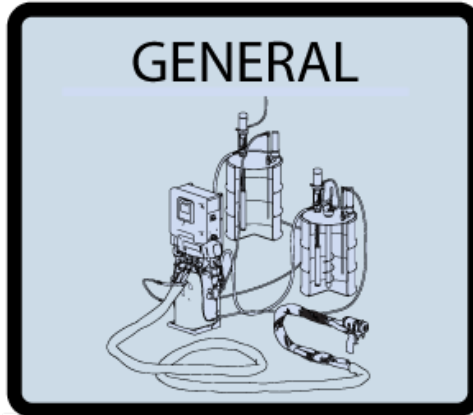
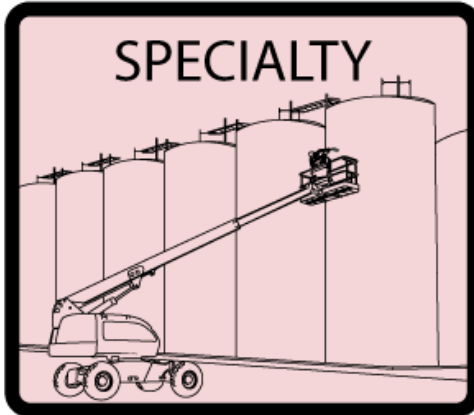
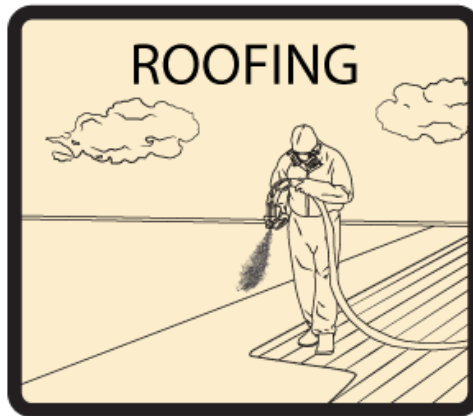
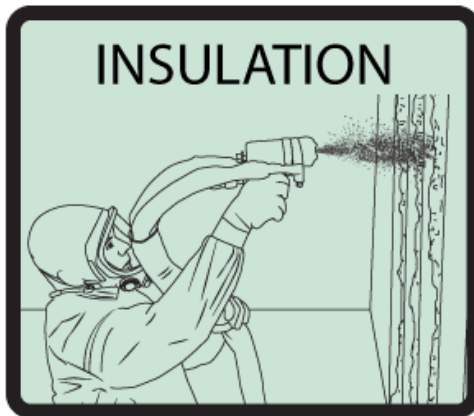




Spray Polyurethane Foam for Exterior Subgrade Thermal and Moisture Protection

SPFA-140



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ABOUT SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

Founded in 1987, the Spray Polyurethane Foam Alliance (SPFA) is the voice, and educational and technical resource, for the spray polyurethane foam industry. A 501(c)6 trade association, the alliance is composed of contractors, manufacturers, and distributors of polyurethane foam, related equipment, and protective coatings; and who provide inspections, surface preparations, and other services. The organization supports the best practices and the growth of the industry through a number of core initiatives, which include educational programs and events, the SPFA Professional Installer Certification Program, technical literature and guidelines, legislative advocacy, research, and networking opportunities. For more information, please use the contact information and links provided in this document.

DISCLAIMER

NOTE: This document was developed to aid building design professionals in choosing spray-applied polyurethane foam systems. The information provided herein, based on current customs and practices of the trade, is offered in good faith and believed to be true, but is made WITHOUT WARRANTY, EITHER EXPRESS OR IMPLIED, AS TO FITNESS, MERCHANTABILITY, OR ANY OTHER MATTER. SPFA DISCLAIMS ALL LIABILITY FOR ANY LOSS OR DAMAGE ARISING OUT OF ITS USE. Individual manufacturers and contractors should be consulted for specific information. Nominal values which may be provided herein are believed to be representative, but are not to be used as specifications nor assumed to be identical to finished products. SPFA does not endorse the proprietary products or processes of any individual manufacturer, or the services of any individual contractor.

