Designation: C 1642 – 07

Standard Practice for Determining Air Leakage Rates of Aerosol Foam Sealants and Other Construction Joint Fill and Insulation Materials[1]

This standard is issued under the fixed designation C 1642; 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 practice is intended to determine the air leakage rate of aerosol foam sealants as measured in a standardized jig. This practice provides a procedure for preparing the test apparatus and further describes the application of aerosol foam sealant and other joint fillers to the apparatus prior to conducting Test Method E 283.

1.2 This practice allows testing laboratories to quantify the air leakage rate of aerosol foam sealants or joint filling products using Test Method E 283 and reporting the data in $L/(s \cdot m^2)$ according to Practice E 29.

1.3 This practice is used in conjunction with Test Method E 283. Although Test Method E 283 is a laboratory test method used with fenestration products, individuals interested in performing field air leakage tests on installed units should reference Test Method E 783 and AAMA 502.

1.4 Aerosol foam sealants are used for a variety of end use applications generally intended to reduce air leakage in the building envelope.

1.5 Insulating type materials also will be found suitable for evaluation with this practice.

1.6 There are no other known practices or test methods that specify the preparation of the assemblies used to determine the air leakage rate of gap filling sealants, dry preformed foams or insulations.

1.7 The values given in SI units are the standard. The inch-pound units in parentheses are for information only.

1.8 *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 1330 Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants

C 1536 Test Method for Measuring the Yield for Aerosol Foam Sealants

C 1620 Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E 283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E 783 Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

3. Terminology

3.1 *Definitions:*

3.1.1 *air barrier*—the assembly of material(s) used in building construction to reduce or retard the uncontrolled passage of air into and out of the building.

[1] This practice 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.

3.1.2 *rough opening gap*—the open space between the building frame and the fenestration product.

3.1.3 *preformed dry foam material*—any cellular product designed for filling construction joints to resist air leakage.

3.1.4 *preformed pre-compressed tapes*—any cellular tape supplied compressed from its fully expanded shape and designed for filling construction joints to resist air leakage.

4. Summary of Practice

4.1 This practice establishes specimen preparation and a test protocol for determining the air leakage rates of aerosol foam sealants per Test Method E 283. Application of foam sealant shall be in accordance with all manufacturers recommendations and in a manner reflecting in use conditions such as the depth and width of the joint or gap. In the event that the manufacturer's instructions are not available, this practice shall be the default application method for the test material (joint width and depth). The depth and density (use Test Method C 1536 for aerosol foam sealant) of the applied material shall be reported in all cases.

4.2 This practice references the following material types:

4.2.1 Type I Material (Aerosol Foam Sealants)

A) Polyurethane

B) Latex

4.2.2 Type II Material (Preformed dry material)

A) Closed cell foam

B) Bi-cellular foam

4.2.3 Type III Material (Batt-Insulation)

A) Faced

B) Un-Faced

5. Significance and Use

5.1 This practice is intended to measure air flow through materials used to fill joints found in building construction.

5.2 This practice does not purport to establish all required criteria for the selection of an air barrier assembly. Therefore, the results should be used only for comparison purposes and should not be seen as the equivalent to field installed building systems.

6. Sampling

6.1 One test jig shall be required for each material type.

7. Test Apparatus

7.1 The jig required for testing is shown in Fig. 1.

NOTE 1—See Annex A1 for the detailed construction and assembly details of the test apparatus.

8. Sample Preparation

8.1 *General Description*—The test sample is a jig containing five cavities each having the following dimensions: 9.525 mm (0.375 in.) wide by 863.6 mm (34 in.) long by 101.6 mm (4 in.) deep. The extrusions are enclosed by a wooden buck frame comprised of 50.8 by 152.4 mm (2 in. by 6 in.) lumber (See Annex A1 drawings).

8.2 The buck shall be sealed at all extraneous points with silicon and butyl tape or other appropriate material. This seal shall extend across the termination joint between aluminum tube and the wood buck surround and 184.15 mm (7.25 in.) toward the center of the specimen completely covering the exposed aluminum shims.

FIG. 1 An Assembled Test Jig Apparatus Ready for Joint Filling with a Perimeter Seal Applied in the Wood Test Buck

8.3 *Applying the Test Material in the Jig*:

8.3.1 *Foam Sealant Applicaion*—The foam may be applied in multi passes as desired. Approximately one half of the cavity depth should be filled on the first pass and allowed to cure until the surface is tack free (see Specification C 1620 for definition). A sharp knife should be used to trim the foam. Do not attempt to trim the foam until it has cured for 24 h. It is not necessary to trim the cured foam on the exterior side of the joint, however the inside face should be trimmed flush with the aluminum if the foam expands beyond the surface.

NOTE 2—Only one pass or more than two passes is required to fully fill the cavities, enter this information as a note in the test report. Use Standard Laboratory Conditions for sample preparation and cure of the foam sealant.

