

**SECTION 07541**

**BASF / DOW CORNING® Seamless Silicone/Polyurethane Insulated Roof System**

**PART 1 - GENERAL**

1.01 Work Included

- A. Preparation of Substrate
- B. BASF Elastospray 5100 Series Sprayed-in-place Polyurethane Foam (SPF) Insulation
- C. DOW CORNING 3-5000 Silicone Roof Coating
- D. Roofing Granules
- E. Walkways

1.02 Related Work

- A. Section 01410: Testing Laboratory Services
- B. Section 07600: Flashing and Sheet Metal
- C. Section 07700: Roof Specialties and Accessories
- D. Section 07800: Skylights

1.03 Quality Assurance

- A. Applicator Qualifications: Must be a current BASF Corporation and Dow Corning Approved Applicator or current applicator of the approved roof system manufacturer.
- B. Roofing applicator must exhibit 5 years and a minimum of 500,000 sq. ft. experience installing the selected roofing system, with projects of a similar scope and nature.
- C. A Pre-Bid Conference shall be conducted one week before bid date. 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 roof areas; and to review the normal flow of activities at the facility. There will be no other access to the roof 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 roofing applicator shall perform the work of this section. Subcontracting installation of the silicone coating/polyurethane foam is not allowed.
- E. Inspections: Completed roofing application will be inspected by an independent inspection firm designated by the warranty provider, on a periodic basis.

#### 1.04 Submittals

A. *Specification Development - The owner/specifier shall supply to BASF Corporation's manufacturer's representative:*

1. *A draft copy of the project specification, including: the roofing section, roof warranty requirements, and roofing 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 Class A, Factory Mutual, and local building code approvals as required.

#### 1.05 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.

#### 1.06 Environmental Conditions

A. The silicone 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 silicone coatings when temperature is below 40°F (5°C).
- D. When wind speeds exceed 10 miles per hour or adversely affects the SPF application, 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.

1.07 Warranty

- A. The SPF Roof 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.
- B. Issuance of a warranty is dependent upon a proper application and following standard procedures. Therefore, prior review of the specification by manufacturer's representative is suggested, see Section 1.04 A, and also a review of the bidders' qualifications by the Owner's representative.

**PART 2 - PRODUCTS**

2.01 Polyurethane Foam Insulation

- A. Physical property requirements are as follows for acceptable insulation products, such as BASF Elastospray HPS-5100.

<b>Property</b>	<b>Value</b>	<b>Test Method</b>
Density, sprayed-in-place, pcf, min.	3.0	ASTM D-1622
Compressive strength, psi	50	ASTM D-1621
Closed-cell content, percent, min.	95	ASTM D-2856
K-factor, aged, max	0.16	ASTM C-518
Dimensional Stability, 28 days, 158°F, 100% R.H., percent volume change, max.	+8%	ASTM D-2126
Flame spread, max.	75	ASTM E-84

2.02 Silicone Coatings

- A. The silicone roofing 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 20 dry mils.

1. The silicone coating will be a product proven through actual roof performance for a period of time equal to, or longer, than the term of the requested warranty.
2. The manufacturer 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 coating as manufactured by Dow Corning is DOW CORNING 3-5000 and has the following minimum properties:

Property	Value	Test Method
<u>As Supplied:</u>		
Solids Content		
by weight, percent	77	**CTM 0010 (ASTM D-2697)
by volume, percent	62	CTM 0010 (ASTM D-2697)
Specific Gravity at 77°F (25°C)	1.23	CTM 0997 (ASTM D-1293)
Flash Point, Pensky-Martin closed cup, °F °C, min.	100 (37.8)	CTM 0021A
Tack-Free Time, hours	1	CTM 0244 (MIL-S-3802)
Dry Time, hours	3.5	CTM 0291 (ASTM D-115)
Volatile Organic Content (VOC, g/l)	290	ASTM D-3960/EPA Method 24
<u>As Cured:</u>		
Durometer Hardness, Shore A, points	45	CTM 0099 (ASTM D-2240)
Tensile Strength, die C, psi	400	CTM 0137A (ASTM D-412)
Elongation, percent	150	CTM 0137A (ASTM D-412)
Permeability <sup>1</sup> , perms	3.7	CTM 0876 (ASTM E-96)
Water Absorption, percent	0.5	CTM 0231A (ASTM D-471)
Temperature Stability Range, °F(°C)	-35 to 302° (-37 to 150)	
Weatherometer,		
Carbon-Arc, 4,000 hours	No observable	
QUV, 10,000 hours	degradation	

<sup>1</sup> 20 mils at 100°F (37.8°C) and 90 percent relative humidity.

\*\*CTM is Dow Corning Corporate Test Method. Correlating ASTM standards are provided where applicable.

## 2.03 Sealant

- A. Sealant shall be a silicone sealant such as DOW CORNING<sup>®</sup> Contractors Waterproofing Sealant. The color of this sealant, if exposed, shall closely match that of the topcoat.