DOCUMENT HISTORY

Date	Sections Modified	Description of Changes
January 2003		
August 2015	All	Administrative changes

TECHNICAL OVERSIGHT COMMITTEE

Mission Statement

The mission of the Technical Committee is to provide a wide range of technical service to the SPF (spray polyurethane foam) industry such as, but not limited to:

- (1) Review existing documents and serve as a clearing house to ensure the “Continuity of Value” of technical information published by SPFA and others concerning the products and services to the SPF industry;
- (2) Review, research, develop, and issue documents concerning new products, systems and services; and
- (3) To identify, explore, develop, and communicate an understanding of technical issues facing to the SPF industry.



Participating Members	
Roger Morrison, Chairman North Carolina Foam Industries	Bruce Schenke BASF
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DESIGN CONSIDERATIONS

GENERAL CONSIDERATIONS

The performance of an SPF (spray-applied polyurethane foam) thermal and moisture protection system can be affected by all the component parts of a foundation structure.

Building codes may not approve the installation of foam plastics on building exteriors below grade in areas where termite infestation is considered “very heavy.” Check with local building code authorities for the applicability of applying SPF below grade in your area.

Structural design, specification review, and contractor and material selection, coupled with the compatibility and positioning of the various structural components, are necessary to produce a successful SPF thermal and moisture protection system.

The specifier should consult with the respective material suppliers and the contractor to receive written confirmation of their agreement to all facets of the thermal and moisture protection system.

There must be sufficient space in the trench to allow a minimum of 2-1/2 feet (760 mm) distance from the spray gun to the substrate wall. (Note: 4 feet [1,200 mm] minimum space from the substrate wall to the trench wall should be sufficient).

DETERMINING SPF INSULATION THICKNESS

Determine the minimums for each of the situations described below, and choose the method that prescribes the greatest insulation thickness:

- (1) Building and Energy Codes: Most code agencies require certain buildings to meet energy conservation standards. Check with local code authorities for requirements.
- (2) Condensation Control: Condensation can occur inside a building or a building cavity when a surface temperature is lower than the dew point of the air. SPF insulation thickness to control this condensation must be based on the design dew point and the design exterior ambient temperature. See SPFA publication SPFA-118, “Moisture Vapor Transmission.”
- (3) Economic Thickness: Greater insulation thickness decreases heat and cooling costs and the cost of HVAC equipment. An economic thickness calculation determines the added incremental insulation thickness, which meets a specified return on investment from energy cost savings. See *ASHRAE Handbook of Fundamentals*. The insulation contractor or supplier may also be able to assist in determining economic thickness.
- (4) Minimum Practical Thickness: SPF applications must be sprayed to a minimum thickness to uniformly cover the substrate and to achieve suitable physical properties. For relatively smooth substrates, the minimum practical thickness is 1 inch (25 mm), but corrugated or unusual substrate configurations may require greater thickness to achieve a suitable finished foam surface.

SURFACE PREPARATION

SPF can successfully be applied to most surfaces. However, the following general practices must be observed.

(1) GENERAL SURFACE PREPARATION PROCEDURES

- a. The building assembly must be secure against delamination and movement that could affect the performance of the SPF thermal and moisture protection system.
- b. There must be full adhesion between the SPF and the substrate. Prior to the application of SPF, the foundation wall must be dry and free of loose dirt or any contaminants that may interfere with adhesion.

(2) WOOD FOUNDATION WALLS

- a. Priming may be required to achieve maximum adhesion of the SPF.

(3) MASONRY AND CONCRETE FOUNDATION WALLS

- a. Concrete surfaces must be dry and free of laitance, release agents, and other contaminants that could affect the adhesion of SPF.
- b. Primers are typically not required on raw masonry or concrete; however, primers may be required under special circumstances.

SELECTION OF PRIMER

If circumstances require a primer, it should be considered in accordance with the type substrate to be sprayed, the intended end use of the wall assembly, and the recommendations of the SPF and primer manufacturers.

