



Designation: C1635 – 22

Standard Test Method to Evaluate Adhesion/Cohesion Properties of a Sealant at Fixed Extension¹

This standard is issued under the fixed designation C1635; 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 test method describes a laboratory procedure for measuring the adhesion/cohesion properties of a sealant when subjected to tensile loads resulting from an applied specified strain. The adhesion/cohesion properties are evaluated before, during, and after water immersion.

1.2 This test method examines the adhesive and cohesive performance of a sealant on a specified substrate at a strain equivalent to a multiple of the strain/movement capability (Class in accordance with Specification C920) designated by the manufacturer for the given sealant in accordance with Specification C920.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 *Comparable Tests*—Other comparable tests are ISO 10590 and 8340.

1.5 *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.*

1.6 *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

C717 Terminology of Building Seals and Sealants

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.

C719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)

C920 Specification for Elastomeric Joint Sealants

C1375 Guide for Substrates Used in Testing Building Seals and Sealants

2.2 ISO Standards:³

ISO 8340 Building construction — Sealants — Determination of tensile properties at maintained extension

ISO 10590 Building construction — Sealants — Determination of tensile properties of sealants at maintained extension after immersion in water

3. Terminology

3.1 *Definitions*—Refer to Terminology C717 for definitions of terms used in this standard, including but not limited to the following: adhesive failure, casting spacers, cohesive failure, standard conditions.

3.2 *separators*—the device or item used to maintain the specimens at fixed extension.

4. Summary of Test Method

4.1 Test specimens made in accordance with dimensions set forth in Test Method C719 are fabricated and allowed to cure.

4.2 Test specimens are extended at standard conditions as defined in Terminology C717 to a specified strain and blocked at the strain for a specified period of time.

4.3 The test specimens are examined for adhesive or cohesive failure, or both, of the sealant at 0, 24 and 168 h.

4.4 A duplicate set of three test specimens are cured at standard conditions as defined in Terminology C717, extended to a specified strain, and then immersed (totally) in deionized water or specified medium (3 specimens/liter of liquid).

4.5 Immersed test specimens are observed at 0, 24 and 168 and other additional specified hours.

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.

4.6 This test method uses ASTM standard substrates as described in Guide C1375. This test method does not exclude the use of any other substrate that provides a suitable flat surface.

5. Significance and Use

5.1 In any sealant application, the sealant must be capable of maintaining an adhesive bond to the substrate when held in strain for its intended service life.

5.2 This test method is an indicator of a sealant's ability to adhere under strain to a given substrate.

5.3 The default test strain is the movement ability (Class in accordance with Specification C920) of the sealant as designated by the manufacturer. The default joint configuration is 12.7 mm by 12.7 mm by 50.8 mm (½ in. by ½ in. by 2 in.). Other strains and joint configurations may be used and reported as noted in Section 8 and Table 1.

6. Apparatus and Materials

6.1 *Container*, for immersion; made of a material compatible with the immersion medium.

6.2 *Device*, to provide a strain on the test specimen.

6.3 *Spatulas*, for use in applying the sealant.

6.4 *Caulking Gun*, for extruding sealant from cartridges when applicable.

6.5 *Substrates*—Twelve substrates minimum of 25.4 mm by 76.2 mm (1 in. by 3 in.) of the same finish or type are required for each test sample. Substrates must be of sufficient thickness or rigidity, or both, so as not to bend or distort under the imposed strain.

6.6 *Casting Spacers*, made from polytetrafluoroethylene (PTFE) or a suitable rigid material shall be used with each test specimen to which the test sealant will not bond and will provide the appropriate joint dimensions and configurations.

6.7 *Substrate Cleaning Materials*:

6.8 *Primer*, (if needed).

6.9 *Separators*, to provide a constant strain on the specimen whilst maintaining parallel bond surfaces.

6.10 *Deionized Water*, or other specified liquid medium for immersion

6.11 *Suitable Probe Type Measuring Device*, capable of measuring defects in the sealant to 1 mm (1/32 in.)

7. Procedure

7.1 *Preparation of Test Specimens*. Six test specimens.

7.1.1 Clean the substrates in accordance with the procedures set forth in Test Method C719 and Guide C1375.

7.1.2 *Primers*—Where use of primer is recommended by the sealant manufacturer, substrate materials shall be primed with the recommended primer or primers.

7.1.3 Apply a bead of sealant 12.7 mm by 12.7 mm by 50.8 mm (½ in. by ½ in. by 2 in.) between parallel 25.4 mm by 76.2 mm (1 in. by 3 in.) substrates (or of other desired dimensions and noted in the report). Use appropriate casting spacers to form the properly sized sealant geometry. Use adhesive tape, rubber bands, or clamps to hold the test assembly together before and after filling it with the sealant. In the case of a pourable-type sealant, use masking or any other suitable tape to retain the sealant. Apply masking tape on the top surface of substrates to prevent any sealant oversmear from curing on the top surface. Remove the tape immediately after filling the specimen joint cavity.

7.2 *Curing Method*:

7.2.1 Cure specimens under one of the following cycles:

7.2.1.1 *Standard Conditions*—As defined in Terminology C717 for a minimum of 21 days.

7.2.1.2 Alternately, cure for a total of 21 days as follows: (a) 7 days at standard conditions; (b) 7 days at 38 °C ± 2 °C (100 °F ± 3.6 °F) and 95 % relative humidity; (c) 7 days at standard conditions.

7.2.1.3 The sealant manufacturer may request conditions other than those specified above provided the temperature does not exceed 50 °C (122°F).

7.2.2 Remove the casting spacers from the specimens after curing.

7.3 Extend all specimens until the separation between the substrates provides the desired strain. Apply this strain at a minimum of 3 mm/h (1/8 in./h).

7.4 When the specimens have reached their specified extension, block the specimens with the appropriate separator and remove from the extension device/machine. Do not remove separators for the duration of test.

7.5 Place three test specimens in water (minimum of 0.33 L (0.09 gal) per specimen) at a specified temperature with the default being 23 °C ± 2 °C (73 °F ± 4 °F). Ensure that the test specimens are fully immersed.

7.6 Leave three test specimens at standard conditions.

7.7 Unless otherwise specified, record the length and width of the adhesive and cohesive defects at 0, 24 and 168 h after reaching the target strain at the standard conditions and water immersed conditions.

TABLE 1 Suggested Strains for a 12.7 mm (0.50 in.) Wide Sealant Joint.

Sealant Movement Class	Distance between substrates at 1× movement rating	Distance between substrates at 1.5× movement rating	Distance between substrates at 2× movement rating	Distance between substrates at 4× movement rating
12.5 %	14.3 mm (0.56 in.)	14.5 mm (0.57 in.)	15.9 mm (0.63 in.)	19.0 mm (0.75 in.)
25 %	15.9 mm (0.63 in.)	17.5 mm (0.69 in.)	19.0 mm (0.75 in.)	25.4 mm (1 in.)
35 %	17 mm (0.67 in.)	19.4 mm (0.76 in.)	21.6 mm (0.85 in.)	30.5 mm (1.2 in.)
50 %	19.0 mm (0.75 in.)	22.2 mm (0.88 in.)	25.4 mm (1 in.)	38.1 mm (1.5 in.)
100 %	25.4 mm (1 in.)	31.8 mm (1.25 in.)	38.1 mm (1.5 in.)	63.5 mm (2.5 in.)