



Designation: C1848 – 17a (Reapproved 2023)

Standard Practice for Installation of High-Pressure Spray Polyurethane Foam Insulation for the Building Enclosure¹

This standard is issued under the fixed designation C1848; 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 covers the installation of high-pressure spray polyurethane foam (SPF) as an insulation for building enclosure assemblies including: walls, ceilings, attics, floors, and crawl spaces. This practice does not apply to SPF used strictly as a component for an air barrier system or for SPF used in roofing applications.

1.2 Building design criteria and selection of SPF are beyond the scope of this practice.

1.3 The use of SPF insulation covered by this practice is typically regulated by building codes or other agencies that address fire performance. Where required the fire performance of the material shall be addressed through standard fire test methods established by the appropriate governing documents.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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

1.6 *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

C168 Terminology Relating to Thermal Insulation

¹ This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.40 on Insulation Systems.

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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.

D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

D4449 Test Method for Visual Evaluation of Gloss Differences Between Surfaces of Similar Appearance

D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

D5469 Guide for Application of New Spray Applied Polyurethane Foam and Coated Roofing Systems

D6226 Test Method for Open Cell Content of Rigid Cellular Plastics

D7425 Specification for Spray Polyurethane Foam Used for Roofing Applications

2.2 *European Standard:*³

EN 14315-2:2013 Thermal insulating products for buildings - In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products - Part 2: Specification for the installed insulation products

2.3 *Society for Protective Coatings (SSPC):*⁴

SSPC SP 1 Society for Protective Coatings: Solvent Cleaning

SSPC SP 6 Society for Protective Coatings: Commercial Blast Cleaning

2.4 *Spray Polyurethane Foam Alliance (SPFA):*⁵

SPFA-119 Glossary of Terms

SPFA-137 Spray Polyurethane Equipment Guidelines

SPFA-143 Primers: Why, When and How to Use Them

SPFA-148 Spray Polyurethane Foam Insulation Installation Certificate

3. Terminology

3.1 Definitions are in accordance with Terminology C168.

3.2 *Definitions:*

3.2.1 Specific Definitions per SPFA-119:

3.2.2 *lift, n*—the sprayed polyurethane foam resulting from passes of foam in a specific area, as defined by its thickness and the area.

³ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.

⁴ Available from Society for Protective Coatings (SSPC), 800 Trumbull Dr., Pittsburgh, PA 15205, <http://www.sspc.org>.

⁵ Available from Spray Polyurethane Foam Alliance (SPFA), 3927 Old Lee Hwy, #101B, Fairfax, VA 22030, <http://www.sprayfoam.org/>.

3.2.3 *pass, n*—the amount of coating or polyurethane foam applied by moving the gun from side to side and moving away from fresh material, delineated by its width, length, and thickness.

4. Classifications

4.1 *Low-Pressure Spray Polyurethane Foam*—Spray polyurethane foam where the plural components (A- and B- side) are delivered a pressure of less than 1.72 MPa (250 psi), at a rate up to 6.4 kg/min (10 lb/min) wherein the liquid components are mechanically mixed using a static mixing nozzle. Components are typically delivered in pressurized tanks.

4.2 *High-Pressure Spray Polyurethane Foam*—Spray polyurethane foam where the plural components (A- and B-side) are delivered at a pressure between 3.45 and 8.96 MPa (500 and 1300 psi), at a rate up to 13.6 kg/min (30 lb/min) wherein the liquid components are aerosolized and impingement mixed outside of the spray gun.

NOTE 1—Both classes of plural components spray polyurethane foam are defined in this standard to identify their differences. This standard only applies to installation of high-pressure spray polyurethane foam.

5. Significance and Use

5.1 This practice outlines general procedures that are recommended for correct installation of spray polyurethane foam (SPF) as an insulation in the building enclosure including; walls, ceilings, attics, floors, crawl spaces, attics and foundations.

NOTE 2—SPF roofing installations are not covered by this document. Users may wish to consult Guide D5469 and Specification D7425.

5.2 This practice is not all-inclusive; this practice is intended only to supplement detailed instructions from manufacturers, SPF industry best practices and safety requirements as may be established by law.

6. Substrate Requirements

6.1 General Requirements:

6.1.1 Installation of SPF in buildings or structures shall conform to the requirements of the applicable construction codes, regulations and standards as adopted and enforced by the relevant authority having jurisdiction or local code official.

