Designation: C1852 – 17

Standard Guide for Product Selection/Delivery Systems for Aerosol Foam Sealants and Adhesives[1]

This standard is issued under the fixed designation C1852; 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 guide covers the general use of aerosol polyurethane and aerosol latex foams extruded from pressurized containers intended for building envelope air barrier sealant and adhesive applications in building construction. It also provides an overview of associated standards and test methods that quantify key physical properties that are useful to design professionals, engineers, specifiers, and end users.

1.2 Currently two main foam sealant types are applicable to this practice, single component polyurethane and latex types.

1.3 The values stated in inch-pound units are to be regarded as standard. SI units provided are for information only and are not considered standard.

1.4 *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.* For specific safety considerations see Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C168 Terminology Relating to Thermal Insulation

C557 Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing

C717 Terminology of Building Seals and Sealants

C1536 Test Method for Measuring the Yield for Aerosol Foam Sealants

C1620 Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants

C1642 Practice for Determining Air Leakage Rates of Aerosol Foam Sealants and Other Construction Joint Fill and Insulation Materials

C1643 Test Method to Measuring the Post Dispensing Volumetric Expansion of Aerosol Foam Sealants

C1737 Guide for Evaluating Temperature Effects to Aerosol Foam Sealant During and After Dispensing

D883 Terminology Relating to Plastics

D3498 Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems

D6464 Specification for Expandable Foam Adhesives for Fastening Gypsum Wallboard to Wood Framing

E72 Test Methods of Conducting Strength Tests of Panels for Building Construction

E84 Test Method for Surface Burning Characteristics of Building Materials

E119 Test Methods for Fire Tests of Building Construction and Materials

E283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E814 Test Method for Fire Tests of Penetration Firestop Systems

E2112 Practice for Installation of Exterior Windows, Doors and Skylights

2.2 *Other Standards:*

AFG-01 Adhesives for Field-Gluing Plywood to Wood Framing[3]

UL 723 Test for Surface Burning Characteristics of Building Materials[4]

UL 1715 Fire Test of Interior Finish Material[4]

AAMA 812 Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations[5]

NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth[6].

[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.

[3] Available from APA: www.https://www.apawood.org/.

[4] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.

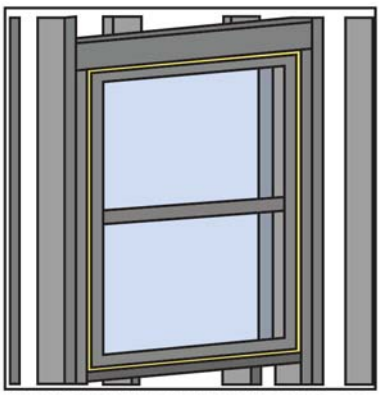
[5] Available from American Architectural Manufacturers Association (AAMA), 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268, http://www.aamanet.org.

[6] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org

Building Envelope Sealing
Window, Door & Skylight Interior Perimeters

Sealing: Gaps, Cracks & Joints
Within Residential & Commercial Building Envelopes

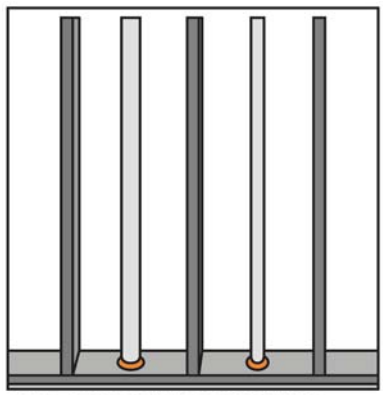
Adhesive
Structural Insulated Panels, Drywall, Subfloor & Insulated Concrete Forms



INTERIOR WINDOW PERIMETERS OF EXTERIOR WALL WINDOWS

Shown as a window perimeter rough opening secondary air seal.

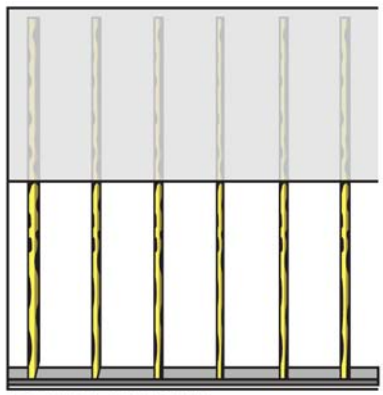
Relevant Lab Standards / Tests: AAMA 812, ASTM C1642, ASTM E283
Installation Guide: ASTM E2112



GAPS / HOLES (FIRE BLOCKING)

Shown as a fire blocking foam sealant for bottom plate penetrations.

