

Guide Specification

BASF Seamless Urethane/Polyurethane Insulation System for Digesters

PART 1 - GENERAL

1.01 Work Included

- A. Preparation of Substrate
- B. BASF Elastospray® Sprayed-in-place Polyurethane Foam (SPF) Insulation
- C. Neogard Urethane Coating
- D. Granules
- E. Walkways

1.02 Related Work

- A. Section 01410: Testing Laboratory Services
- B. Section 03300: Cast-in-Place Concrete
- C. Section 09900: Painting

1.03 Related Documents

The codes, standards and practices listed shall be the latest edition. ASTM refers to ASTM International.

ASTM C 518 – Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM D 93 – Standard Test Methods for Flash Point by Penske-Martens Closed Cup Tester

ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

ASTM D 822 – Standard Practice for Filtered Open Flame Carbon Arc Exposures of Paint and Related Coatings

ASTM D 1004 – Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting

ASTM D 1203 – Standard Test Methods for pH of Water

ASTM D 1310 – Standard Test Method for Flash Point and Fire Point of Liquids by Tag Open Cup Apparatus

ASTM D 1353 – Standard Test Method for Non Volatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer and Related Products

ASTM D 1475 – Standard Test Method for Density of Liquid Coatings, Inks and Related Products

ASTM D 1621 – Standard Test Method of Compressive Properties of Rigid Cellular Plastics

ASTM D 1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics

ASTM D 2126 – Test Method for Response of Rigid Cellular Plastics to Thermal and Heat Aging

ASTM D 2240 – Standard Test Method for Rubber Property Durometer Hardness

ASTM D 2856 – Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer

ASTM D 4209 – Standard Practice for Determining Volatile and Non-Volatile Content of Cellulosics, Emulsions, Resin Solutions, Shellac and Varnishes

ASTM D 6947 – Liquid-Applied Moisture Cure Urethane coating used in Spray Polyurethane Foam Roofing Systems

ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E 96 – Standard Test Method for Water Vapor Transmission of Materials

ASTM E 108 (UL 790) – Standard Test Method for Fire Tests of Roof Coverings

1.04 Quality Assurance

- A. Applicator Qualifications: Must be a current BASF Approved Team Q Applicator or current applicator of the approved SPF system manufacturer.
- B. Applicator must exhibit 5 years and a minimum of 500,000 sq. ft. experience with the selected SPF system, with projects of a similar scope and nature.
- C. A Pre-Bid Conference shall be conducted. Its purpose shall be: To discuss any details of the project not adequately covered within the specification; to allow bidding applicators a period of access to the digester areas; and to review the normal flow of activities at the facility. There will be no other access to the digester area without the consent of the owner's representative. All bidding applicators must attend this Pre-Bid Conference. A list of those companies present will be recorded.
- D. The SPF applicator shall perform the work of this section. Subcontracting installation of the urethane coating/polyurethane foam is not allowed.
- E. Inspections: Completed digester insulation application will be inspected by an independent inspection firm designated by the warranty provider on a periodic basis.

1.05 Submittals

- A. Specification Development - The owner/specifier shall supply to BASF manufacturer's representative:
 - 1. A draft copy of the project specification, including: the SPF insulation system section, warranty requirements, and drawings. This shall be completed before project goes out to bid.
 - 2. This draft specification shall be reviewed for general technical acceptance and eligibility for issuance of a warranty. A letter confirming an appropriate application, drawings and specification, based on the current available information, will be delivered to the owner's representative at their request.
- B. Any alternate products shall be submitted to the owner and/or owner's representative 10 days before bid date to allow time for product review. Submittals shall include: all appropriate technical data sheets, manufacturer's references, warranty, follow-up inspection policy and outline, material safety data sheets, and a typical, physical sample (3' x 3') to be used as a standard of quality. Manufacturer shall supply list of geographically appropriate work and list of work of similar size and scope to substantiate their period of performance, see 2:02A.1.
- C. Applicator shall submit to owner's representative at or before time of bid:
 - 1. Reference projects with contacts, substantiating years of experience and completion of minimum prior work submitted by applicator.
 - 2. Provide specimen copy of warranty.
 - 3. Submit Underwriters Laboratory, UL 790 classification, and other approvals as required/requested.

1.06 Materials, Delivery and Storage

- A. Deliver materials to the site in their original, tightly sealed containers, all clearly labeled with manufacturer's name, product identification and lot number.
- B. Safely store materials in their original containers out of the weather and where the temperatures are within the limits specified by the manufacturer.
- C. All materials shall be stored in compliance with applicable fire and safety requirements.

- D. Protect materials from damage during transit, handling, storage and installation. Applicator shall provide secure site storage trailers.

