions, when tested for instantaneous Shore A hardness as prescribed in 7.7.1, shall show hardness readings as follows:

6.7.1.1 Class A Compound—not less than 15 nor more than 60.

6.7.1.2 Class B Compound—not less than 15 nor more than 50.

6.7.2 Hardness After Heat Aging. Properly mixed compounds which have cured for 7 days at standard conditions followed by 7 days at 180 ± 3.4 F (82 ± 2 C), when tested according to 7.7.2 shall show instantaneous hardness readings as follows:

[2] *1967 Book of ASTM Standards*, Part 14.

6.7.2.1 Class A Compound—not less than 15 nor more than 60.

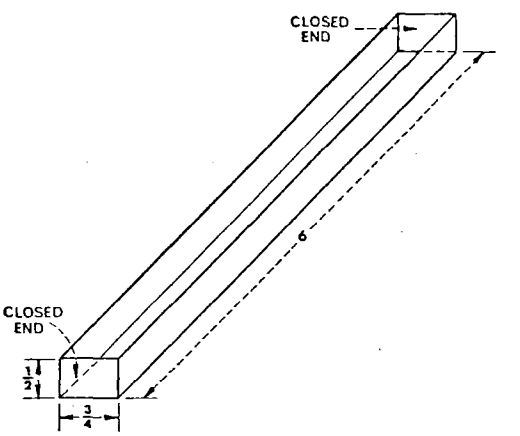
6.7.2.2 Class B Compound—not less than 15 nor more than 50.

6.8 Weight Loss After Heat Aging. A properly mixed compound shall not lose more than 12 percent of its original weight when tested according to 7.8.

6.9 Recovery. Three aluminum test assemblies shall be prepared according to 7.3.1 and 7.3.2 and tested according to 7.3.3 and 7.9. The recovery of the compound in the test joint shall be not less than 25 percent within 1 hour at standard conditions.

7. Physical Tests

7.1 Test for Application Life. This test shall be performed on the two components that have been separately conditioned at least 16 hours at standard conditions. Application life shall be considered to begin within 10 minutes after mixing the two components. The test to determine applicability shall be performed by hand mixing for 5 minutes 8 fluid ounces (237 cubic centimeters) of the sealing compound in the proportions recommended by the manufacturer, after each component has been conditioned as described, and when tested under the same conditions. Maximum application life shall be considered to be reached when the time required to discharge 6 fluid ounces (177 cubic centimeters) of mixed compound, placed in a 250-6C Semco cartridge or equivalent, with no tip, with a front opening of 0.540 ± 0.002 inches using a pressure of 50 pounds per square inch (3.5 kilograms per square centimeter) exceeds 1 minute for Class A or 2 minutes for Class B Compounds.



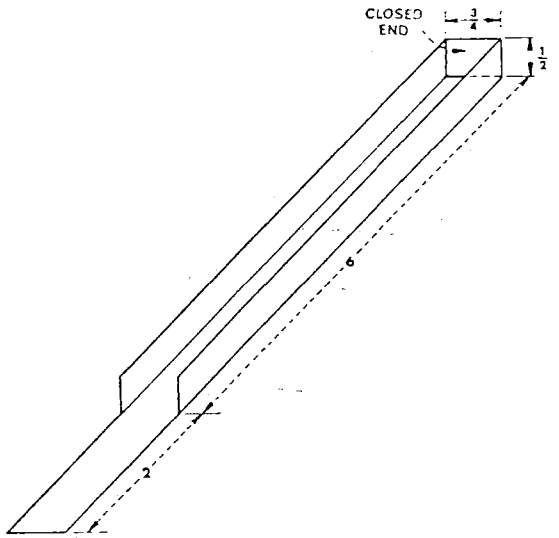
All dimensions in inches.

FIG. 1—Assembly for Testing Flow in Class A Compounds.