8.3.2 *Pre-formed Foam Application*—Cut a continuous length of Type II material measuring 12.7 mm (½ in.) longer than the channel length. Align the cut length with the channel gap to be filled. Carefully use a blunt or round device to push the aligned material into the total length of the 9.525 mm (0.375 in.) gap. If material is punctured, cut, or otherwise damaged during insertion, it shall be removed, discarded, and replaced with a new length of material. Since by design, the cut

material length is slightly longer, the ends should be compressed on both ends to provide a tight fit against the shims and channels. The inserted material *(1)* shall be between the channel with no visible material protruding to either the interior or the exterior sides, *(2)* shall provide a continuous contact surface between the channels and shims, and *(3)* shall be positioned at the same depth in the channel with a variance of ±6.35 mm (0.25 in.). This procedure applies for each additional continuous length that is positioned in the channel. Reported information shall include the depth of the material into the joint, material cross-sectional dimensions prior to insertion, number of pieces if more than one length of foam is used, length of each piece, and type and class of material, (Type shall be bi-cellular or closed cell per Terminology C 717. Class would be C, closed cell or B, bi-cellular per Specification C 1330 or other).

8.3.3 Batt material installation: Cut a continuous length of Type III material measuring 88.9 mm (3.5 in.) by 19.05 mm (0.75 in.) by 1177.73 mm (45.38 in.). Note: The length is 25.4 mm (1.0 in.) longer than the aluminum channel. Align the cut length with the channel gap to be filled. Carefully use a blunt or round device to push the aligned material into the total length of the 9.525 mm (0.375 in.) gap. Ensure specimen completely fills the cavity with no visible material protruding to either the interior or the exterior sides.

9. Test Procedure

9.1 *Air Leakage*:

9.1.1 The air leakage testing procedure shall be conducted in accordance with Test Method E 283. A minimum pressure differential of 75 Pa is required when testing all products and aerosol foam sealants but higher test pressures can be evaluated and reported also.

9.1.2 *Results*—The rate of air leakage for both exfiltration and infiltration shall be reported as: litres/second/square meter, that is, L/s/m^2) (ft^3/min /ft^2) and litres/second/linear metre, that is, L/s/m (ft^3/min/ft).

10. Calculation

10.1 The total air leakage rate (*Qs*) for the test specimen shall be expressed in terms of airflow at standard conditions using the following equations:

$$Qs = Qt/A$$

$$Ql = Qt/l$$

where:

Qs = air leakage rate for test specimen, L/s/m^2) (ft^3/min/ft^2)
Ql = air leakage rate for test specimen, L/s/m) (ft^3/min/ft)
Qt = total air leakage rate
A = surface area of one specimen: 0.00822 m^2(0.089 ft^2)
l = length of one specimen joint: 0.864 m (2.83 ft)

11. Report

11.1 *General Requirements*:

11.1.1 Complete product name and model number of product tested,

11.1.2 Manufacturer's name,

11.1.3 Manufactured date or expiration date, or both, when provided,

11.1.4 Test initiation date,

11.1.5 The number of foam beads or number of strips or pieces used, or both, to fill the jig,

11.1.6 Label net weight if provided, and

11.1.7 Specify depth and size of preformed foam specimens used to fill the jig apparatus.

11.2 A statement indicating that the test method used was in accordance with ASTM C 1642.

11.3 The results of the air leakage rate to be reported in units of L/s/m^2(fm^3/min/ft^2) and L/s/m (ft^3/min/ft)

11.4 Any modifications or deviations from this practice should be reported.

12. Precision and Bias

12.1 The precision and bias of this practice has not been determined.

13. Keywords

13.1 aerosol; aerosol foam; air barrier; air barrier foam sealant; air exfiltration; air infiltration; air leakage; air permanence; door; fenestration; insulation materials; latex foam sealant; polyurethane foam sealant; window

ANNEX

A1. CONSTRUCTION AND ASSEMBLY

A1.1 **Detailed Construction Drawings for the Test Apparatus (Test Buck)**:

A1.1.1 See Figs. A1.1-A1.3.

A1.2 **Construction of the Test Buck**:

A1.2.1 *Materials List for Building Test Buck*:

(1) Two pieces stock pine. Dimensions: 50.8 mm (2.0 in.) by 152.4 mm (6 in.) by 2438.4 mm (8 ft).

(2) One piece stock pine. Dimensions: 25.4 mm (1.0 in.) by 50.8 mm (2.0 in.) by 2438.4 mm (8 ft).

(3) Sixteen #8 drywall screws 50.80 mm (2 in.).

(4) Eight #8 drywall screws 31.75 mm (1¼ in.).

(5) Gunnable sealant or self-adhering flashing tape adequate to seal the test assembly's non-test areas.

(6) Two 10–24 threaded rods, four 10–24 washers and four 10–24 nuts.

(7) Ten aluminum shims, thickness: 9.525 mm (0.375 in.) thick.