1.07 Environmental Conditions

- A. The coating and the polyurethane foam shall not be applied during periods of inclement weather (rain, snow, fog, mist).
- B. Do not apply the polyurethane foam when substrate or ambient air temperatures are below 40°F (5°C) unless specifically approved in writing by the polyurethane foam manufacturer.
- C. Do not apply urethane coatings when temperature is below 40°F (5°C).
- D. When wind speeds exceed 10 miles per hour or adversely affects the quality of the SPF, windscreens shall be used during the application of the polyurethane foam and coatings to prevent overspray onto surfaces not intended to receive foam and coating. Under no circumstances shall the polyurethane foam or urethane coating be applied when wind speeds exceed 25 miles per hour.

1.08 Sequencing and Scheduling

The spray polyurethane foam is installed when the digester valves and piping are completed. There should not be any tradespeople working on the digester exterior when the spray polyurethane foam and urethane coating are being installed.

1.09 Warranty

The SPF system manufacturer's **10 Year Full System Warranty** shall be issued upon completion, inspection and acceptance of the project. Any repairs covered by the warranty are without cost to the Owner throughout the term. The warranty shall be comprehensive with no proration and no cap for repairs.

PART 2 - PRODUCTS

2.01 Polyurethane Foam Insulation

- A. The coating material and the SPF insulation must be supplied by one manufacturer.
- B. Physical property requirements are as follows, for acceptable insulation products with Zero-Ozone Depleting Potential, such as BASF Elastospray 81285 and 81305.

Property	Value	Test Method
Density, sprayed-in-place, pcf, min.	2.7 - 3.2	ASTM D 1622
Compressive strength, psi, min.	50	ASTM D1621
Closed-cell content, percent, min.	>90	ASTM D 2856
K-factor, aged, max	0.158	ASTM C 518
Dimensional Stability, 28 days, Percent volume change, max.	+0.69	ASTM D 2126
Flame spread, max.	<75	ASTM E 84

2.02 Urethane Coating

- A. The urethane membrane shall consist of a minimum two coats of an elastomeric, liquid applied material, domestically engineered and produced. The two coats shall be of contrasting colors. The minimum two-coat thickness shall be **40** dry mils.

1. The urethane coating will be a product proven through actual performance for a period of time equal to, or longer, than the term of the requested warranty.
2. The warrantor shall have an established program to rapidly respond to any required warranty repair, if the original applicator is unable to perform standard repairs.
3. The Neogard 7419 aromatic urethane base coating has the following minimum properties:

<u>Property</u>	<u>Value</u>	<u>Test Method</u>
As Supplied:		
Solids Content		
by weight, percent	90	ASTM D 4209
by volume, percent	84	calculated
Weight (lbs) per gallon	11.2	ASTM D 1475
Flash Point, Pensky-Martin. closed cup, °F, min	107	ASTM D 93
Volatile Organic Content (VOC), (g/l)	145	EPA Method 24
As Cured:		
Tear Resistance, lbs/in	100	ASTM D 1004
Tensile Strength, die C, psi	350	ASTM D 412
Elongation, percent	500	ASTM D 412
Permeability, English perms	1.6	ASTM E 96

4. The Neogard 70611 Series aromatic urethane top coating has the following minimum properties.

<u>Property</u>	<u>Value</u>	<u>Test Method</u>
As Supplied:		
Solids Content		
By weight, percent	83	ASTM D 1353
By volume, percent	76	Calculated
Weight (lbs) per gallon	10.5	ASTM D 1475
Flash Point, °F, min	110	ASTM D 1310
Volatile Organic Content (VOC), lbs/gal	1.83	
As Cured:		
Tensile Strength, min, psi	1500	ASTM D 412
Elongation, min, percent	360	ASTM D 412
Permeability, English Perms	2.2	ASTM E 96 (B)
Tear Resistance, lbs/in	140	ASTM D 1004
Weathering Resistance	slight chalk	ASTM D 822

2.03 Sealant

- A. Sealant shall be a pigmented urethane sealant such as BASF NP1 Urethane Sealant. The color of this sealant, if exposed, shall closely match that of the topcoat.

2.04 Substrate Primer

- A. For concrete, - the primer must be approved by BASF Corporation, such as a water-based epoxy BASF FE 1601 Primer.
- B. For non-ferrous metals (cleaned aluminum, galvanized copper, etc) - a primer shall be required, which is approved by BASF Corporation. Such a primer is Mist Coat II Primer by Jones-Blair.
- C. For mild steel – The primer shall be a BASF approved polyamide epoxy corrosion resistant primer.