7.2 Tests for Rheological Properties.

7.2.1 Class A (Self-Leveling) Compounds. This test shall be performed in a test assembly using a channel

made of Type 302 or 304 stainless steel with 2B finish. This channel shall have inside dimensions, ¾ inch (1.9 centimeters) wide by ½ inch (1.3 centimeters) deep, and shall be 6 inches (15.2 centimeters) long and closed at both ends, as shown in Figure 1. Before preparing the test assembly, 100 grams of base compound, with an appropriate amount of curing agent shall be conditioned at 40 ± 1.8 F (4.5 ± 1 C) for a minimum of 16 hours, and the metal channel shall also be conditioned at the same temperature for not less than 1 hour. At the end of this conditioning period, the two components shall be removed from the conditioning chamber and hand mixed for 5 minutes. The mixed compound shall be returned to the 40 ± 1.8 F (4.5 ± 1 C) conditioning chamber for 30 minutes, after which it shall be poured

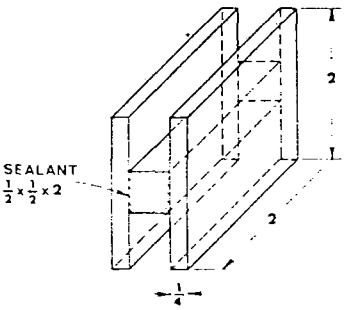


All dimensions in inches.

FIG. 2—Assembly for Testing Sag in Class B Compounds.

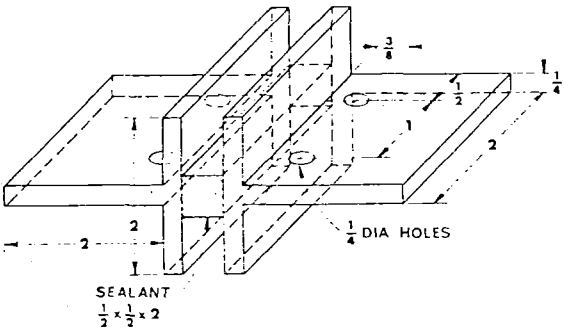
into the conditioned channel, held horizontally at 40 ± 1.8 F (4.5 ± 1 C) and then shall be maintained at this temperature for 1 hour. At the end of this period, the compound shall be examined.

7.2.2 Class B (Non-Sag) Compounds. This test shall be performed in two test assemblies using channels made of Type 302 or 304 stainless steel with 2B finish and shall have inside dimensions, ¾ inch (1.9 centimeters) wide by ½ inch (1.3 centimeters) deep and shall be 6 inches (15.2 centimeters) long, with the bottom surfaces extended 2 inches (5.1 centimeters) at one end, as shown in Figure 2. Before preparing the test assembly, 200 grams of base compound, with an appropriate amount of curing agent shall be maintained at standard conditions for a minimum of 16 hours, and the two channels shall be conditioned for not less than 1 hour, one at 40 ± 1.8 F (4.5 ± 1 C) and the other at 122 ± 1.8 F (50 ± 1 C). At the end of this conditioning period, the two components shall be hand mixed for 5 minutes. The conditioned channels shall be removed from their respective conditoning chambers and both shall be filled, by spatula, with the mixed compound within 1 minute and strike off flush on open end. The filled channels shall then be returned to their respective conditioning



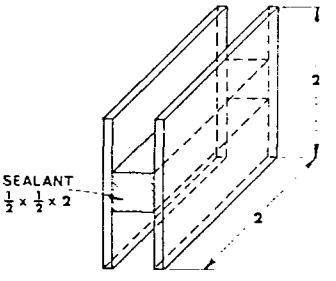
All dimensions in inches.

FIG. 3—Assembly for Testing Adhesive Strength to ¼-Inch Plate.



All dimensions in inches.

FIG. 4—Assembly for Testing Adhesive Strength to T-Sections.



All dimensions in inches.

FIG. 5—Assembly for Testing Adhesive Strength to Thin Plates.

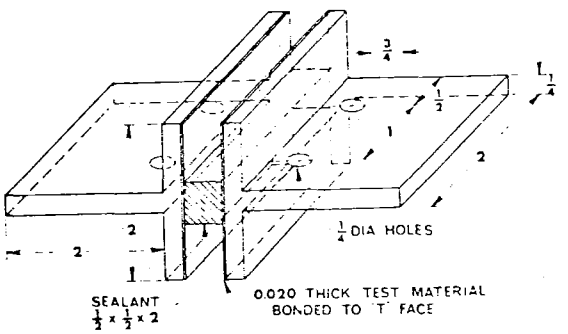
chambers, placing the long dimension of the channels vertically with their open ends downward. At the end of 1 hour the channels shall be inspected, and the sag of the compound at the bottom ends of the channels shall be measured.