SELECTION OF A VAPOR RETARDER

If a vapor retarder is required, its selection should be based on the following criteria:

- (1) Perm rating required (based on moisture vapor drive and perm ratings of other components)
- (2) Compatibility with adjoining materials
- (3) Compatibility with adjoining materials

SELECTION OF THE SPRAY POLYURETHANE FOAM SYSTEM

Many different SPF systems are available in various densities, each exhibiting different temperature limitations and physical properties.

Most published data is run on laboratory-produced samples. The thickness of polyurethane foam sprayed, number of passes, temperature of substrate, ambient temperatures, etc., have a pronounced effect on all properties.

From a fire safety standpoint, SPF can be used safely. It is important, however, that all persons associated with the design, fabrication, storage, and installation understand the materials and environments involved.

Polyurethane foam insulation is combustible and should be treated as such. Flame spread ratings provided for polyurethane products using small scale tests are not intended to reflect the hazards presented by this or any other materials under actual fire conditions. Care must be taken to ensure that the foam is not exposed to temperatures in excess of 93°C (200°F).

SELECTION OF WATERPROOFING

SPF is resistant to water intrusion; however, under circumstances such as high water tables, water could accumulate in the SPF. If these circumstances are anticipated, waterproofing is recommended. Waterproofing must form a water-resistant protective membrane over the SPF.

This guide discusses the application of seamless SPF for use as a subgrade thermal and moisture protection system. Your contractor, systems manufacturer, and local code agencies can assist you, as each project must be assessed individually.

PART 1—GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, tools, and equipment necessary for the application of an SPF subgrade thermal and moisture protection system, including accessory items, subject to the general provisions of the contract.

1.02 RELATED WORK SPECIFIED ELSEWHERE

(1) Cast-in-place concrete	Section 03300
(2) Masonry construction	Section 04200
(3) Rough carpentry	Section 06100
(4) Foundation drainage	Section 02710
(5) Waterproofing	Section 07700
(6) Insulation	Section 07200

1.03 QUALITY ASSURANCE

Contractor Qualifications: The contractor should provide information concerning projects similar in nature to the one proposed, including location and person to be contacted. Some manufacturers of SPF systems have approval programs and/or licensing methods that could be applicable.

1.04 SUBMITTALS

- (1) Manufacturers to provide published data sheets or letters of certification that their products comply with the materials specified, including primers (if required), SPF, and waterproofing
- (2) Shop drawings on specific foundation and footer terminations
- (3) Manufacturer's application or installation instructions
- (4) Contractor and applicator certification from SPF manufacturer or other evidence of contractor qualification and experience. (See Section 1.03)
- (5) Safety and handling instructions for storage, handling, and use of the materials to include MSDS (Materials Safety Data Sheets)
- (6) Field Quality Control Procedures to be utilized by the contractor and applicator to ensure proper preparation and installation of SPF and protective coating, detail work and follow-up inspection

1.05 MATERIALS, DELIVERY, AND STORAGE

- (1) Materials shall be delivered in the manufacturer’s original, tightly sealed containers or unopened packages, all clearly labeled with the manufacturer’s name, product identification, safety information, and batch or lot numbers where appropriate.
- (2) Containers shall be stored out of the weather and direct sun, where the temperatures are within the limits specified by the manufacturer.
- (3) All materials shall be stored in compliance with local fire and safety requirements.

1.06 ENVIRONMENTAL CONDITIONS

Do not apply the SPF below the temperature or above the humidity specified by the manufacturer.

1.07 SEQUENCE AND SCHEDULING

The SPF is installed when the foundation walls and penetrations have been completed. Subsequent penetrations must be resealed. There should not be any other trades in the immediate area when the SPF and waterproofing are being installed.

