Designation: ~~C1536 – 10~~ C1536 – 18

Standard Test Method for Measuring the Yield for Aerosol Foam Sealants[1]

This standard is issued under the fixed designation C1536; 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 determines the quantity of linear units of a foam sealant ~~having~~at a specified bead diameter that may be obtained from ~~a single can of aerosol product. Four (4) cans~~ each container of an aerosol product. A minimum of four (4) representative containers of the aerosol product are required for ~~each product~~ this determination.

1.2 The test method is intended to estimate the contents of the aerosol container (*1*) for purposes of label statements, and (*2*) to provide the user information needed to estimate job requirements.

1.3 Foam sealants are used for a variety of end-use applications but are primarily intended to reduce air movement in the building envelope.

1.4 Currently, two main foam sealant types are applicable to this standard: single component polyurethane and latex.

~~1.5 There is no other known standard test method to measure aerosol foam sealant yield.~~

1.5 Values are reported in SI units only. ~~Certain apparatus and supply items are referenced in inch-pound units for purchasing purposes.~~

1.6 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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

C1620 Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *empty aerosol ~~can~~container (of foam sealant)*—~~the time~~An aerosol container that has reached the point at which the ~~product flow of the foam sealant is less than 2.0 linear cm or 1.0 g of~~ foam sealant can be no longer dispensed at a minimum rate of 1.0 g or 2.0 linear cm continuous foam bead ~~during~~within two continuous ~~seconds of dispensing.~~seconds.

3.1.2 *symbols*—letter symbols are used to represent physical measurements and are defined in Table 1 and Table 2.

3.1.3 *yield*—the yield for an aerosol ~~can of~~ foam sealant product is the quantity of linear unit (meter) at a specified nominal diameter of cured foam bead that ~~is dispensed~~ may be obtained from a full ~~can as defined by~~ container. It is determined by following this test method.

4. Summary of Test Method

4.1 Unless otherwise stated, *Standard Condition* shall be used.

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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 C24.61 on Aerosol Foam Sealants.

Current edition approved ~~June 1, 2010~~Sept. 15, 2018. Published ~~August 2010~~November 2018. Originally approved in 2002. Last previous edition approved in ~~2003~~2010 as C1536~~–03.~~–10. DOI: ~~10.1520/C1536-10.~~10.1520/C1536-18.

[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.

TABLE 1 Data Acquisition and Calculation Form for Foam Yield Measurement Procedure A

Sample Description		Symbol
~~Canister~~	~~Avg. initial weight (g)~~	~~$A = (A_1 + A_2)/2$~~
Container	Avg. initial weight (g)	$A = (A_1 + A_2)/2$
	Avg. weight after discharge (g)	$B = (B_1 + B_2)/2$
	Avg. max discharged weight (g)	$A - B$
Specimen Preparation	Temperature (°C)	. . .
	Relative humidity (%)	. . .
	~~Can's starting weight (g)~~	~~$E = (E_1 + E_2)/2$~~
	Container's starting weight (g)	$E = (E_1 + E_2)/2$
	~~Can's finishing weight (g)~~	~~$F = (F_1 + F_2)/2$~~
	Container's finishing weight (g)	$F = (F_1 + F_2)/2$
	Amount of discharged product for 10 beads (g)	$E - F$
~~Results~~	~~Total dischargeable volume of cured beads measured by water displacement (mL)~~	~~$H = \sum_{n=1}^{10} \frac{P_n}{\rho_{water}} = \sum_{n=1}^{10} \frac{P_n}{1.0 g/cc}$~~
Results	Total volume of 10 cured bead specimens determined by water displacement (mL)	$H = \sum_{n=1}^{10} \frac{P_n}{\rho_{water}} = \sum_{n=1}^{10} \frac{P_n}{1.0 g/cc}$
	~~Yield (Y) based on linear metres of 1.0 cm bead per can~~	~~$Y = \frac{H(A-B)}{2(E-F)} \cdot \left(\frac{1}{78.5}\right)^A$~~
	Linear yield (meter) per container at 2.0 cm bead diameter	$Y = \frac{H(A-B)}{100\,\pi(E-F)}$
	~~Total can Linear Yield (Y) in meters based on actual post cured *bead* diameter other than 1.0 cm, dispensed per can.~~	~~$Y = \frac{H(A-B)}{2(E-F)} \cdot \left(\frac{1}{25\pi D^2}\right)$~~
	Linear yield (meter) per container based on cured bead diameter, *D*, other than 2.0 cm.	$Y = \frac{H(A-B)}{25\,\pi D^2(E-F)}$