7.3 Tests for Adhesive Strength in Tension

7.3.1 Test Surfaces. The compound shall be tested on aluminum alloy 6063 T5 or 6061 T6 (anodized a minimum of 20 minutes over any scale-free finish), mortar

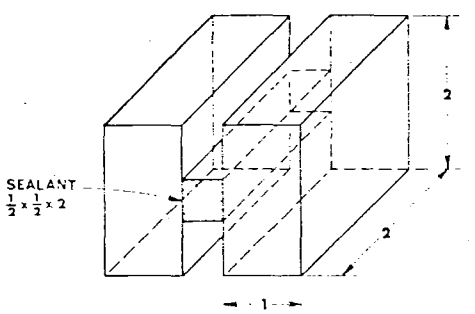
test blocks, and clear nontinted plate glass. Additional surfaces may be included by agreement between manufacturers and purchasers.

7.3.2 Construction of Test Assemblies. Six test assemblies shall be prepared for each test surface. These assemblies may be made (1) by using 2 by 2 by ¼ inch (5.1 by 5.1 by 0.64 centimeter) plates of test surface material such as clear non-tinted plate glass or aluminum (see Figure 3) or (2) by using 2 inch (5.1 centimeter) T-sections (see Figure 4) or (3) by using thinner 2 by 2 inch (5.1 by 5.1 centimeter) plates of the test surface



All dimensions in inches.

FIG. 6—Assembly for Testing Adhesive Strength on Surfaces Laminated to T-Sections.



All dimensions in inches.

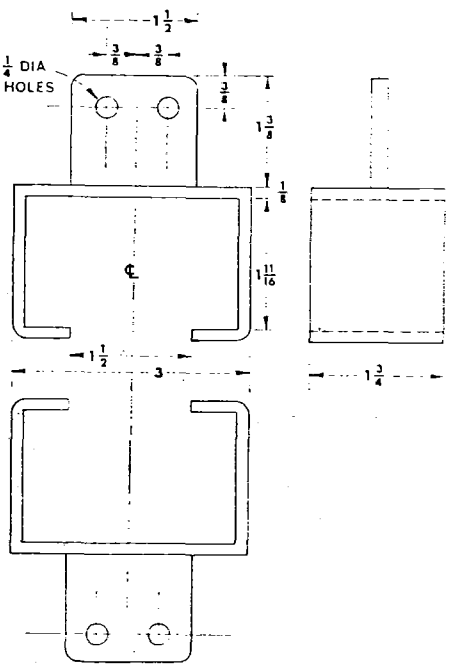
FIG. 7—Assembly for Testing Adhesive Strength to Concrete Blocks.

material, if it has sufficient rigidity to withstand deformation under testing, as in the case of stainless steel (see Figure 5) or (4) by using relatively thin 2 by 2-inch (5.1 by 5.1-centimeter) plates of the test material securely bonded to the 2 by 2-inch (5.1 by 5.1-centimeter) lengths of aluminum T-sections (see Figure 6) or (5) by using 2 by 2 by 1-inch (5.1 by 5.1 by 2.5-centimeter) mortar blocks as shown in Figure 7. Mortar test blocks shall be 2 by 2 by 1 inch thick (5.1 by 5.1 by 2.5 centimeter thick), and shall be prepared as prescribed in SS-R-406, method 223.11 (see 7.2), or in the Methods of Testing Concrete Joint Sealers (ASTM D 1191 – 52),[3] (see 6(*b*)), except that each block shall be surfaced by wet grinding on an iron lap with No. 60 silicon carbide or aluminum oxide abrasive grain. Blocks shall be cured a minimum of 28 days if standard portland cement is used, and for 7 days if high early cement is used.