6.1.2 Substrate materials to receive SPF should be physically stable and resistant to movement or excessive flexure relative to the building structure.

6.1.3 All substrates to receive SPF should be clean, dry and free of contaminants that may cause poor adhesion of the SPF.

NOTE 3—If in doubt of the potential adhesion, spray a section of the substrate with SPF and test the adhesion in accordance with SPF industry guidelines. An example of a typical SPF field adhesion test procedure is provided in Test Method D4541. To assure proper bonding of SPF to the substrate, the failure surface should indicate a cohesive failure of the SPF.

6.2 Metal:

6.2.1 Primed or coated metal substrates should be free of dirt, loose scale, rust, weathered or chalked coatings. Such substrates should be cleaned using suitable means.

NOTE 4—Suitable means may include, but are not limited to, clean and dry compressed air, vacuum equipment, and hand or power tools.

6.2.2 Grease, oil or other contaminants should be removed with suitable cleaning solutions. An example of a specification for solvent cleaning of metal surfaces is provided by SSPC SP 1.

6.2.3 Fine condensation on some metal substrates may be difficult to visually detect. Consider using moisture-detection paper (cobalt-chloride strips) to check for condensation when metal substrate temperatures are close to the atmospheric dew point temperature.

6.2.4 Thick metal substrates, such as structural steel and walls of pressure vessels can act as a heat sink. In these cases, consult manufacturer installation instructions (MII) or contact the SPF manufacturer.

6.2.5 If the cleaned metal substrate does not allow for adequate adhesion of the SPF, primers may be needed and installed in accordance with the primer and the SPFMII. Guidance for primer selection can be found in SPFA-143.

6.2.5.1 *Ferrous Metal*—Sandblasting is recommended for iron and steel surfaces that are not shop primed, painted, or otherwise protected. Remove loose rust and unsound primer from shop-primed iron and steel surfaces. The sandblasted area should be primed the same day using an SPF-compatible primer. An example of a specification for abrasive blast cleaning procedures and condition of steel surfaces is provided by SSPC SP 6.

6.2.5.2 *Non-Ferrous Metal*—SPF Installer should clean and prime all surfaces (if required) as recommended by primer or SPF manufacturer, or both.

6.3 Concrete or Masonry:

6.3.1 SPF installer should verify the concrete or masonry surfaces are clean, and free of contaminants that can affect adhesion. Existing concrete should be free of spalling, scaling, loose coatings, efflorescence and other conditions that affect adhesion.

6.3.2 SPF Installer should verify the concrete is dry to obtain good adhesion of the primer or SPF, or both. Consider using Test Method D4263 or other reliable method approved by the SPF and primer manufacturer to check concrete moisture.

6.3.3 SPF installer should verify that any newly poured concrete has cured before application of SPF or primer.

NOTE 5—Most new poured concrete requires a 28-day cure time unless the concrete is specifically designed for a shorter cure time.

6.3.4 Thick concrete substrates can act as a heat sink. In these cases, consult MII or contact the SPF manufacturer.

6.3.5 Primer (as may be required) should be applied as recommended by the primer and SPF manufacturer.

6.4 Wood:

6.4.1 The SPF installer should verify the wood surface is clean, dry and free of contaminants that can affect adhesion.

6.4.2 Wood substrates should typically have a surface moisture content no greater than 18 % as measured in accordance with Test Method D4449. Field measurements may be obtained with hand held moisture meters.

6.4.3 Treated wood (for insects or water resistance) may provide poor adhesion and should be evaluated for adhesion. If

a primer is required, it should be applied as recommended by the primer and SPF manufacturer.

6.5 *Interior Cladding Board (gypsum board, fiberboard, fiber-reinforced gypsum board, etc.):*

6.5.1 SPF installer to verify surfaces are clean, dry and free of contaminants that can affect adhesion.

6.5.2 Primer, if required, shall be applied as recommended by primer or SPF manufacturer, or both.

7. Equipment

7.1 SPF shall be metered and mixed through equipment capable of providing a fixed volumetric ratio of equal parts of A-side (isocyanate) and B-side (polyol blend) chemicals, with an accuracy of $\pm 2\%$ by volume at the temperature ranges specified by the MII. The A and B side chemicals shall be provided by a single supplier and designed to work as a matched system. Typical equipment for high-pressure SPF application is shown in Fig. 1, and described in detail in SPFA-137.

