Designation: C 1643 – 08

Standard Test Method to Measuring the Post Dispensing Volumetric Expansion of Aerosol Foam Sealants[1]

This standard is issued under the fixed designation C 1643; 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 measures the volumetric expansion of aerosol foam sealants after dispensing.

1.2 This test method provides a means for estimating the quantity of initial material required to dispense in order to fill a cavity.

1.3 Aerosol foam sealants are used for a variety of applications intended to reduce airflow through the building envelope.

1.4 This test method applies to two types of single component aerosol foam sealants: polyurethane and latex.

1.5 There are no other known standard test methods to measure aerosol foam sealants post dispensing expansion.

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

1.7 *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:* [2]

C 717 Terminology of Building Seals and Sealants

C 1620 Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants

3. Terminology

3.1 *Definitions:*

3.1.1 Refer to Terminology C 717 for definitions of the following terms used in this test method: aerosol foam sealant, post dispensing contraction, post dispensing expansion.

4. Summary of Test Method

4.1 *Procedure A*—For single component polyurethane aerosol foam sealants.

4.1.1 Aerosol foam sealant is dispensed into aluminum channels.

4.1.2 Post dispensing volumetric expansion is determined by the volume of the foam expanded from the channel.

4.1.3 Post dispensing volumetric expansion factor is calculated by measuring the volumetric displacement of the cured foam.

4.2 *Procedure B*—For single component latex aerosol foam sealants.

4.2.1 Aerosol foam sealant is dispensed onto aluminum panels.

4.2.2 Post dispensing volumetric expansion is measured by the change of the foam height.

4.2.3 Post dispensing volumetric expansion factor is calculated by measuring the height of the foam.

5. Significance and Use

5.1 Post dispensing volumetric expansion factor $\bar{F}$ indicates the ratio of the fully cured foam sealant volume and the initially dispensed foam sealant volume. For example, if the expansion factor $\bar{F}$ were 2, the fully cured foam would double its initial volume; therefore, one should fill 50 % of the cavity uniformly to anticipate the full coverage upon curing.

5.2 Post dispensing volumetric expansion factor $\bar{F}$ does not predict the performance capability of the foam sealants of the suitability for the intended applications.

[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

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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.

5.3 This test method is intended to lend guidance in product selection as related to the post dispensing expansion characteristics of the aerosol foam sealants.

5.4 This test method recognizes that the results are reflective of controlled laboratory conditions. Post dispensing expansion in field applications may vary according to temperature, humidity, and surfaces that the aerosol foam sealants are in contact with.

6. Apparatus

6.1 *Aluminum channels*, External dimensions: length = 15.25 cm (6 in.), width = 1.91 cm (¾ in.), height = 1.91 cm (¾ in). Internal dimensions: length = 15.25 cm (6 in.), width = 1.27 cm (0.5 in.), height = 1.59 cm (⅝ in.). Wall thickness = 0.32 cm (⅛ in).

6.2 *Aluminum panel*, 22.86 by 7.62 cm (9 by 3 in.) by 0.06 cm (0.025 in.).

6.3 *Digital caliper*, accurate to 0.01 mm.

6.4 *Top loading balance*, readable to 0.01 g.

6.5 *Wood tongue depressors*.

6.6 *Graduated cylinder*—1000 mL, with 5 mL increments.

7. Test Specimens and Substrates

7.1 All sample preparation and test should be done at standard laboratory conditions of 23 ± 2°C and 50 ± 5 % relative humidity.

7.2 Each channel shall be wiped clean with rubbing alcohol 24 h before testing

7.3 Polyurethane aerosol foam sealants shall be dispensed directly into the aluminum channels. A total of five aluminum channels are required per test.

7.4 Aluminum panels shall be wiped clean with rubbing alcohol 24 h before testing.

7.5 Latex foam sealants shall be dispensed directly onto the aluminum panels. Divide each panel with a permanent marker into two sections by drawing a line mid-way along the width. A total of five aluminum panels are required per test.

7.6 For each product tested it is essential to follow the manufacturer's label directions and to use the dispenser supplied with the product.

8. Conditioning

8.1 Condition both foam sealants and substrates under standard laboratory conditions of 23 ± 2°C and 50 ± 5 % relative humidity for a minimum of 24 h before testing.