2.05 Granules

- A. Granules shall be number 11 screen size, ceramic-coated granules as manufactured by the Industrial Products Division of 3M Company or equal, color to best match topcoat.
- B. Quartz or silica aggregate such as U. S. Silica Company's #2 unground silica, this product will have natural color variations, color should be selected to match topcoat.

2.06 Protective Covering / Walkways

- A. As required a weather-resistant, breathable, resilient pad composed of synthetic rubber strands shall be installed to create additionally protected areas. This product shall be approved by BASF. Such a walkway is Yellow Spaghetti, as manufactured by Western Plastics, Inc.
- B. Walkways may alternately be constructed by outlining the walkway on the finished system, applying an additional ten dry mils of the urethane top coating in a contrasting light color and embedding additional colored granules to match the top coating in the walkway.

PART 3 – EXECUTION

3.01 Inspection

- A. Verify that all surfaces to receive polyurethane foam insulation are clean, dry and free of dust, dirt, debris, oil, solvents and all materials that may adversely affect the adhesion of the polyurethane foam.
- B. Verify that all penetrations and flashings are properly installed and secured.
- C. Do not begin applying polyurethane foam insulation until substrate and environmental conditions are satisfactory.

3.02 Surface Preparation

A. Concrete Surfaces

1. The concrete shall be cured a minimum of 28 days at temperatures above 50°F and must be free of any laitance.
2. Remove all loose dirt, dust and debris using air pressure, a hand or power broom and/or a vacuum. Oil, grease, release agents and other contaminants must be removed using the appropriate cleaning solution.
3. All joints or cracks greater than ¼ inch shall be caulked or grouted prior to polyurethane foam application.
4. Make sure all surfaces are clean and dry prior to application of an approved primer and polyurethane foam application.
4. Prime the clean, dry concrete surface with BASF FE 1601 Black primer at the rate of ½

gallons per 100 square feet.

B. Mild Steel Surfaces

1. Mild steel shall be prepared per SSPC 6 Commercial blast.
2. The primer shall be an approved polyamide epoxy corrosion resistant primer applied per the manufacturer's recommendations.

C. Other Surfaces

1. Contact BASF's Technical Services for recommendations on surface preparations on other surfaces to receive a BASF Urethane Coating and SPF insulation system. Contact BASF technical department for recommendations at (800) 706-0712, or spfinfo@basf.com.

3.03 Polyurethane Foam Application

A. Inspection

1. Prior to polyurethane foam application, inspect the substrate surface to ensure preparations required in Section 3.02 have been met.
2. Polyurethane foam shall not be applied unless the environmental requirements of Section 1.06 are met.

B. Application

1. All objects that require protection from overspray shall be protected; all mobile objects shall be moved to an acceptable area. All intake air vents shall be turned off and covered.
2. Apply the polyurethane foam in strict accordance with the spray polyurethane foam (SPF) manufacturer's specifications and application instructions, using spray equipment recommended by the SPF manufacturer.
3. Polyurethane foam shall be applied in a minimum of ½-inch thick passes. The total thickness of the polyurethane foam shall be a minimum of 2 inches (or more for additional insulation value), except where tapering is required to facilitate drainage or at a tapered edge.
4. Apply the full thickness of polyurethane foam in any area on the same day.
5. Polyurethane foam shall be applied to ensure positive drainage, resulting in no ponding water. Ponding water is defined as "an area of 100 square feet or more which holds in excess of ½ inch of water as measured 24 hours after rainfall."
6. The polyurethane foam shall be terminated neatly a minimum of 4 inches above the finished surface at any penetrations. Sprayed-in-place cants shall be applied to allow a smooth transition from the horizontal to vertical surface.
7. The finished polyurethane foam surface texture shall be "smooth to orange-peel", free of voids, pinholes and depressions. "Verge of popcorn" texture is acceptable if it can be thoroughly and completely coated. Popcorn and tree bark textures are not acceptable. Unacceptable SPF textures shall be removed and re-sprayed prior to the coating application.

3.04 Neogard Urethane Coating Application

A. Inspection

1. Prior to the application of urethane coating, inspect the polyurethane foam surface to ensure the conditions of Section 3.03 have been met.
2. The polyurethane foam surface shall be free of moisture, dust, dirt, debris and other contaminants that would impair the adhesion of the urethane coating.

3. If more than 24 hours elapse between the polyurethane foam application and the start of the urethane coating application, thoroughly inspect the polyurethane foam surface for UV degradation and oxidation. Call BASF technical department for procedures to proceed, if UV degradation has affected the SPF.
4. Make sure all environmental conditions of Section 1.06 are met prior to urethane coating application.