1.08 SAFETY REQUIREMENTS

- (1) See API Bulletin SPFA-119, “MDI -Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal.”
- (2) Refer to appropriate MSDS for additional safety information.
- (3) Proper disposal of waste materials and containers must be done in compliance with the manufacturer’s guidelines and federal, state, and local regulatory agencies.
- (4) See OSHA 29 CFR 1926 “Safety and Health Regulations for Construction.”

PART 2—PRODUCTS

2.01 SPF

The polyurethane foam to be applied shall be a two-component system made by combining an isocyanate (A-component) with a polyol (B-component) and shall possess the following physical characteristics:

PROPERTIES (Sprayed in Place)	ASTM TEST	SI UNITS	US UNITS
Density	D-1622	48 kg/m ³	1.5—3.0 lbs/ft ³
Comprehensive Strength	D-1621	100 kPa (minimum)	15 lb/in ² (minimum)
Closed Cell Content	D-2856	90% (minimum)	90% (minimum)
R-Value	C-177, C-236, or C-518	1.1 K•m ² /W (minimum)	6.0°F•hr•ft ² /Btu
Smoke*	E-84	<450	<450

*This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions. This numerical flame spread rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

2.02 WATERPROOFING

The waterproofing must be suitable for below-grade application.

2.03 RELATED PRODUCTS

- (1) Drainage board, if specified, can be applied to the finished surface.
- (2) Protection board, if specified, can be used to protect the finished installation prior to backfilling.
- (3) Substrate primer, if required, shall be used as recommended by the manufacturer of the SPF specified.

PART 3—EXECUTION

3.01 APPLICATION OF PRODUCTS

The products intended for use in the building envelope insulation system must be applied within the manufacturer's guidelines for temperature, humidity, and other atmospheric conditions. They must be sequenced so as to take into consideration substrate preparation, proper cure times, and inter-coat adhesion.

3.02 SUBSTRATE CONSIDERATION AND PREPARATION

- (1) Concrete/Masonry
 - a. Remove loose dirt, dust, debris, or other contaminants prior to the application of the thermal and moisture protection systems.
 - b. If priming is required, the primer shall be applied in accordance with Section 3.03.
- (2) Wood
 - a. Plywood shall contain no more than 18% water, as measured in accordance with ASTM D4449.
 - b. Priming may be required to achieve maximum adhesion of the SPF. If required, apply priming in accordance with Section 3.03.
 - c. The surface shall be free of contaminants prior to the application of the primer or SPF.

3.03 PRIMER APPLICATION

When required, the primer shall be applied to the properly prepared substrate in accordance with the manufacturer's guidelines.

3.04 SPF APPLICATION

- (1) Inspection
 - a. Prior to the application of the SPF, the substrate surface shall be inspected to ensure that conditions required by Sections 3.02 and 3.03 have been satisfied.
 - b. Verify that temperature, humidity, and other atmospheric conditions are within the SPF manufacturer's guidelines for the application of SPF.
- (2) Application
 - a. The SPF A- and B-components shall be processed in accordance with the manufacturer's instructions.
 - b. The SPF shall be sprayed in minimum 1/2 inch (13 mm) thick passes with the overall thickness to be a minimum of ___ inches (___ mm). The full thickness of SPF to be applied within any given area should be completed in one day.
 - c. The SPF total thickness will be a minimum of 1 inch (25 mm) or more if specified. The SPF shall be applied uniformly over the entire surface with a thickness tolerance of plus 1/4 inch per inch (7 mm per 25 mm) of specified thickness, minus zero.
 - d. Foamed-in-place fillets shall be smooth and uniform to allow positive drainage at the intersection of the foundation wall and the footing.
 - e. SPF shall be terminated in a clean, neat line.
- (3) Surface Finish
 - a. The final SPF surface shall be "smooth," "orange peel," "coarse orange peel," or "verge of popcorn." SPF surfaces designated as "popcorn" or "treebark" are not acceptable. These areas shall be removed and refoamed to an acceptable surface texture.
 - b. Damage or defects to the SPF surface shall be repaired prior to the application of the waterproofing.