## 2.04 Substrate Primer

- A. For B.U.R., concrete, wood, brick, metal (ferrous, not rusted) - option - to be selected by Specifier. The primer must be approved by BASF Corporation, such as a water-based epoxy primer, Uniseal from United Coatings.
- 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 Techno Adhesive's P199 Primer.
- C. Cut-back asphalt primers are not to be used. For other substrates contact BASF technical.

2.05 Granules (Recommended Option)

- A. Granules shall be number 11 screen size, ceramic-coated roofing granules as manufactured by the Industrial Products Division of 3M Company, 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 (Recommended Option)

- A. As required a weather-resistant, breathable, resilient pad composed of synthetic rubber strands shall be installed to create additionally protected roof areas. This product shall be approved by BASF Corporation. Such a walkway is Yellow Spaghetti, as manufactured by Western Plastics, Inc.

**PART 3 - EXECUTION**

3.01 Inspection

- A. Verify that all surfaces to receive SPF insulation are clean, dry and free of dust, dirt, debris, oil, solvents and all materials that may adversely affect the adhesion of the insulation.
- B. Verify that all roof 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. Built-Up Roof Membrane

- 1. Remove all loose and poorly imbedded aggregate surfacing material, if present, by use of a: wet vacuum, power broom, hand broom, power vacuum, and/or other suitable means. Do not accumulate large amounts of aggregate surfacing material in one location that may overload the roof deck structure.

2. Remove all wet insulation under existing built-up roof membrane. Clean and dry the area and install new similar compatible insulation, or apply polyurethane foam insulation to the level of the adjacent existing membrane.
3. Repair all built-up roof membrane defects, such as blisters, ridges, splits, punctures and felt delaminations, by cutting, removing, nailing or properly adhering to form a solid substrate. BUR repairs shall be made using hot process BUR or modified bitumen products, cut-back products shall not be used. Make sure the adjoining roof materials around these defects are dry.
4. Remove all loose stones, dust, dirt, debris and other contaminants from the built-up roof membrane that may impair the adhesion of the polyurethane foam.
5. Primer - Install primer per manufacturer's recommendations. Make sure all surfaces are clean and dry prior to primer and/or polyurethane foam application.

#### B. Metal Decks

1. The metal roof deck should be a minimum of 22-gauge and be securely installed to conform to local building code requirements. Deflections shall not exceed 1/240 of the span.
2. Remove any loose scale, rust and weathered or chalking paint using a wire brush, scraper, sand blasting or other suitable means. Prime if necessary and as recommended.
3. Remove all dust, dirt and debris using air, a hand or power broom and/or a power washer. Other contaminants such as oil and grease must be removed with appropriate cleaning solution, and rinsed with clean water. (New metal will have a thin film of milling oil on it, which must be removed.)
4. Fluted metal roof decks should be covered with a polyester tape securely adhered to the metal deck over the flutes, or by mechanically fastened gypsum, urethane, perlite or fiberglass board per Factory Mutual recommendations for local wind uplift resistance. The boards shall be firmly butted together along all edges. Any joints greater than 1/4 inch shall be taped prior to foam application.
5. Factory painted metal surfaces will not normally require an additional application of primer.
6. Make sure all surfaces are clean and dry prior to foam application.

#### C. 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 1/4 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.
5. Lightweight concrete insulating, fill material - If present in the existing roof assembly, recommendations will be made on a per job basis, please contact BASF's Technical Services, see last page.

#### D. Wood Surfaces

1. Plywood shall be exterior grade not less than ½ inch thick, nailed firmly in place. Attachment must meet building code requirements for resistance to wind uplift. Deflections should not exceed 1/240 of the span.
2. The plywood shall contain no more than 18 percent moisture by weight, as measured in accordance with ASTM D-2016.
3. All untreated and unpainted surfaces shall be primed with an appropriate, approved primer to minimize moisture absorption and aid in the polyurethane foam adhesion.
4. Tongue-and-groove sheathing and planking decks shall be overlaid with a minimum of ¼-inch exterior grade plywood, insulation board or a base sheet securely attached to meet building code requirements.
5. Any joints greater than ¼ inch shall be caulked or taped prior to the polyurethane foam application.
6. Remove all loose dirt, dust and debris using air, a hand or power broom and/or a vacuum. Power washing is not recommended as it may introduce water into the substrate. Oil, grease and other contaminants must be removed using appropriate cleaning solution. Severely contaminated wood substrates shall be removed and replaced.
7. Ensure all surfaces are clean and dry prior to polyurethane foam application.

#### E. Other Surfaces

1. Contact BASF Corporation's Technical Services for recommendations on surface preparations on other surfaces to receive a BASF Elastospray SPF Insulation and DOW CORNING 3-5000 Silicone Roof System.

### 3.03 Polyurethane Insulation 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 polyurethane foam manufacturer's specifications and application instructions, using spray equipment recommended by the SPF manufacturer. The field of the roof shall be applied, as practical, by a robotic SPF application device. The robotic method shall improve: consistency, slope-to-drain, and visual appearance.
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 \_\_\_\_\_ inches, except where tapering is required to facilitate drainage. A minimum of 1 inch of the polyurethane foam is required for a warranty consideration.
4. Apply the full thickness of polyurethane foam in any area on the same day.
5. Polyurethane foam shall be applied to ensure proper 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 roof surface at roof 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 refoamed prior to coating application.