7.3.2.1 Before constructing the test assemblies, test surfaces shall be cleaned and prepared as follows:

(a) **Clear Nontinted Plate Glass:** Clean with methyl-ethyl-ketone or similar solvent, followed by a thorough cleaning with a detergent solution and a final rinse with distilled or deionized water and air dried.

(b) **Aluminum:** Same preparation as clear nontinted glass plates.



All dimensions in inches.

FIG. 8—Jaws for Holding Assemblies Illustrated in Figs. 3, 5, and 7.

(c) Mortar Blocks: Condition the blocks for a minimum of 7 days at standard conditions after wet grinding operation described in 7.3.2. Brush test surfaces with a natural bristle brush.

(d) Other Materials: Clean and prepare as required by the sealant manufacturer's directions.

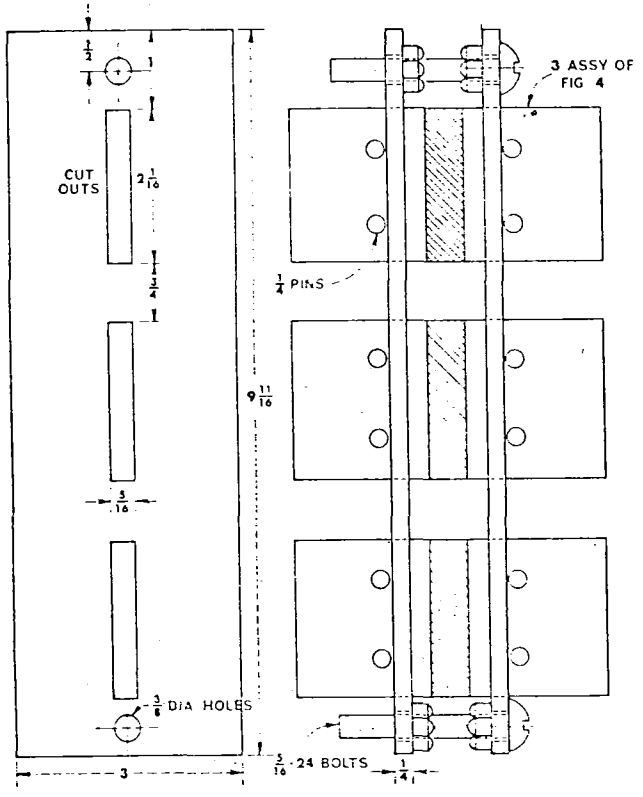
(e) **Special Cleaning:** Where special cleaning instructions are given by the sealant manufacturer for any substrate material, all test surfaces of such material shall be cleaned in that manner and so reported.

7.3.2.2 Test specimens shall be prepared by applying 8 ounces of properly conditioned and mixed compound in a ½ by ½ by 2-inch (1.3 by 1.3 by 5.1-centimeter) bead between the parallel 2 by 2-inch (5.1 by 5.1-centimeter) faces of test surfaces as illustrated in Figures 3

[3] *1967 Book of ASTM Standards*, Part 10.

through 7. Steel spacer bars ¾ by ½ by 2 inches (1.9 by 1.3 by 5.1 centimeters) long may be used to give the proper size of bead and paraffin or other non-migrating mold-release agent may be used to prevent adhesion to these spacer bars. Masking tape may be used to retain the compound and to hold the assembly together. The test assemblies shall be cured for 7 days at standard conditions before testing or further conditioning.

7.3.2.3 The specimens shall be scribed with a sharp knife or marking pencil along the lines where the sealant is in contact with the test surface, in order to record the original bonded area.



All dimensions in inches.

FIG. 9—Assembly for Testing Adhesive Strength at Low Temperatures.

7.3.3 Method of Testing. When a tensile tester is used to test the assembly made in accordance with either Figure 3, 5, or 7, the assembly shall be positioned in a set of jaws as illustrated in Figure 8, these jaws in turn being held by the jaws of the tensile tester. When a tensile tester is used to test the assembly made in accordance with either Figure 4 or 6, the assembly shall be gripped directly by the jaws of the tensile tester. For low temperature testing, the assembly as shown in Figure 9 may be used for testing assemblies prepared as shown in Figures 4 and 6. The specified rate of separation may be obtained by periodically adjusting the nuts. Other mechanical instruments such as described in TT-S-227C (GSA-FSS) are also suitable.