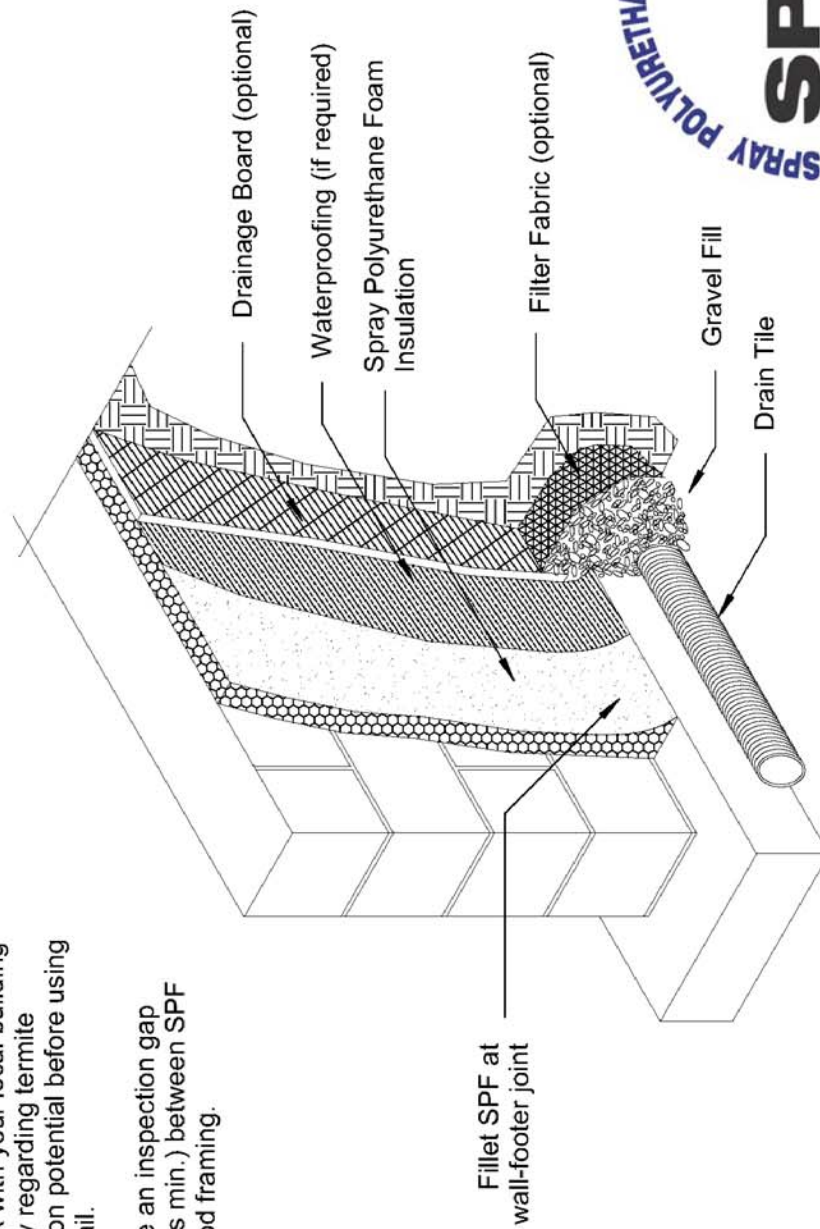
3.05 WATERPROOFING APPLICATION

- (1) The SPF surface shall be free of contaminants that would impair the adhesion of the waterproofing.
- (2) The waterproofing shall be applied to all SPF surfaces and extended 2 inches above the foam termination line.
- (3) Waterproofing shall be applied to achieve a minimum dry film thickness of ___ mils (___ mm).
- (4) The waterproofing shall be allowed to fully cure prior to the installation of the protective board and backfill.

EXTERIOR SUBGRADE SPF THERMAL & MOISTURE PROTECTION

Notes:

1. Check with your local building authority regarding termite infestation potential before using this detail.
2. Leave an inspection gap (6 inches min.) between SPF and wood framing.



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