



Standard Test Method for Extrusion Rate of Elastomeric Sealants¹

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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 states in metric units are to be regarded as the standard. The values in parentheses are for information only.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 717 Terminology of Building Seals and Sealants²

D 1475 Test Method for Density of Liquid Coatings, Inks and Related Products³

D 2452 Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds²

3. Terminology

3.1 *Definitions*—See Terminology C 717 for applicable definitions of the following terms: caulking, compound, elastomeric and nonsag sealant, 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 measures the volume of sealant extruded in 1 min at a given pressure (kPa or psi).

5. Classification of Sealants

5.1 The sealant shall be classified by type as follows:

5.1.1 *Type S*—single-component sealant, and

5.1.2 *Type M*—multi-component sealant.

6. Apparatus

6.1 *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.).

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

6.3 *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.

6.4 *Caulking Gun*, 177 mL (6 fluid oz) capacity, air powered.

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

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

6.7 *Balance*, accurate to ± 0.1 g (0.035 oz).

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

6.9 *Thermometer*.

6.10 *Spatula*.

7. Test Conditions

7.1 Unless otherwise specified by those authorizing the tests, standard conditions for all tests are $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and $50 \pm 5\%$ relative humidity.

8. Procedure

8.1 *Type S (Single-Component)*

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

8.1.2 Determine the specific gravity of the sealant as described in Test Method D 2452 or D 1475, or use another scientifically correct technique.

8.1.3 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 1—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.

¹ This test method is under the jurisdiction of ASTM Committee C-24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.20 on General Test Methods.

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

³ *Annual Book of ASTM Standards*, Vol 06.01.

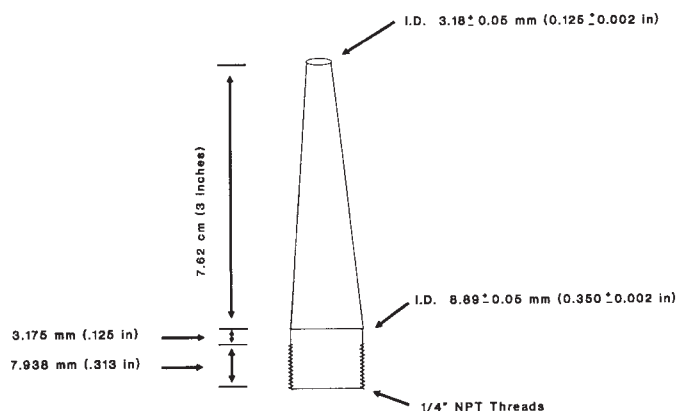


FIG. 1 Metal Nozzle Dimensions

8.1.4 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.

8.1.5 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.

8.1.6 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:

$$\frac{\text{Number of grams}}{\text{Number of seconds}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} \times \frac{1}{\text{specific gravity}} = \frac{\text{Number of milliliters}}{\text{minutes}}$$

8.2 Type M (Multi-Component)

8.2.1 Condition the unopened containers for at least 16 h at standard conditions.

8.2.2 Mix 100 g (3.53 oz) of the sealant with the proper amount of curing agent and determine the specific gravity as described in Test Method D 2452 or D 1475 or use another scientifically correct technique.

8.2.3 Mix 400 g (14.12 oz) of the sealant with the proper amount of curing agent, follow the mixing directions as recommended by the manufacturer.

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

8.2.5 Within 30 min, attach the nozzle to the cartridge, connect the air supply and immediately follow the procedures described in 8.1. Measure the temperature of the sealant immediately after weighing. Calculate the extrusion rate in mL/min.

NOTE 2—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.

9. Report

9.1 The report on the extrusion rate of Type S (single-component), or Type M (multicomponent) sealants shall include the following information:

9.1.1 The trade name and other identification of the sealant,

9.1.2 The sealant type,

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

9.1.6 Any variations, specified or otherwise, from the above described test method, including heating of sealant if so required (Type S) or varying the length of the curing period or temperature and humidity conditions (Type M),

9.1.7 For Type M 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 ⁴

10.1 Precision:

10.1.1 Round-robin testing of 5 Type S 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.

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	

10.1.2 The precision of this test for Type M 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.

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

11. Keywords

11.1 elastomeric sealant; extrusion rate

⁴ Supporting data are available from ASTM Headquarters, 1916 Race St., Philadelphia, PA 19103. Request RR:C24-1010 and 1016.



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