### 3.04 DOW CORNING 3-5000 Silicone Roof Coating Application

#### A. Inspection

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



## B. Application

1. DOW CORNING 3-5000 Silicone Roof Coating dark gray may be used as the basecoat on the polyurethane foam.
2. The silicone basecoat 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.
3. Apply the basecoat in a uniform application to achieve a finished dry film thickness of approximately ½ the total thickness required for the roof.
4. The basecoat shall not be subjected to foot traffic or otherwise disturbed until it is tack-free.
5. After it has cured, inspect the coating for pinholes, cracks, thin areas or other defects. All defects observed shall be caulked with a silicone sealant and/or roller coated with additional basecoat prior to applying subsequent coats of silicone.
6. The basecoat must be cured, clean and free of all moisture prior to application of topcoat.
7. Apply the topcoat in a contrasting color to the basecoat within 72 hours of the basecoat application. The topcoat application shall be made at right angles to the basecoat application. Surface texture and conditions may require additional quantities of silicone coating to insure proper thickness. It is the applicator's responsibility to properly coat the insulation regardless of the quantity of silicone coating necessary.
8. Apply the topcoat in a uniform application to achieve a minimum total finished dry film thickness of the basecoat and topcoat of 20 mils.
9. The DOW CORNING 3-5000 Silicone Roof Coating shall be 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.
10. Allow the topcoat to cure and inspect the finished coating surface for pinholes, cracks, thin areas, or other defects. Repair any defects observed with silicone sealant and/or additional silicone coating material.
11. It is the applicator's responsibility to ensure the minimum total dry film thickness specified is achieved throughout the entire roof area regardless of the quantity of silicone coating required.

### 3.05 Granule Application (Recommended Option)

#### A. Application

1. Apply roofing granules in a wet finish coat of silicone coating. A minimum of 10 dry mils of silicone coating is required to hold the granules.

2. Apply the roofing granules, using suitable compressed air equipment, uniformly at a rate of approximately 40 pounds per 100 square feet of roof area.
3. Apply the roofing granules immediately after the additional coating application to obtain maximum wet-out and imbedment.
4. After the coating has fully cured, excessive loose granules shall be removed using a soft-bristled broom to prevent blocking drains and scuppers.
5. Bare spots in the granulated surface shall be filled in by applying additional coating and granules in these areas.

### 3.06 Walkways (Recommended Option)

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

### 3.07 Field Quality Control

- A. Before commencing work the applicator shall submit to the owner's representative a listing of any deficient roof areas, such as: ponding, wet insulation, deck problems, required new drains, etc.
- B. Core samples of the silicone coating/SPF roof system will be secured at completion by an independent inspection firm at a rate of one core per 10,000 square feet, with a minimum of 2 cores per roof, to test for foam thickness, compressive strength, density and adhesion. Additionally, slit samples will be taken at a rate of 3 per 10,000 square feet, with a minimum of 6 per roof, to test the coating thickness and coating adhesion. Sampled areas will be repaired using silicone 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. Thickness and adhesion of the insulation shall be examined by removing cores at a rate of 1 every 10,000 feet.
  4. After and during coating application, the applicator shall remove slits to examine adhesion of the coating to the insulation and the dry millage of applied silicone coating.

3.08 Safety Requirements

- A. Proper safety precautions shall be followed throughout the entire roofing 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 of the American Plastics 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 roof and at all work sites, a fire extinguisher will always be available.

3.09 Follow-Up Inspections

- A. The roof 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:		
Dow Corning Corporation	Elaina Carpino	517-496-1706
BASF Corporation	Bruce Schenke	800-547-4004

**PLEASE NOTE:**

\* Building owner is responsible to test for presence of asbestos or other hazardous substances that may be present within or near the work area. Such items, if found to be present, shall be communicated to the roofing applicator before any additional testing, removals or roof replacement is performed.

On remedial work, the Owner's representative must conduct a full inspection to determine if there is any structural damage (rust, dry rot, etc.) or moisture within the existing roofing systems.

If the Architect or Owner suspect that there is moisture within the existing roofing system, a non-destructive evaluation should be conducted. The major advantage to this type of inspection is that trouble spots are located, thus possibly preventing a complete tear-off of the existing roof. Likewise, this can also save many man hours, which may be necessary to thoroughly inspect the roof using a moisture meter probe. The main point which the Architect and Owner must take into consideration on remedial work is that polyurethane foam must not be sprayed over any substrate that contains moisture.

If this type of inspection is required, the specifications must be modified to either include it as part of the applicator's bid or it shall state that this information will be provided to the applicator on a plotted roof plan at Owner's expense.

BASF Corporation and/or the Dow Corning Corporation do not provide structural, engineering or architectural services. They assume no responsibility for the structural integrity of the building 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.