~~[A] 78.5 is the factor to convert volume (cm^3) to linear meter of 1 cm diameter bead.~~

TABLE 2 Data Acquisition and Calculation Form for Foam Yield Measurement Procedure B

Sample Description		Symbol
~~Canister~~	~~Avg. initial weight (g)~~	~~$A = (A_1 + A_2)/2$~~
Container	Avg. initial weight (g)	$A = (A_1 + A_2)/2$
	Avg. weight after discharge (g)	$B = (B_1 + B_2)/2$
	Avg. max discharged weight (g)	$A - B$
Specimen Preparation	Temperature (°C)	. . .
	Relative humidity (%)	. . .
	~~Can's starting weight (g)~~	~~$E = (E_1 + E_2)/2$~~
	Container's starting weight (g)	$E = (E_1 + E_2)/2$
	~~Can's finishing weight (g)~~	~~$F = (F_1 + F_2)/2$~~
	Container's finishing weight (g)	$F = (F_1 + F_2)/2$
	Amount of discharged product for 10 beads (g)	$E - F$
	~~Total volume of cured beads measured and calculated by $\pi \cdot r^2 \cdot L$ (cm^3)[A]~~	~~H~~
	Total volume of 10 cured bead-specimens determined by adding up volume of each bead measured and calculated by $\pi \cdot r^2 \cdot L$ (cm^3)	H
~~Results~~	~~Total dischargeable volume foam per can (cm^3)~~	~~$V = \frac{H(A-B)}{2(E-F)}$~~
Results	Total dischargeable volume foam per can (cm^3)	$V = \frac{H(A-B)}{(E-F)}$
	~~Total Linear Yield (Y) based on 1.0 cm diameter bead per can~~	~~$Y = \frac{H(A-B)}{2(E-F)} \cdot \left(\frac{1}{78.5}\right)$~~
	Linear yield (meter) per container at 2.0 cm diameter	$Y = \frac{H(A-B)}{100\,\pi\,(E-F)}$
	~~Total can Linear Yield (Y) in meters based on actual post *cured* bead diameter other than 1.0 cm dispensed per can.~~	~~$Y = \frac{H(A-B)}{2(E-F)} \cdot \left(\frac{1}{25\pi D^2}\right)$~~
	Linear yield (meter) per container at cured bead diameter, *D*, other than 2.0 cm.	$Y = \frac{H(A-B)}{25\,\pi\,D^2(E-F)}$

~~[A] 78.5 is the factor to convert volume (cm^3) to linear meter of 1.0 cm diameter bead.~~

4.2 *Procedure A*—Suitable for ~~foams~~ aerosol foam sealant that can be measured by water displacement (intended only for polyurethane foams).

4.2.1 The middle of the aerosol ~~can's~~container's contents is ~~dispensed~~ used for dispensing bead specimens at specified bead ~~size segments.~~size.

4.2.2 The dispensed foam volume is determined by submerging the foam bead ~~segments~~specimens in water and measuring the ~~weight of the displaced water.~~ buoyancy.

4.2.3 The yield ~~(defined as the total bead length of a specified nominal bead diameter of cured foam per can)~~ is calculated from the measured foam specimen's volume.

4.3 *Procedure B*—Suitable only for foam sealants that cannot be measured by water displacement (Intended only for latex foams).

4.3.1 The middle of the container's contents is ~~dispensed as a specified bead size segments.~~used for dispensing bead specimens at specified bead size.