9. Procedure A

9.1 Prepare the substrates as described in 7.2 and 7.3.

9.2 Prepare the aerosol foam sealants for dispensing per manufacturer's directions.

9.3 Dispense ⅓ of the full contents of the aerosol foam sealant product to a waste can. Record the weight of the product before filling the first channel and after filling the last channel.

9.4 Fill a total of 5 channels using the middle ⅓ of the product.

9.5 Fill each channel evenly and visually full to the flush of the edges. Do not strike off.

9.6 Allow foam specimens to cure for 24 h at standard laboratory conditions of 23 ± 2°C and 50 ± 5 % relative humidity.

9.7 Fill a 1000 mL graduated cylinder with 500 mL tap water. Carefully immerse one cured foam specimen in the cylinder. Record to the nearest millilitre as V. Repeat for each foam specimen.

10. Calculations for Procedure A

10.1 Calculate the post dispensing volumetric expansion factor (F) for each specimen:

$$\begin{aligned} F &= \text{Final foam volume/Initial foam volume} \\ &= (V - 500 - V_{\text{Channel}})/V_{\text{Initial Foam}} \\ &= (V - 500 - 25)/31 \\ &= (V - 525)/31 \end{aligned} \quad (1)$$

where:

V_{Channel} = 25 mL
$V_{\text{Initial Foam}}$ = 31 mL

10.2 Calculate the average post dispensing volumetric expansion factor $\bar{F}$ for each product test:

$$\bar{F} = \Sigma F/n \quad (2)$$

where:

n = 5 or number of specimens tested per product.

Calculate standard deviation.

11. Procedure B

11.1 Prepare the substrates as described in 7.4 and 7.5.

11.2 Prepare the aerosol foam sealants for dispensing per manufacturer's directions.

11.3 Dispense ⅓ of the full contents of aerosol foam sealant product to a waste can. Record the weight of the product before making the first bead and after making the last bead.

11.4 Dispense a total of 5 beads (one at a time) using the middle ⅓ of the product.

11.5 Dispense each bead approximately 15 cm long and 1.5 cm wide directly onto the aluminum panel. Immediately (<5 s after dispensing) measure the initial bead height (including the thickness of the aluminum panel) using a digital caliper to the nearest 0.01 mm, at the point where the bead and the line intersect. Record as R_1.

11.6 Allow foam beads to dry for 24 h at standard laboratory conditions of 23 ± 2°C and 50 ± 5 % relative humidity.

11.7 Measure each bead height (including the thickness of the aluminum panel) at the same point R_1 is measured. Record as R_2.

12. Calculations for Procedure B

12.1 Calculate the post dispensing volumetric expansion factor $\bar{F}$ for each sample:

$$F = (R_2/R_1)^2 \quad (3)$$

12.2 Calculate the average post dispensing volumetric expansion factor $\bar{F}$ for each product tested:

$$\bar{F} = \Sigma F/n \quad (4)$$

where:

n = 5 or number of specimens tested per product.
Calculate standard deviation.

13. Report

13.1 Report the following information:

13.1.1 Complete name or designation of product tested from label information,

13.1.2 Date of initiation of the test,

13.1.3 Date of report,

13.1.4 Expiration date of the product tested,

13.1.5 Temperature and relative humidity of the testing laboratory,

13.1.6 The weights of the product before and after specimen preparation,

13.1.7 Record whether procedure A or B was followed,

13.1.8 Post dispensing volumetric expansion factor $\bar{F}$ and standard deviation, and

13.1.9 A statement that the test or tests were conducted in accordance with this Test Method, C 1643.

NOTE 1—Low expansion foam sealants are defined as products with $\bar{F}$ <1.5; Medium expansion foam sealants are products with 1.5<or = $\bar{F}$ = or <2.5; and High expansion foam sealants are products with $\bar{F}$ >2.5.

14. Precision and Bias

14.1 No precision and bias values have been developed for this test method. Plans to establish precision and bias statements are being made at the time of publication of this standard.

15. Keywords

15.1 aerosol; aerosol foam; air barrier from sealant; air exfiltration; air infiltration; foam sealant; latex foam sealant; polyurethane foam sealant