Relevant Lab Standards / Tests: ASTM C1620, ASTM C1642, ASTM C1643, ASTM E814", ASTM E84, UL 1715, UL 723

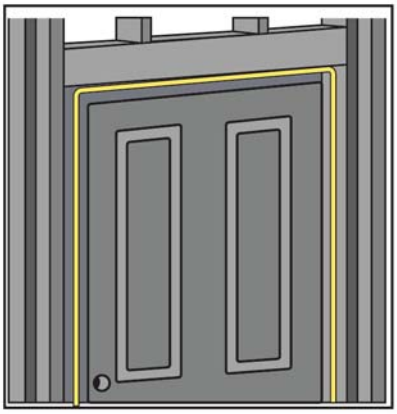


DRYWALL ADHESIVE

Shown as an adhesive between drywall and wall studs.

Relevant Lab Standards / Tests: ASTM C1620, ASTM C557, ASTM D6464, ASTM E72

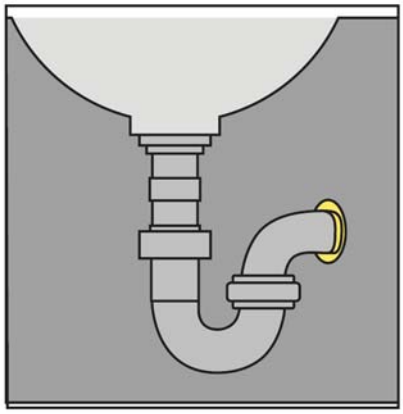
FIG. 1 Interior Window Perimeters of Exterior Wall Windows, Gaps/Holes (Fire Blocking), and Drywall Adhesive



INTERIOR DOOR PERIMETERS OF EXTERIOR DOORS

Shown as a door perimeter rough opening secondary seal.

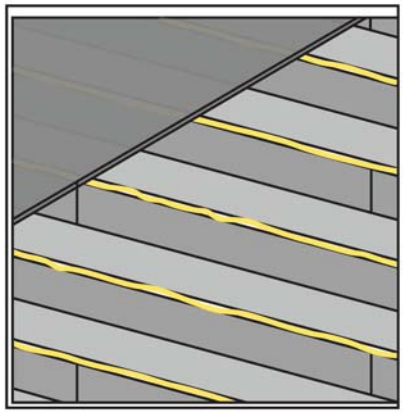
Relevant Lab Standards / Tests: AAMA 812. ASTM C1642, ASTM C1620, ASTM E283



GAPS / HOLES (GENERAL)

Shown as an interior wall pipe penetration seal.

Relevant Lab Standards / Tests: ASTM C1620, ASTM C1642, ASTM C1643



SUBFLOOR ADHESIVE

Shown as an adhesive between floor sheathing and floor joists.

Relevant Lab Standards / Tests: AFG-01, ASTM C1620, ASTM D3498

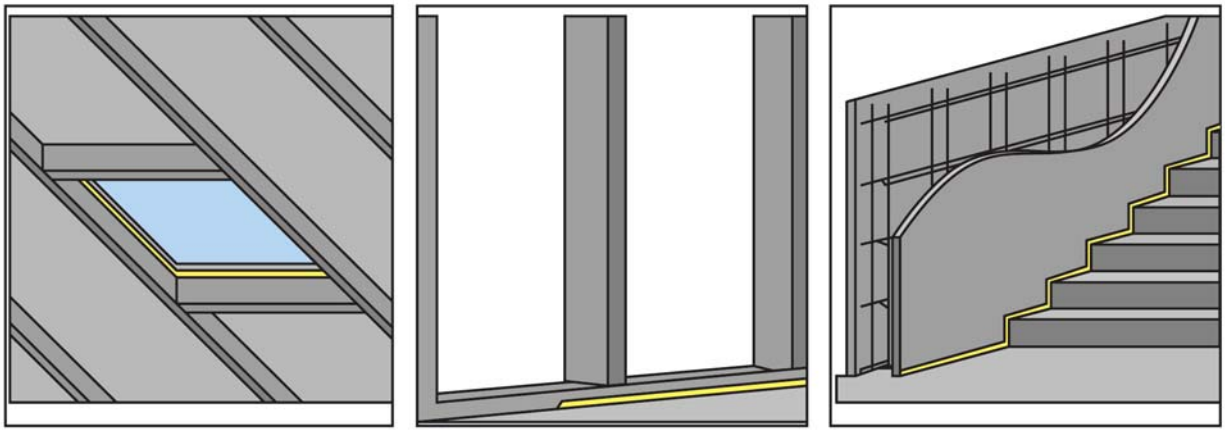
FIG. 2 Interior Door Perimeters of Exterior Doors, Gaps/Holes (General), and Subfloor Adhesive

