



Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants¹

This standard is issued under the fixed designation C 639; 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 describes a laboratory procedure for the determination of rheological (flow) properties of single- and multicomponent chemically curing sealants for use in building construction.

1.2 Other suitable flow characteristics may be agreed upon between the seller and purchaser or specifier. Special nonsag properties and lower flow characteristics may be required for use in sloping joints where absolute leveling is not desired.

NOTE 1—The sealants are supplied in various rheological properties ranging from pourable fluids to stiff nonsagging pastes. Multicomponent sealants are supplied as a base component with an activator or curing agent separately packaged. After mixing the multiple parts, the sealant is ready for application. Single-component sealants are supplied ready for use upon opening of the package and usually depend on the external environment for cure.

1.3 This test method describes four types of joint sealants:

1.3.1 *Type I*—Single-component flowable or self-leveling,

1.3.2 *Type II*—Single-component nonsag,

1.3.3 *Type III*—Multicomponent flowable or self-leveling, and

1.3.4 *Type IV*—Multicomponent nonsag.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *This standard does not purport to address the safety problems 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:*

C 717 Terminology of Building Seals and Sealants²

¹ This test method is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.20 on General Test Methods.

Current edition approved June 10, 2001. Published July 2001. Originally published as C 639 – 69. Last previous edition C 639 – 95.

² *Annual Book of ASTM Standards*, Vol 04.07.

3. Terminology

3.1 *Definitions*—Refer to Terminology C 717, Section 4.1, for definitions of the following terms used in this standard: chemically curing sealants, compound, elastomeric, flow (slump), non-sag sealant (non-slump), sealant, self-leveling sealant (flowable).

4. Comparison to Other Standards

4.1 ISO 7390:1987 Building Construction-Jointing Products-Determination of Resistance to Flow

5. Significance and Use

5.1 The results obtained from this test method are simply a measure of the degree of horizontal or vertical flow of single-component or multi-component sealants when applied to a set joint configuration at two pre-determined temperatures. Only samples conditioned at the same temperature may be directly compared.

6. Apparatus

6.1 *Refrigerator*, controlled at $4.4 \pm 2^\circ\text{C}$ ($40 \pm 3.6^\circ\text{F}$).

6.2 *Oven*, convention-type, controlled at $50 \pm 2^\circ\text{C}$ ($122 \pm 3.6^\circ\text{F}$).

6.3 *Channel*, one, stainless steel (Type 304, No. 2-B finish, No. 16 gage), inside dimensions 19 mm wide, 13 mm deep, 152 mm long ($\frac{3}{4}$ by $\frac{1}{2}$ by 6 in.), and closed at both ends (see Fig. 1a).

6.4 *Channels*, two, stainless steel (Type 304, No. 2-B finish, No. 16 gage), inside dimensions 19 mm wide, 13 mm deep, 152 mm long ($\frac{3}{4}$ by $\frac{1}{2}$ by 6 in.) with both ends open and the back surface extended 51 mm (2 in.) (see Fig. 1b).

7. Standard Test Conditions

7.1 Unless otherwise specified, standard conditions shall be $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and $50 \pm 5\%$ relative humidity.

8. Procedures

8.1 *Test for Type I Sealants:*

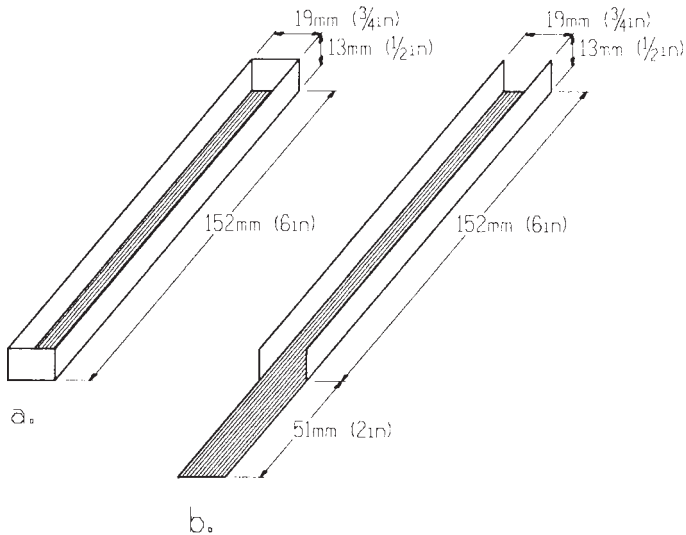


FIG. 1 Channels Used for Determining Rheological Properties; (a) for Self-Leveling or Flow-Type Compound; (b) for Nonsag-Type Compound