B. Application

1. The urethane base coat shall be applied on the same day as the polyurethane foam application, after the polyurethane foam has been allowed to cure a minimum of one hour. Apply the base coat in a uniform application to achieve the finished dry film thickness.
2. The base coat shall not be subjected to foot traffic or otherwise disturbed until it is tack-free or cured. After it has cured, inspect the coating for pinholes, cracks, thin areas or other defects. All defects observed shall be caulked with urethane sealant and/or roller coated with additional base coat prior to applying subsequent coats of urethane.
3. The base coat and sealant must be cured, clean and free of all moisture prior to application of topcoat.
4. Apply the topcoat in a contrasting color to the base coat within 48 hours of the base coat application. The topcoat application shall be made at right angles to the base coat application. Surface texture and conditions may require additional quantities of urethane coating to insure proper thickness. It is the applicator's responsibility to properly coat the insulation regardless of the quantity of urethane coating necessary.
5. Apply the topcoat in a uniform application to achieve a minimum total finished dry film thickness of the base coat and topcoat of **40** mils. It is the applicator's responsibility to ensure the minimum total dry film thickness specified is achieved throughout the entire project regardless of the quantity of urethane coating required.
6. The Neogard Urethane Coating shall be neatly applied a minimum of 2 inches beyond all the terminated edges of the polyurethane foam. These terminations should be masked to provide a straight edge, neat, finished appearance.
7. Allow the topcoat to cure and inspect the finished coating surface for pinholes, cracks, thin areas, or other defects. Repair any defects observed with urethane sealant and/or additional urethane coating material.

3.05 Granule Application

A. Application

1. Apply granules in the second or finish coat of urethane. A minimum of 10 dry mils of urethane coating is required to hold the granules.
2. Apply the granules, using suitable compressed air equipment, uniformly at a rate of approximately 40 pounds per 100 square feet of area.
3. Apply the granules immediately after the additional coating application to obtain maximum wet-out and embedment.
4. After the coating has fully cured, excessive, loose granules shall be removed using a soft-bristled broom to prevent blocking drains, scuppers, or gutters.
5. Bare spots in the granulated surface shall be filled in by applying additional coating and granules in these areas.

3.06 Walkways

- A. Factory-formed walkway pads may be used at equipment to provide a working surface. Spot adhere the pads or rolls to the finished surface with generous buttons of urethane sealant. These shall be applied where instructed by the owner's representative.

- B. Walkways may alternately be constructed by outlining the walkway on the finished system, applying an additional ten dry mils of the urethane top coating in a contrasting light color and embedding additional colored granules to match the top coating in the walkway.

3.07 Field Quality Control

- A. The independent inspector at the final inspection shall instruct the contractor to repair any deficient areas.
- B. Core samples of the urethane coating/SPF system will be secured at completion by an independent licensed inspection firm at a rate of one core per 10,000 square feet, with a minimum of 2 cores per digester, to test for SPF thickness, compressive strength, density and adhesion. Additionally, slit samples will be taken at a rate of 6 per 10,000 square feet, with a minimum of 6 per project, to test the coating thickness and coating adhesion. Sampled areas will be repaired using urethane sealant and replacement SPF cores.
- C. Applicator's quality control during application shall consist of the following, as a minimum:
 - 1. If specified, the primer application rate shall be verified by a wet mil gauge test onto a metal test panel.
 - 2. Insulation thickness shall be verified with a probe at frequent and random locations.
 - 3. During and after the coating application process, the applicator shall remove slits to examine adhesion of the coating to the insulation and the dry film thickness of each coat.

3.08 Safety Requirements

- A. Proper safety precautions shall be followed throughout the entire operation. OSHA and local regulations shall be strictly followed. Manufacturer's Material Safety Data Sheets must be available on site, for specific safety information on handling and working with all materials. Spray Polyurethane Foam Alliance and the American Chemistry Council's Recommendations for the Safe Handling and Use of Sprayed Urethane Foam and Coating Materials shall be strictly adhered to. Dispose of all trash, debris and empty containers in accordance with local regulations.
- B. On the project and at all work sites, a properly maintained fire extinguisher will always be available.
- C. Dispose of trash, debris and empty containers in accordance with local regulations.

3.09 Follow-Up Inspections

- A. The system manufacturer shall have a standard warranty inspection program, employing an independent testing firm to perform periodic inspections throughout the term of the warranty.

FOR TECHNICAL ASSISTANCE, PLEASE CALL: BASF at (800) 706-0712

BASF Corporation does not provide structural, engineering or architectural services. BASF assumes no responsibility for the structural integrity of the project during the work described herein or after completion of the work. This guideline shall not be construed as contracting to provide engineering or architectural services of any kind.