3. Terminology

3.1 *Definitions*—For definitions of terms used in this guide, refer to Terminologies C168, C717, and D883.

4. Summary of Guide

4.1 This guide is intended to provide general assistance for a specifier, engineer, design professional or end user who is



SKYLIGHT PERIMETERS

Shown as an interior secondary seal.

Relevant Lab Standards/Tests: ASTM C1642, ASTM C1620

JOINTS

Shown as a seal at the bottom plate to floor joint.

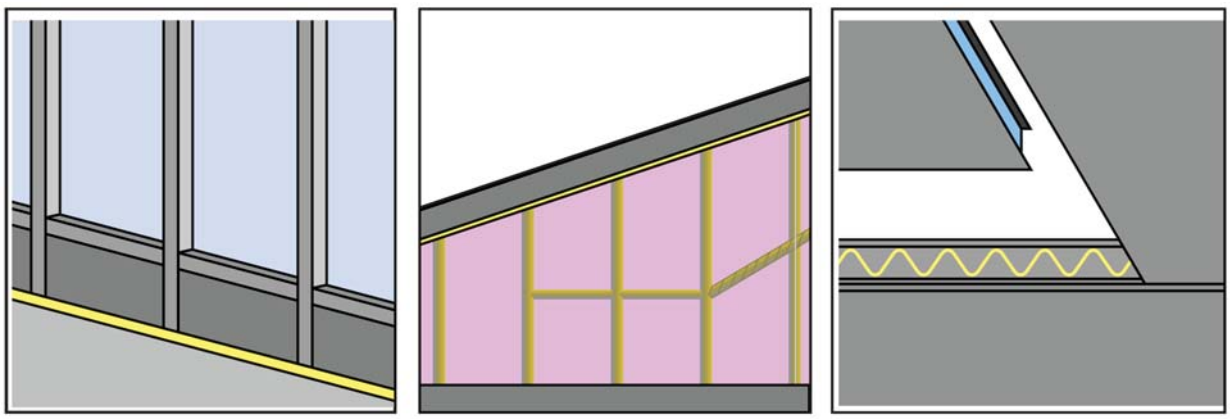
Relevant Lab Standards/Tests: ASTM C1620, ASTM C1642, ASTM C1643

INSULATED CONCRETE FORMS

Shown as a seal between insulated concrete forms and existing construction.

Relevant Lab Standards/Tests: ASTM C1620, ASTM C1642

FIG. 3 Skylight Perimeters, Joints, and Insulated Concrete Forms



COMMERCIAL WINDOW INTERIOR PERIMETERS

Shown as an interior secondary seal.

Relevant Lab Standards / Tests: AAMA 812, ASTM C1642, ASTM E283

SEALING JOINTS OF RIGID INSULATION

Shown as an air seal between rigid insulation and wall studs.

Relevant Lab Standards / Tests: ASTM C1620, ASTM C1642, ASTM C1643

STRUCTURAL INSULATED PANELS (SIPs)

Shown as an adhesive and air seal in the on-site assembly of SIP foam core panels at a ridge detail.

Relevant Lab Standards / Tests: AFG-01, ASTM C1642, ASTM C1643, ASTM D3498

FIG. 4 Commercial Window Interior Perimeters, Sealing Joints of Rigid Insulation, and Structural Insulated Panels (SIPs)

seeking material selection assistance for a one component aerosol foam sealant. This guide provides an overview and creates awareness of the most common uses of one component foam sealants and further describes key product attributes and performance criteria that may assist in the material selection process. The guide explains only the most common uses of polyurethane and latex foam sealants and provides an overview of aerosol foam sealant physical properties, climate condition considerations, dispensing container types, and product storage variables. The guide provides information on environmental conditions and effects that are known to detrimentally affect a foam sealant. The guide further provides definitions relevant to

aerosol foam sealants, germane standards and test methods, product storage best practices, substrate guidance, general safety considerations, and shelf life information.