8.1.1 Clean the closed-end channel (Fig. 1a) 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 then air dry.

8.1.2 Before preparing the test assembly, condition at least 100 g of the compound under test in the unopened container for at least 16 h at standard conditions. Then condition the compound for 16 to 24 h and the channel for 2 h in a refrigerator held at $4.4 \pm 2^\circ\text{C}$ ($40 \pm 3.6^\circ\text{F}$). At the end of the conditioning periods, pour the compound into the conditioned channel held horizontally at the latter temperature and maintain the test specimen at this temperature for 4 h. At the end of this period, examine the compound for flow properties.

8.2 Tests for Type II Sealants:

8.2.1 *Vertical Slump*—Before preparing the test assemblies, condition the compound at standard conditions as described in 8.1.2. Expose the two channels with open ends (Fig. 1b), cleaned as indicated in 8.1.1, for 2 h, one at $4.4 \pm 2^\circ\text{C}$ ($40 \pm 3.6^\circ\text{F}$) and the other at $50 \pm 2^\circ\text{C}$ ($122 \pm 3.6^\circ\text{F}$). At the end of this conditioning period, remove the channels from the respective chambers and fill them with compound within 10 min. The channels may be filled with the aid of a spatula and shall be trimmed so that the sealant is flush with the face and ends of the channels. Return the filled channels to their respective chambers, placing them in a vertical position, with the 51-mm (2-in.) extension at the bottom for 4 h. At the end of this period remove the channels from the chambers and measure, to the nearest 1.5 mm ($1/16$ in.), the distance that the bottom edge of sealant moves downward along the 51-mm extended back surface. This distance is the sag of the compound.

8.2.2 *Horizontal Slump*—Repeat the procedure described in 8.2.1 with the following change: after filling the channels, return them to their respective chambers, placing them in a horizontal position resting on the 13-mm ($1/2$ -in.) side. At the

end of the exposure period, remove the channels from the chambers and note any change in the configuration of the compound in the channels.

8.3 *Test for Type III Sealants*—The test procedure shall be the same as that described in 8.1 with the following exception: After conditioning the base and curing agent separately for 16 to 24 h and the channel for 2 h in the refrigerator, remove and hand mix them for at least 5 min. Return the mixed compound to the cold box for an additional 30 min. Then pour the compound into the horizontal channel and proceed as described in 8.1.2. Examine the compound for flow properties.

8.4 Tests for Type IV Sealants:

8.4.1 *Vertical Slump*—Test as in 8.2.1 with the following exception: Immediately before removing the conditioned channels from the refrigerator and oven, hand mix at least 200 g of the base compound and the appropriate amount of curing agent for 5 min. Fill the channels within 10 min (or longer if specified by the manufacturer) and proceed as in 8.2. At the end of the test, measure the sag to the nearest 1.5 mm ($1/16$ in.).

8.4.2 *Horizontal Slump*—Follow the procedure described in 8.4.1 with the change indicated in 8.2.2.

9. Report

9.1 Report the following information:

9.1.1 Name or other identification of the sealant.

9.1.2 *Flow Test*:

9.1.2.1 Whether Type I or III sealant was used,

9.1.2.2 Whether the compound self-leveled in channel, and

9.1.2.3 Any other surface conditions such as bubbling.

9.1.3 *Sag Test*:

9.1.3.1 Whether Type II or Type IV sealant was used,

9.1.3.2 Amount of sag of the compound when placed in the vertical position, to the nearest 1.5 mm ($1/16$ in.), and

9.1.3.3 Any change in the configuration of the compound when placed in the horizontal position.

9.1.4 *Variations in Test Method*—Any variation from the specified test procedure.

NOTE 2—Unusual application conditions or use of heat applied sealants may require variation in testing time or temperature. There also may be necessary variations in positioning of channels other than strictly horizontal or vertical. These may be determined by agreement and reported accordingly under 9.1.4.

10. Precision and Bias ³

10.1 The statistics for this test method are based on four materials tested once in two laboratories. This does not make rigorous statistical treatment possible, but approximations can be made. The conclusions is that at 95 % confidence, a variation of no more than 6.35 mm (0.25 in.) should occur.

11. Keywords

11.1 flow; rheology; sag

³ Supporting data are available from ASTM Headquarters. Request RR: C 24 – 1011.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).