7.2 SPF foam ratio control should be monitored by proportioner equipment, which indicates constant pressure and also by observing the uniform color and spray pattern of the spray applied foam.

7.3 SPF equipment shall provide temperature control of the A and B components to within an accuracy of 2.8°C (5°F).

8. Installation Personnel

8.1 Installation of high-pressure SPF requires training and experience. All SPF installers should be trained on the proper operation of the equipment and installation of the SPF materials. Training may be provided by manufacturers, distributors or third-party organizations. Certifications or licensing programs, or both, may be available.

9. Safety Requirements

9.1 All handling, storage and installation safety precautions shall be as defined by the Safety Data Sheet (SDS) and other applicable documents provided by the material supplier.

9.2 SPF installers shall conform to all applicable state, local and federal government regulations and SPF industry best practices, including use of appropriate engineering controls and personal protective equipment during and shortly after SPF installation. All personnel inside the designated spray zone must wear proper personal protective equipment. Other trades must be kept outside of the spray zone until it is deemed safe to re-enter. Re-entry time should be clearly posted on warning signage at all entry points to the spray zone.

NOTE 6—Designated spray zone is a clearly-marked isolated volume that is properly ventilated during and shortly after SPF installation.

NOTE 7—The time to re-enter or re-occupy the spray zone should be specified by the SPF manufacturer. If this time is not provided by the

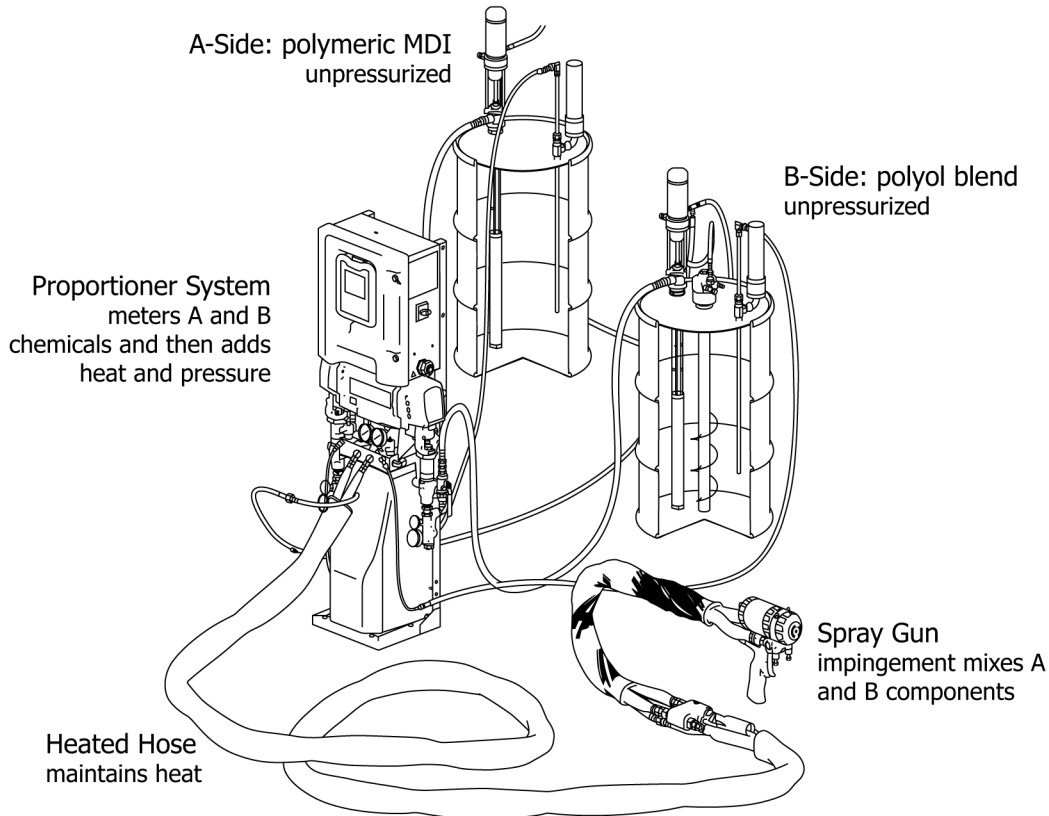


FIG. 1 Typical High-Pressure SPF Equipment