4.2 In addition to the product considerations in this guide, consult the foam sealant manufacturer about applications and limitations for its products and their proper use and installations. Considering the range of appropriate applications, the properties of commercially available foam sealants, and the many conditions of use, the information contained herein is general in nature.

5. Significance and Use

5.1 The intended use of this guide is to provide a high level summary of relevant test methods and performance criteria of aerosol foam sealants that can be helpful in identifying material properties and suitable applications. Use of this guide can be leveraged to further understand how foam sealant materials can be expected to perform and are positioned for intended use by manufacturers in the marketplace.

5.2 This guide is limited in scope and does not cover all possible end use applications. Consult the Aerosol Foam Sealant Manufacturer for specific performance capability, third party reports, or International Code Council evaluation reports.

6. Performance Overview and Guide to Key Physical Properties

Matrix of Three Primary Application Categories for One Component Aerosol Foam Sealants (See Figs. 1-4)

6.1 *Windows, Doors, and Skylights:*

6.1.1 *Pressure-Build:*

6.1.1.1 *Referenced Voluntary Practice*—AAMA 812.

6.1.1.2 *Background of Performance Criteria*—AAMA 812 is the voluntary practice referenced standard that reports three values to the user of the document. It reports pressure-build reported in psi, dimensional stability in volume %, and a standardized beam deflection in inches. These three physical characteristics of the foam sealant are useful in a system design when the foam is applied next to a fenestration product. Table 1 provides guidance in product selection and supplements

TABLE 1 Pressure Build

Potential for Frame Distortion	Measurement of Foam Pressure-Build
Highest	Above 2 psi
Medium	1–2 psi
Lowest	0–1 psi

AAMA 812.

6.1.1.3 Foam pressure build is defined as a value for maximum pressure developed under specified conditions as determined in AAMA described in pounds per square inch (psi) or units of Pascal (Pa).

6.1.2 *Air Infiltration:*

6.1.2.1 *Referenced Standards*—Test Method E283, Practice C1642 with the air infiltration allowable designated in Specification C1620.

TABLE 2 Air Permeability

Air Flow Categories	Measurement of Foam Air Permeability (Air Leakage)
Greater Air Permeability	Max 0.01 cfm/ft^2 >1.5 L/ (s·m^2) (0.3 ft^3/(min·ft^2) >0.02 L/ (s·m^2) (0.01 ft^3/(min·ft^2)
Allowable Air Permeability	Max 0.01 cfm/ft^2 <1.5 L/ (s·m^2) (0.3 ft^3/(min·ft^2) <0.02 L/ (s·m^2) (0.01 ft^3/(min·ft^2)

6.1.2.2 *Background of Performance Criteria*—Practice C1642 provides a method to build a test specimen before running Test Method E283 specifically for aerosol foam sealants and other materials typically found in the rough opening gap between a window and wall system. Test Method E283 designates how to apply a pressure differential across the specimen using the test assembly called out in Practice C1642. The performance criteria for air infiltration are designated in Specification C1620, Table 1.

6.1.3 *Foam Bead Expansion:*

6.1.3.1 Many aerosol foam sealants will expand during cure. This property has been found to be unrelated to Pressure-Build described above. In general, this foam sealant characteristic is useful when determining the best product for filling gaps. Larger gaps may be best filled by a high expanding foam sealant while smaller gaps are generally more easily filled with a low expansion foam sealant.

TABLE 3 Post Expansion

Foam Expansion Categories	Percentage
High Expanding	Greater than 250 %
Medium Expansion	150–250 %
Minimal Expanding	Less than 150 %

6.1.4 *Post Expansion:*

6.1.4.1 *Reference Standard*—Test Method C1643.

6.2 *Gaps, Cracks, Joints, Fireblocking:*

6.2.1 *Surface Flame Spread and Fire Testing:*

6.2.1.1 *Reference Standards:*—Test Method E84, UL 1715, Test Methods E119 time temperature curve, NFPA 286.