4.3.2 The volume of the foam bead is directly measured from the dried or cured foam bead ~~segments by direct measurement.~~ specimens. Yield is calculated from these measurements.

NOTE 1—Procedure A uses tap water (see 11.10) to which 4.2 g of Dioctyl Sodium Sulfosuccinate (70 % solids) and 1.2 g of SAG 10 defoamer per 4 ~~litres~~liters may be added as wetting agent/defoamer blend. This avoids false readings if air bubbles become a problem. The water is maintained at 23 ± 2°C during the submersion part of the test. It is permissible for a single batch of water to be used up to 48 h.

5. Significance and Use

5.1 The yield measurement of aerosol foam sealants is used to indicate the amount of foam sealant that can be obtained from a single ~~can~~container of product.

5.2 The yield does not predict the performance capability of the foam sealant product or its suitability for the intended application.

5.3 Procedure A was developed for use with products that can be volumetrically measured by submersion in water. Procedure B was developed for product that cannot be measured by using a water displacement method.

5.4 Yield is often dependent on the bead size dispensed. Extrapolation of test results using data measured for larger size beads to estimate smaller sized beads has shown inaccuracies. Since yield will be reported based on the diameter of the cured bead (not initial ~~bead size),~~ size of wet beads), the operator shall determine the nominal initial bead size required to produce a specific nominal cured bead diameter. This foam characteristic, called "post dispensing contraction" or "post dispensing expansion," is defined in Terminology C717.

6. Apparatus

6.1 A container to hold water. Large enough to submerse foam samples.

6.2 A ~~metal grating heavy enough to~~ wire grating or mesh attached to a thin, stiff rod, designed to keep foam samples ~~submersed.~~submerged (see Fig. A1.2).

6.3 *Top Loading Balance,* readable to 0.01 g.

6.4 *PTFE Release Agent,* or ~~equivalent.~~equivalent (such as non-silicone weak release coating).

6.5 ~~*Fiberglass Insect Screening,*~~ *Fiberglass,* awning screen material or equivalent.

6.6 *Polyolefin ~~Film or Mesh,~~ Film,* available from various local supply ~~companies,~~ companies. Use only smooth film with 2 mil ~~thickness~~ or greater ~~film of smooth finish only, matte~~thickness (matte or textured finishes are not ~~suitable.~~suitable).

6.7 *Corrugated Cardboard 200 Pound Weight Substrate,* available in various ~~sizes, trimmable to 70 ± 10 × 120 ± 15 cm for convenient handling.~~sizes.

6.8 Uncoated smooth brown wrapping paper.

6.9 ~~*Meter Stick,*~~*Precision Ruler,* readable to the nearest 0.1 cm.

6.10 *Vernier Caliper,* readable to the nearest 0.1 mm.

7. Test Specimens and Substrates

7.1 ~~Prepare all test specimens at standard laboratory~~ All foam bead specimens shall be dispensed and cured at conditions of 23 ± 2°C and 50 ± 5 % relative humidity.

7.2 Polyurethane foam sealant complying with Specification C1620 (measured using Procedure A) shall be dispensed directly on to polyolefin film covered rigid cardboard or suspended mesh or fiberglass screen mounted on a frame of convenient size, ~~approximately 40 × 40 cm.~~minimum 30 by 20 cm area for each sample set.

7.3 If in Procedure A, a fiberglass screen is used as the specimen substrate, it shall be lightly coated with a PTFE ~~aerosol spray composition~~ release coating equivalent (see 6.4). The coating shall be lightly brushed or sprayed-applied and allowed to air dry ~~30-45 s~~ for at least 1 min before the foam sealant is applied. If polyolefin film or mesh is used, do not use the PTFE spray.

7.4 Foam sealants complying with Specification C1620 that cannot be measured by water displacement, such as Latex (measured using Procedure B), shall be dispensed directly on to brown paper or corrugated cardboard sheet of ~~convenient size~~