(8) 3.175 mm (0.125 in.) wall made from T52 6063 aluminum 50.8 mm (2 in.) by 101.6 mm (4 in.).

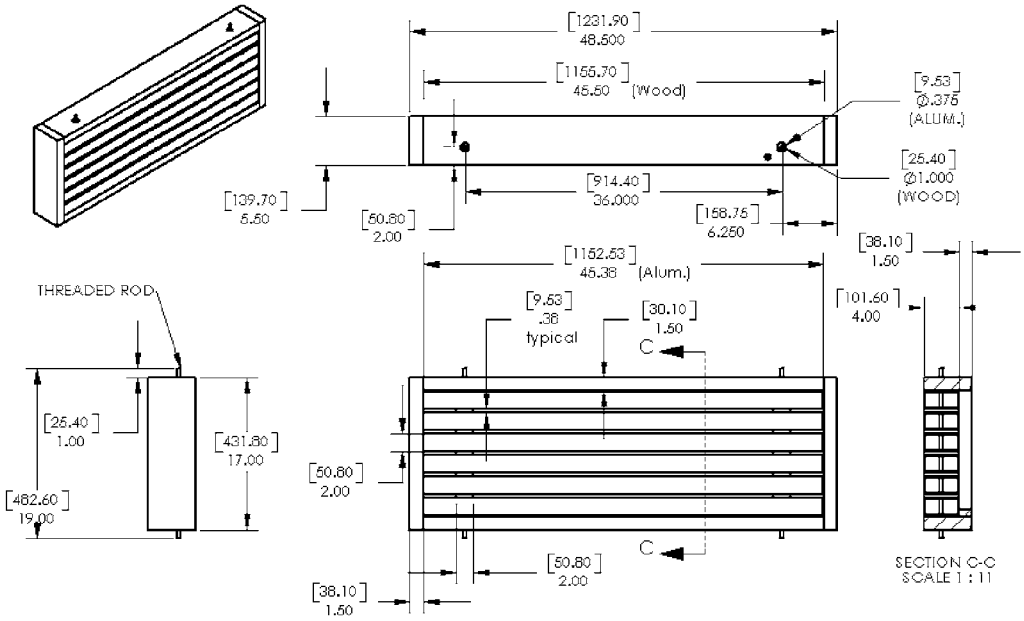

FIG. A1.1 Detailed Construction Drawings for the Test Apparatus (Test Buck)

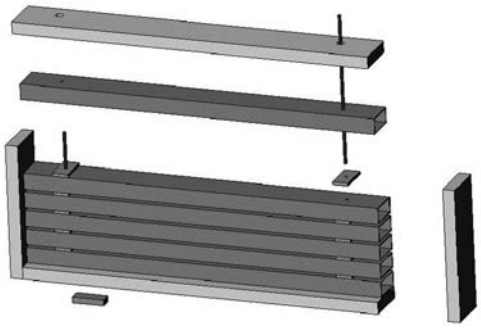

FIG. A1.2 Test Buck – Exploded Assembly

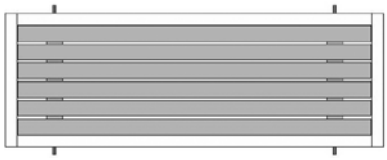

FIG. A1.3 Front View – Assembled Test Buck

A1.2.2 *Tools Required*:
(1) Industrial drill press.
(2) Portable or plug-in drill.
(3) Table saw.
(4) Caulk gun.
(5) 44.45 mm hole saw.
(6) 3.175 mm drill bit (for pilot holes on buck)
(7) horizontal band saw.

A1.2.3 *Special Equipment Required for Testing*
(1) Test Method E 283 Test Apparatus.
A1.2.4 *Method of Construction for Test Specimen*
A1.2.5 *Frame Construction*:
(a) Cut 50.8 by 152.4 mm (2 by 6 in.) to a length of 1.15 m.
(b) Cut 2nd framing member to a length of 1.15 m.
(c) For head and sill pieces cut lengths at 355.6 mm.
(d) Frame up three sides leaving one 1.15-m length unassembled.
(e) Continue to assemble substrate section as indicated below.
A1.2.6 *Substrate Construction*:
(a) On a horizontal band saw, cut four aluminum substrates to 1152.525 mm length.
(b) After the four substrates are cut to 1152.525 mm length it is vital that they fit inside the dimensions of the 50.8 by 152.4 mm (2 by 6 in.) frame. Place the wooden frame together so the 50.8 mm frame side is flat on the table. Do not fasten the last jamb buck section yet, but assemble the wood framing so the six aluminum lineals fit inside the buck.
(c) Cut the 25.4 by 50.8 mm pine sotck into four cuts at 101.6 mm lengths.
(d) Fasten the 101.6 mm piece of pine in a manner to secure aluminum substrates. (See Fig. A1.2)
(e) Drill and assemble aluminum lineals according to exploded assembly drawing (Fig. A1.2). Seal between each shim and aluminum substrate.