6.2.1.2 Firestopping is different than Fireblocking and approved Fireblocking materials should never be used in Firestopping applications involving noncombustible construction:

(1) Fireblocking is the restriction of hidden fire and smoke movement via the inside of hollow concealed spaces in wood frame walls. Contrast this to Firestopping, which is the prevention of fire spread from one side over to the other side of a fire rated wall or floor assembly. Fireblocking is typically accomplished by the construction of top plate (usually a 2 by 4) and the vertical wood studs in the wall. Gaps in the plates or studs that accommodate wiring or piping could allow the free passage of fire and smoke, and should be sealed with an approved material according to building codes. Some building code requirements only call for sealing opening every 10 ft horizontally. Many building code officials require that these openings be sealed at every single stud cavity. Code acceptance is achieved with an approved foam or firestop material that has

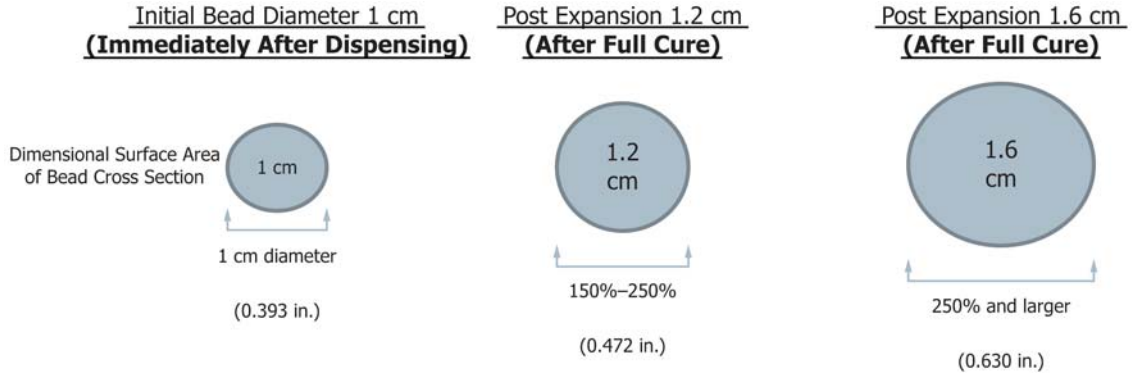


FIG. 5 Post Expansion

TABLE 4 Surface Flame Spread and Fire Testing

Application Testing	Acceptable Results
Surface Burning Characteristics (Test Method E84/UL 723	Third party agency determination[A,B] Flamespread (25 or less) Smoke developed (50 or less)
Room Corner Burn (UL 1715), NFPA 286	Third party agency determination[A,C]
Modified Test Method E814 Fire Test	Third party agency determination[A,D]

[A] Approved third party testing laboratory such as Underwriters Laboratories.
[B] This test method is intended to provide only comparative measurements of surface flame spread and smoke density compared with that of select grade red oak and fiber cement board surfaces under the specific fire exposure conditions described herein.
[C] This test method is intended to simulate product performance when used in a specific application in a small room fire test. A standardized wood crib is placed in one corner, ignited, and then results evaluated per prescribed metrics for conformance to code requirements. The standard describes a method for determining the contribution of interior finish materials to room fire growth during specified fire exposure conditions. It is intended for the evaluation of the flammability characteristics of wall and ceiling interior finish, other than textile wall coverings, where such materials constitute the exposed interior surfaces of buildings. This test is also known as the "room corner" test.
[D] This test method is mostly used to determine the performance of a Firestopping system with respect to exposure to a standard time-temperature fire test and a hose stream test. The performance of a Firestopping system is dependent upon the specific assembly of materials tested including the number, type, and size of penetrations and the floors or walls in which it is installed.

been tested according to this protocol in a modified ASTM E814 test. The term "modified" basically indicates that the standard type E814 test was performed but without the usual hose stream test performed at the end of the fire exposure.

(2) Fireblocking does not require a "system test" like Firestopping, which requires that each general application be tested for code acceptance. The Fireblocking requirement is simply to seal the visible gap around stud penetrations with an approved material. Since aerosol foams are not specifically mentioned in the building codes as acceptable Fireblocking sealants, some inspectors often require "ICC-ES acceptance" reports for use of these materials in Fireblocking applications. Thus, the need to perform the E814 modified test.