7.3.4 Testing Procedure.

7.3.4.1 Adhesive Strength After Heat Aging and Water Immersion. After 7 days cure at standard conditions three test assemblies for each of the test surfaces shall be heated for 7 days in a convection oven at 158 ± 1.8 F (70 ± 1 C) and shall then be conditioned for not less than 4 hours at standard conditions. These test assemblies shall then be immersed in 900 cc of distilled or deionized water per assembly for 4 days at standard temperature and shall then be immediately subjected to strain by placing each in the jaws of a tensile tester and pulling apart at a rate of 0.20 to 0.25 inch (0.5 to 0.64 centimeter) per minute and record force necessary for extention. The assembly shall be taken from the tensile tester and put into an assembly where it is held at 100 percent extension for 24 hours at standard conditions.

7.3.4.2 Adhesive Strength After Cycling at −15 F and 73.4 F. After 7 days cure at standard conditions, three test assemblies for each of the type of surfaces shall be placed in a suitable device for separating the parallel test surfaces. These devices and the contained test assemblies shall be placed in the cold box maintained at −15 ± 1.8 F (−26 ± 1 C) for not less than 4 hours. After this conditioning period, the test assemblies, still at −15 ± 1.8 F (−26 ± 1 C) shall be stretched at a rate of 1/32 inch (0.8 millimeter) every 3 minutes, until the compound has been extended 100 percent. The assemblies shall be maintained at this extension at a temperature of −15 ± 1.8 F (−26 ± 1 C) for 16 hours. The assemblies shall then be removed from the cold box, spacers removed, and the assembly allowed to stand, with all tensile stress removed at standard conditions for 4 hours. At the end of this time, they shall be compressed at the rate of ¼ inch (0.64 centimeter) per minute until they regain their original thickness, and shall then be allowed to relax for an additional 16 hours at standard conditions thus completing one test cycle. Each test assembly shall be subjected to a total of three such cycles.

7.3.4.3 Adhesive Strength After Sun Lamp Exposure Through Glass.

NOTE 3: This test is required only when the intended use of the sealant will be against clear nontinted glass.

Three test assemblies shall be prepared, each consisting of a ½ by ½ by 2-inch (1.3 by 1.3 by 5.1-centimeters) bead of properly prepared compound between a plate of aluminum 2 by 2 by ¼ inch (5.1 by 5.1 by 0.64 centimeter) on one side and a clear nontinted glass plate of the same dimensions on the other, as shown in Figure 3. Test surfaces shall be cleaned as specified in 7.3.2.

These assemblies shall be allowed to cure for 7 days at standard conditions. At the end of this cure period the glass side of each assembly shall be exposed to ultraviolet radiation from a General Electric RS Sunlamp (275 watts, 125 volts, 50 to 60 hertz) or equivalent. Air temperature at the surface of the test specimen shall be 150 F ± 5 (65 ± 2.8 C) during the exposure period. Exposure shall be for 96 continuous hours, at a distance of approximately 12 inches (30.5 centimeters) from the surface of the bulb and normal to the axis through the center of the light, with at least one corner of the glass on this axis. At the end of the exposure period, the test assemblies shall be immersed in 900 cubic centimeters of distilled or deionized water per assembly for 4 days at standard temperature, and then immediately subjected to strain by placing in the jaws of a tensile tester and pulling apart at the rate of 0.20 to 0.25 inches (0.51 to 0.64 centimeters) per minute until the compound has extended 100 percent.

7.4 Test for Adhesion in Peel.

7.4.1 Test Surfaces. The compound shall be tested on aluminum alloy 6063 T5 or 6061 T6 (anodized a minimum of 20 minutes over any scale-free finish), mortar test block, and clear nontinted plate glass. Additional surfaces may be included by agreement between manufacturers and purchasers.

