Designation: C1183/C1183M – 13

Standard Test Method for Extrusion Rate of Elastomeric Sealants[1]

This standard is issued under the fixed designation C1183/C1183M; 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 covers two laboratory procedures for determining the extrusion rate of elastomeric sealants for use in building construction.

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 non-conformance with the standard.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 There is no known ISO equivalent to this test method.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C717 Terminology of Building Seals and Sealants

D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products

D2452 Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds

3. Terminology

3.1 *Definitions*—See Terminology C717 for applicable definitions of the following terms: caulking, compound, elastomeric and nonsag sealant, sealant, latex sealant.

4. Significance and Use

4.1 Sealants are supplied with various rheological properties ranging from pourable liquids to nonsagging pastes. Single-component sealants are supplied ready for use upon opening the container. Multicomponent sealants are supplied as a base component(s) and a curing agent separately packaged. After mixing the two or more parts, the sealant is ready for application. This test method is intended to provide a means to measure the extrusion rate spanning the range of rheological properties.

4.2 This test method also covers the option of measuring the freeze-thaw and heat stability of such sealants.

4.3 This test method provides for an option of either a metal or plastic nozzle. It is intended that the metal nozzle be used when greater precision is required, such as in ASTM specifications. The plastic nozzle may be used for general screening of sealant properties or for developmental purposes when a large number of test specimens are being tested.

4.4 This test method measures the volume of sealant extruded over a given period of time at a given pressure (kPa or psi).

5. Apparatus

5.1 *High Density Polyethylene Cartridge,* with plunger and cap, 177 mL [6 fluid oz] capacity, with the front end having an inside diameter of 13.7 ± 0.05 mm [0.540 ± 0.002 in.].

5.2 *Nozzle.*

5.2.1 *Metal Nozzle,* threaded to fit threaded end of polyethylene cartridge with the dimensions given in Fig. 1.

5.2.2 *Polyethylene Cartridge Nozzle,* 64 mm [2 ½ in.] in length with 3–mm [⅛ –in.] orifice

5.3 *Air Supply,* to provide 280 ± 7 kPa [40 ± 1 psi] pressure with appropriate fittings and air lines to attach to an air powered gun for convenience of use.

5.4 *Caulking Gun,* 177 mL [6 fluid oz] capacity, air powered.

5.5 *Freezer,* capable of maintaining −17 ± 1°C [0 ± 2°F].

5.6 *Circulating Air Oven,* capable of maintaining 50 ± 1°C [122 ± 2°F].

5.7 *Time Device,* a clock or stop-watch graduated in seconds.

5.8 *Small Container,* can, cup, and so forth, as receiver for extruded sealant.

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[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.

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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.

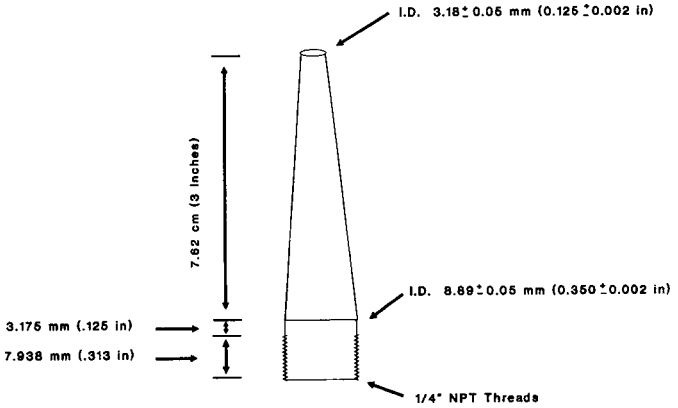

FIG. 1 Metal Nozzle Dimensions

5.9 *Balance,* accurate to ±0.1 g [0.035 oz].

5.10 *Pycnometer,* or suitable apparatus to obtain a specific gravity.

5.11 *Thermometer.*

5.12 *Spatula.*

6. Test Conditions

6.1 Unless otherwise specified by those authorizing the tests, standard conditions as defined by Terminology C717 shall be used.

7. Procedure A

7.1 Condition the unopened container of sealant for at least 16 h at standard conditions.

7.2 Determine the specific gravity of the sealant as described in Test Methods D2452 or D1475, or use another scientifically correct technique. For multiple component systems, mix 100 g sealant [4 oz] with the proper amount of curing agent.

NOTE 1—Curing times and conditions for multicomponent mixed compounds may vary. Therefore, the length of time between mixing the components and testing the extrusion rate may vary. Record the time from mix completion to the start of the extrusion test.

7.3 For multiple component sealants, mix 400 g [14.1 oz] sealant with the proper amount of curing agent. Follow the mixing directions as recommended by the manufacturer.

7.4 Place a sufficient amount of sealant into the polyethylene cartridge to fill it completely with the plunger in place, and level with the back of the cartridge.