6.3 *Adhesive:*

6.3.1 *Drywall Performance Criteria:*

6.3.1.1 *Referenced Standard*—Specification D6464.

6.3.1.2 *Scope of Standard*—This specification establishes minimum performance requirements for determining strength, aging, and working properties of expandable foam adhesives intended for bonding back surfaces of gypsum wallboards of all thicknesses to wood framing. Minimum physical and performance requirements are specified for all measured properties of adhesives and adhesive bonds. See Table 5.

TABLE 5 D6464 Performance Requirements

Test Type	Minimum Requirements (psi)
24 h Shear	10 psi
14 Day Shear	40 psi
Cyclic Exposure Shear	32 psi
24 h Tensile	15 psi
14 Day Tensile	25 psi
Freeze Thaw Shear	10 psi

6.3.2 *Wall Racking Test:*

6.3.2.1 *Referenced Standard*—Test Methods E72.

6.3.2.2 *Significance and Use and Performance Criteria*—The procedures described in Test Methods E72 are those that will test the behavior of segments of wall construction under conditions representative of those encountered in service. Performance criteria based on data from those procedures can ensure structural adequacy and service life.

6.3.2.3 *Scope*—Test methods cover the following procedures for determining the structural properties of segments of wall, floor, and roof constructions:

Test Condition	Test Result
Rack Loading Test Methods E72	Report Load versus Deflection

6.3.3 *Specification D3498:*

6.3.3.1 *Referenced Standard*—Specification D3498

6.3.3.2 *Significance and Use and Performance Criteria*—This specification covers minimum performance standards and test requirements for gap-filling construction adhesives for field-gluing plywood to lumber framing for floor systems. The adhesive shall conform to the strength and durability properties prescribed. The different methods for specimen's preparation are presented in details. The shear strength, gap-filling effect on strength, and durability shall be tested to meet the requirements prescribed..

TABLE 6 Specification D3498 Requirements

Test Substrate / Condition	Average Minimum Shear Strength
Wet Lumber	150 psi
Frozen Lumber	100 psi
Dry Lumber	150 psi
Gap Filling	100 psi
Moisture Resistance	150 psi

6.3.4 *Insulated Concrete Forms:*

Test / Substrate Conditions	Minimum Requirements
No test method has been established	NA

7. Safety Considerations

7.1 Read SDS, product data sheet, and label on package prior to use of aerosol foam sealant.

7.2 Wear protective gloves, eyewear and cover all exposed skin.

7.3 Shut off all pilot lights and other sources of ignition.

7.4 Do not smoke when using this product.

7.5 Use aerosol foam with adequate ventilation.

7.6 Evaluate applicability of Confined Space Safety requirements.

8. General Delivery System Consideration

8.1 The following briefly describes several aspects that must be considered when selecting a one component aerosol foam sealant delivery system. A foam sealant manufacturer's written literature should always be consulted for the manufacturer recommended procedures and materials.

8.2 *Product Dispensing Selection Types*—See Fig. 6 and Table 7.

8.3 *Gun Foam Sealants*—The product of this reaction is bead extruded from pressurized containers through attached hand held, trigger operated device designed to control dispensed product quantity, bead diameter, and permit multiple use.

8.3.1 *Preparation*—Ensure substrate for installation is dry and clean from debris. For optimal installation, a light pre-moistening of the substrate may be required to achieve desirable foam expansion and cure time.

8.3.2 *Dispensing*—Mount dispenser on can with the can on a flat surface. Do not over tighten. Shake can vigorously after attaching the dispenser. Open valve to allow foam to fill dispenser. Unlock the safety on the trigger to allow foam dispensing. Point discharge end of dispenser away from user and pull trigger to dispense foam. Adjust dial on dispensing device as needed to control bead diameter.

TABLE 7 Product Dispensing Selection Types

	Advantages	Accessory Considerations	Typical Available Can Sizes
Type A Gun Foam	Controllable bead dispensing Gun is reusable Higher yield	Gun cleaner Extended barrel length dispensers for subfloor Extensions for tip of barrel for narrow gaps	20 oz, 24 oz, 32 oz
Type B / C	Typically for limited one-time use Low cost and convenient Minimal dispensing control	Additional straws	6 oz, 12 oz, 16 oz, 20 oz, 24 oz
Straw Foam	Readily available No gun dispenser is needed		

NOTE 1—Gun cleaner is recommended with the professional system.