7.4.2. Construction of Test Assemblies. Materials required are: (1) proper testing machine with tension grips capable of pulling at a rate of 2 inches (5.1 centimeters) per minute; (2) two 5 by 3-inch (12.7 by 7.6-centimeter) pieces of aluminum; (3) two 5 by 3-inch (12.7 by 7.6-centimeter) pieces of ¼ inch (0.64 centimeter) plate glass; (4) six 10 by 3-inch (25.4 by 7.6-centimeter) pieces of desized grade A airplane fabric 4.28 ounces per square yard (3.8 grams per square centimeter) 80/84 thread count (or other suitable fabric to prevent fabric adhesive loss); (5) two 5 by three inch (10.2 by 7.6 centimeter) mortar blocks of convenient thickness (see 7.3.2); (6) paper masking tape 1 inch (2.5 centimeters) wide.

7.4.2.1 Before constructing test assemblies, the test surfaces shall be cleaned and prepared as specified in 7.3.2.

7.4.2.2 A strip of 1-inch (2.5-centimeter) wide paper masking tape shall be placed across the width of the test surface at one end. Sealant that has been conditioned for at least 16 hours at standard conditions shall then be mixed in accordance with the manufacturer's recommendations and spread over the test surface and tap at a thickness of approximately ⅛ inch (0.32 centimeter). The cloth then shall be smeared at one end over an area of 3 by 3 inch (7.6 by 7.6 centimeters), the compound being forced into the cloth with a spatula. The impregnated cloth shall be laid over the layer of sealant compound without entrapping air. The assembly shall be rolled with a glass rod using proper spacers so that the thickness of the compound between the cloth and the test surface is approximately 1/16 inch (0.16 centimeter).

7.4.3 Testing Procedure. After preparation, the test specimens shall be allowed to cure at standard conditions for 7 days followed by an additional 7 days curing while completely immersed in distilled or deionized water at standard temperature. After the specimens have cured the first 2 days, the cloth shall be coated with a thin layer 1/32 inch (0.8 millimeter) or less of the mixed sample to protect the cloth from moisture and to minimize cloth adhesion failure after water immersion.

7.4.3.1 After 7 days curing in air and immediately prior to water immersion the surface of the fabric shall be cut through to the base surface with a sharp razor blade along the panels long axis leaving two 1-inch wide strips of sealant and fabric.

7.4.3.2 Immediately following the 14 days cure, the specimen shall be prepared for testing by wiping it dry, and releasing 1 inch (2.5 centimeters) of the cloth and masking tape from the base. Then the specimen shall be placed in the testing machine and the cloth and sealant shall be peeled back at an angle of 180 degrees. The rate of separation of the jaws of the machine shall be 2 inches (5.1 centimeters) per minute. The sealant shall be pulled for 1 inch (2.5 centimeters) and the average value in pounds (or kilograms) indicated by a dial or recording chart on the machine shall be noted. If the cloth peels from the sealant during testing, such values obtained shall be disregarded. In such instance, the compound shall be cut across with a sharp razor blade in order to get separation to the test surface.

7.4.3.3. Two assemblies shall be tested for each base material (aluminum, glass, etc.) and the average peel values recorded in pounds (or kilograms).

7.5 Test for Crazing. A test panel of aluminum (surface treated, if desired, to permit easy stripping) with a 4-inch (10-centimeter) square level patch of cured compound approximately ⅛ inch (0.32 centimeter) thick shall be exposed to a General Electric RS Sunlamp (275 watts, 125 volts, 50 to 60 hertz), or equivalent. The lamp manufacturer's instructions shall be followed for preconditioning lamp before use, and lamp shall not be used more than 200 hours for testing. The specimen shall be positioned perpendicular to the light rays at a distance of approximately 12 inches (30.5 centimeters) from the lamp. The air temperature at the surface of the test specimen shall be 150 ± 5 F (65 ± 2.8 C) during the exposure period. Exposure shall be for 96 continuous hours. The depth of crazing may be determined by slightly elongating the specimen and hand buffing the surface with an abrasive cloth (Fine Emery Cloth no.

112-B—Clover Co., Norwalk, Conn.) until all surface imperfections are buffed off. Thickness measurements before and after buffing shall determine the depth of crazing.

7.6 Test for Staining of Concrete and/or Masonry.

NOTE 4: This test is required only when the intended use of the sealant will be against concrete, masonry or other porous surfaces.