NOTE 2—The cartridge filling is most easily accomplished by extruding the sealant into the test cartridge through the nozzle end. Avoid any air entrapment as this will significantly affect the accuracy of the results.

7.5 Attach the nozzle to the cartridge; connect the air supply and immediately extrude a small amount of material to completely fill the nozzle. Wipe off the end of the nozzle with a paper towel.

7.6 Extrude the sealant at 280 ± 7 kPa [40 ± 1 psi] pressure into the preweighed container (nearest 0.1 g) for 60 s. Make sure all of the material that has exited the end of the nozzle is in the container.

7.7 Weigh the container to the nearest 0.1 g and subtract the initial weight, to obtain the weight of the extruded sealant. Convert the weight of the sealant to volume of sealant by dividing the weight by the specific gravity. If all the material is extruded in less than 60 s, note the length of time required and calculate the volume of sealant that would have been extruded in 60 s as follows:

$$\frac{\text{Number of grams}}{\text{Number of seconds}} \times \frac{60 \text{ seconds}}{1 \text{ minute}}$$

$$\times \frac{1}{\text{specific gravity}} = \frac{\text{Number of milliliters}}{\text{minutes}}$$

8. Procedure B

8.1 Subject the sealant in its original container to 5 freeze-thaw cycles, each cycle consisting of 16 h at −17 ± 1°C [0 ± 2°F] and 8 h at 23 ± 1°C [73.4 ± 2°F], followed by 7 days at 50 ± 1°C [122 ± 2°F].

8.2 Condition the sealant which is still in its original container, for a minimum of 5 days at standard conditions.

8.3 Condition the polyethylene cartridge for a minimum of 16 h at the same conditions as specified in 8.2.

8.4 Place a sufficient amount of sealant into the polyethylene cartridge to fill it completely with the plunger in place, and level with the back of the cartridge.

8.5 Attach the nozzle to the cartridge; connect the air supply and immediately extrude a small amount of material to completely fill the nozzle. Wipe off the end of the nozzle with a paper towel.

8.6 Extrude the sealant at 280 ± 7 kPa [40 ± 1 psi] pressure into the preweighed container (nearest 0.1 g). Make sure all of the material that has exited the end of the nozzle is in the container. Record the elapsed time to extrude the sealant.

8.7 Weigh the container to the nearest 0.1 g and subtract the initial weight, to obtain the weight of the extruded sealant.

8.8 Calculate the number of grams per second extruded.

NOTE 3—The cartridge filling is most easily accomplished by extruding the sealant into the test cartridge through the nozzle end. Avoid any air entrapment as this will significantly affect the accuracy of the results.

9. Report

9.1 The report on the extrusion rate of sealants shall include the following information:

9.1.1 The trade name and other identification of the sealant,

9.1.2 The procedure used,

9.1.3 The specific gravity of the sealant,

9.1.4 The temperature of the sealant, if the sealant was multicomponent,

9.1.5 *Procedure A*—The number of mL (rounded to the nearest 0.1) extruded in 60 s, reported mL/min.

9.1.6 *Procedure B*—The number of grams per second extruded.

9.1.7 The type of nozzle used.

9.1.8 Any variations, specified or otherwise, from the above described test method, including heating of sealant or varying the length of the curing period or temperature and humidity conditions.

9.1.9 For multiple component sealants, describe the mixing system, the time taken to mix and the time from mix completion to the start of the extrusion test.

10. Precision and Bias[3]

10.1 *Precision:*

10.1.1 Round-robin testing of 5 single component sealants by six laboratories, using aluminum nozzles, indicates the precision between laboratories is 60 % of the test result (two standard deviations). Precision within a laboratory is estimated at 10 % of the test result (two standard deviations). See Table 1.

10.1.2 The precision of this test for multiple component sealants is not known and is subject to time of mixing, mixing technique and equipment, temperature rise caused by mixing, and elapsed time from mix completion to extrusion. See Table 1.

TABLE 1 Precision Summary—Extrusion Rate of Elastomeric Sealants

Material	Average Value	Repeat-ability	Between Lab	Percent Within	Percent Between	Precision Between
A	27.201	0.884	7.260	3.249	26.691	7.314
B	44.589	2.036	13.802	4.566	30.953	13.951
D	49.989	0.994	14.496	1.989	28.999	14.530
C	73.071	2.718	21.283	3.721	29.126	21.456
E	83.089	5.942	20.679	7.152	24.887	21.516
One Standard Deviation				4.135	28.131	

10.2 *Bias*—There is no statement on bias at this time.

11. Keywords

11.1 elastomeric sealant; extrusion rate; extrudability; freeze-thaw stability; latex sealant; sealant

[3] Supporting data are available from ASTM International Headquarters. Request RR:C24-1010 and 1016.