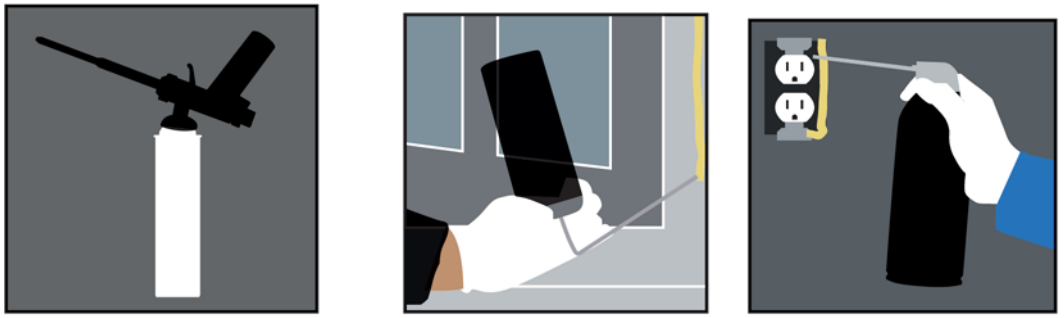
8.4 *Straw Foam Sealants*—The product of this reaction is bead extruded from pressurized containers through a simple attached straw and trigger designed for smaller, single use applications.

8.4.1 Ensure substrate for installation is dry and clean from debris. For optimal installation, a light pre-moistening of the substrate may be required to achieve desirable foam expansion and cure.

8.4.2 Mount the straw on the trigger-dispenser and screw the trigger onto the valve stem. Shake can vigorously after attaching the dispenser. Point discharge end of dispenser away from user and pull trigger to dispense foam. Adjust your finger pressure on the trigger as needed to control bead diameter.

9. Substrates

9.1 Aerosol foam sealants can be installed to provide a durable air barrier in a variety of building construction types. Polyurethane foam sealants will bond to most typical building substrates such as wood, gypsum, and concrete. Specialty plastics such as PTFE (polytetrafluoroethylene) may pose adhesion challenges. Polyurethane and latex foams are not known to degrade any dry substrates such as polystyrene. Special consideration should be given to wet or potentially wet situations such as pipe condensation as potential substrate discoloration or degradation could occur. Consult foam sealant



Warning–Do not inject foam sealant into the outlet or outlet box.

FIG. 6 Product Dispensing Selection Types

manufacturer's written installation instructions for limitations of specific products being installed.

9.2 Aerosol foam sealants must be used within the limits of the numerous allowances and restrictions on building, finish, insulating and trim materials contained within the applicable building code, depending on each specific application for which the specific aerosol foam is intended.

10. Environmental Influences

10.1 Extreme temperature and humidity conditions can impact product bead structure of aerosol foam sealants during installation and cure process. Polyurethane aerosol foam sealants require atmospheric moisture to cure once extruded from the container. Latex foam sealants cure best at low relative humidity.

10.2 Installation in temperatures >90°F presents higher risk condition of improper expansion and curing of an aerosol foam bead structure.

10.3 Installation in temperatures of <40°F presents higher risk condition of a low product dispensing rate, brittleness of bead structure after cure and poor cellular structure. Consult foam sealant manufacturer's written data for environmental limitations of specific products being installed.

11. Storage

11.1 Product storage is critical to achieving optimum performance during installation as well as meeting intended expiration periods.

11.2 Store product between 50°F and 75°F in dry area protected from UV light. Consult manufacturer's recommendations for requirements of specific products.

11.3 Aerosol foam sealant canisters exposed to temperatures >120°F pose a risk of rupturing. Caution must be observed during storage and transport of aerosol containers. Never store foam sealants in an enclosed vehicle or car trunk.

11.4 Aerosol foam sealant acceptable use periods before expiration range from 9 to 18 months. Expiration dates are product specific designated by the manufacturer.

12. Keywords

12.1 aerosol; aerosol foam; air barrier foam sealant; air exfiltration; air infiltration; foam sealant; latex foam sealant; polyurethane foam sealant