This test shall be conducted in accordance with ASTM C 510 – 65.[2]

7.7 Tests for Hardness.

7.7.1 Hardness at Standard Conditions. Accessory materials required are: (1) Shore A durometer; (2) brass frame with inside dimensions 5 by 1½ by ¼ inch (12.7 by 3.8 by 0.6 centimeters); (3) two aluminum plates 3 by 6 inch (7.6 by 15.2 centimeters) 0.024 to 0.060 inches (6 to 15 millimeters); (4) thin knife blade; (5) metal straight edge. The instrument used to measure hardness shall be a Shore A durometer.[4] All readings shall be taken by the instantaneous method using the standard load of 822 grams (1.8 pounds). The procedure shall be carried out at standard conditions. After conditioning at least 250 grams of base compound and the appropriate amount of curing agent for 16 hours at standard conditions, the components should be thoroughly hand mixed for 5 minutes. The frame, after being centered on the aluminum plate, shall be filled with a portion of the sample and struck off level with a spatula. The frame shall then be lifted off of the sealant after running a thin knife blade along the inside edge of the frame. Two such specimens shall be prepared and allowed to cure for 14 days at standard conditions. At the end of 14 days hardness, measurements shall be made with the durometer. Three readings shall be taken on each specimen and averaged.

7.7.2. Hardness After Heat Aging. Accessory materials required are: (1) Convection oven controlled at 180 ± 3.4 F (82 ± 2 C); (2) Shore A durometer; (3) brass frame with inside dimensions 3 by 5 by ⅜ inches thick (7.6 by 12.7 by 0.98 centimeters); (4) two aluminum plates 3 by 6 inches (7.6 by 15.2 centimeters) 0.024 to 0.060 inches (6 to 15 millimeters); (5) thin knife blade; (6) metal straight edge.

[4] A stand type with the constant load is desirable.

in 7.7.1, except that the thickness of the sealant layer shall be ⅜ inch (0.98 centimeter) instead of ¼ inch (0.64 centimeter). The specimens shall be allowed to cure for 7 days at standard conditions, followed by 7 days curing in an oven at 180 ± 3.4 F (82 ± 2 C). At the end of the oven curing period the specimens shall be allowed to cool for 3 hours at standard conditions. After cooling, an ⅛-inch (0.32-centimeter) layer of sealant shall be cut from the top surface of the specimen. Three hardness readings shall be taken on the newly exposed surface of each specimen and the six readings shall be averaged to determine the test value.

7.8 Test for Weight Loss after Heat Aging. Apparatus and materials required are: (1) Convection oven controlled at 180 ± 3.4 F (82 ± 2 C); (2) balance sensitive to 0.01 gram; (3) materials listed in 7.7.1.

7.8.1 After weighing the two aluminum plates to the nearest 0.01 gram, two specimens shall be prepared as described in 7.7.1 and a second weighing, to the nearest 0.1 gram made within 4 hours. They shall then be allowed to cure for 7 days at standard conditions, and then placed in a convection oven at 180 ± 3.4 F (82 ± 2 C) for an additional 7 days. Following the heat aging, the specimens shall be allowed to cool for 2 hours at standard conditions, and then weighed. The percentage weight loss of the sealant shall be calculated, and the average weight loss of the two samples shall be the accepted test value.

7.9 Recovery. After 7 days cure at standard conditions, three test assemblies on aluminum surfaces shall be placed in an oven at 120 ± 2 F (48.9 ± 1.1 C) for 3 days; then removed and conditioned for not less than 16 hours at standard conditions. After conditioning, they shall be placed in the jaws of a tensile tester and pulled apart at the rate of 0.20 to 0.25 inch (0.5 to 0.6 centimeter) per minute until extended 150 percent. The assemblies shall be held in the tester at this extension for 5 minutes; then shall be immediately removed and allowed to recover without compression by placing them edgewise on a glass surface with the long axis of the compound bead perpendicular to this surface. Recovery shall be calculated by the formula:

$$\text{Recovery, percent} = \frac{\text{width extended} - \text{width after recovery}}{\text{width extended} - \text{width initially}} \times 100$$