Specification Guide

Section 07541 –
Energy Star Acrylic Polyurethane Foam Roof System

PART 1 – GENERAL

1.01 Work Included
- A. Preparation of substrate
- B. Sprayed-in-place Zero Ozone Depleting Polyurethane Foam Insulation
- C. LEED Compliant & Energy Star Acrylic Coating Application
- D. LEED Compliant # 11 Granules (Optional)

1.02 Related Work
- A. Section 01410: Testing Laboratory Services
- B. Section 07600: Flashing and Sheet Metal
- C. Section 07700: Roof Specialties and Accessories

1.03 Quality Assurance
- A. Contractor Qualifications: Must be a Manufacturer Approved Applicator in order to qualify for roof warranties. Contractor shall carry 2,000,000 liability insurance. Contractor shall have been in business a minimum of ten years under the same name.
- B. The Approved Applicator shall perform the work of this section. Subcontracting the roofing work is not allowed.
- C. Manufacturer Qualifications: Both foam and coating manufacturer must be ISO 9000 certified. Manufacturer may not own or operate any part of the roofing contracting company.
- D. Inspections: Completed roofing application will be inspected by an independent inspection firm designated by the manufacturer to verify compliance with warranty requirements. Owner may elect to contract with its own consultant to take core samples and slit samples to verify compliance with the specification. Manufacturer's representative shall conduct pre-start deck inspection, test for proper foam thickness and coating thickness during the installation.

1.04 Submittals
- A. Product Data: Provide two copies of product data sheets of acrylic coating and the polyurethane foam to be used.
- B. Samples: Provide a sample of completed roof system showing surface texture and finished thickness of polyurethane foam, color and thickness of acrylic roof coating.
- C. Submit verification that the applicator is a current manufacturer approved applicator.

D. Provide specimen of manufacturer's warranty to be issued for this roof installation.
E. Submit Underwriters Laboratories and/or local building code approvals as required for the composite roof system to be installed.

1.05 Delivery, Storage and Handling
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. 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.

1.06 Environmental Conditions
A. Neither the acrylic roof coating nor the polyurethane foam shall be applied during periods of inclement weather (rain, snow, fog, mist or high humidity).
B. Do not apply the polyurethane foam when substrate or ambient air temperatures are below 50^{o}F unless specifically approved in writing by the polyurethane foam manufacturer.
C. Do not apply the polyurethane foam when the substrate surface is less than 5^{o}F above the dew point.
D. Do not apply acrylic roof coating when weather conditions will not permit complete cure before rain, dew, fog or freezing temperatures occur. Do not apply in late afternoon if heavy moisture condensation may appear during the night.
E. When wind speeds exceed 10 miles per hour at the job site, windscreens shall be used during the application of the surface primer, polyurethane foam and acrylic roof coating to prevent overspray onto surfaces not intended to receive foam and coating. Under no circumstances shall the surface primer, polyurethane foam or acrylic roof coating be applied when wind speeds exceed 25 miles per hour.

1.07 Warranty
A. Upon satisfactory completion of the work, provide:
1. Manufacturer's 10 Year Full System Warranty.

PART 2 – PRODUCTS

2.01 Polyurethane Foam Insulation

A. The polyurethane foam system must be a two component, Zero-ODP (Ozone Depleting Potential), product. The polyurethane foam insulation shall be composed of HFC 245fa blowing agents.

B. Physical Property Requirements:

Property	Value	Test Method
Density, sprayed-in-place, pcf, min.	2.8	ASTM D-1622
Compressive Strength, psi, min.	50	ASTM D-1621
Closed-cell Content, percent, min.	90	ASTM D-2856
Aged K-Factor = R 6.3 per inch	.16	ASTM -518
Dimensional Stability, 28 days, 158°F Dry - percent volume change, max.	0.69%	ASTM D-2126
Flame Spread, max.	75	ASTM E-84

C. Approved Manufacturers:

1. BASF Elastospray 81285

2.02 Energy Star Acrylic Roof Coating

A. The acrylic roof coating shall be Energy Star listed and meet ASTM D-6083 standards, along with the physical property requirements listed herein.

B. Typical physical properties per ASTM D-6083:

Property	Method	Result
Initial Tensile Strength (psi)	ASTM D-2370	222
Initial Elongation (%)	ASTM D-2370	135
Wet Adhesion (pli)*	ASTM C-749, D-903	5.7
Tear Resistance (lbf/in)	ASTM D-624	87
1000-hr Accelerated Weathering	ASTM D-4798	No Cracking or Checking
Elongation After Accelerated Weathering (%)	ASTM D-2370	161
Low Temperature Flexibility After Accelerated Weathering	ASTM D-522	Pass
Permeance (perms)	ASTM D-1653	13.98
Water Swelling (%)	ASTM D-471	17.05
Fungi Resistance (zero=No Growth)	ASTM G-21	Zero Rating
Volume Solids (%)	ASTM D-2697	52
Weight Solids (%)	ASTM D-1644	65
Viscosity (KU)	ASTM D-562	101
*Measured Over Sprayed Polyurethane Foam		

C. Approved Manufacturers:

1. United Coatings – Diathon

2.03 Sealant

A. Sealant shall be United Coatings Roof Mate Buttergrade in a color to best match the topcoat color.

2.04 Substrate Primer

A. The primer shall be a water based epoxy primer for use over concrete.

B. Approved Primers:

1. United Coatings Uniseal Black

2.05 Cleaning Solution

A. Cleaning solution shall be a water based biodegradable solution approved by the EPA for cleaning roof surfaces.

B. Approved Cleaners:

1. United Coatings UCC

2.06 Granules

A. Lucas Bright White Dust Free # 11

PART 3 – EXECUTION

3.01 Inspection

A. Verify that all surfaces to receive roof system components are clean, dry and free of dust, dirt, debris, oil, solvents and all material that may adversely affect the adhesion of the surface primer, polyurethane foam or acrylic coating.

B. Verify that all roof penetrations 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 embedded 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. Perform an infrared moisture survey and 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 delamination, 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. Ensure existing BUR roof meets applicable wind uplift requirements.
6. 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, as recommended.
3. Remove all dust, dirt and debris using air pressure, 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 by mechanically fastened gypsum, polyiso 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 ¼ 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 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.
5. Lightweight concrete insulation, fill material - If present in the existing roof assembly, recommendations will be made on a per job basis, please contact foam manufacture's technical services.

D. Wood Surfaces

1. Plywood shall be exterior grade not less than ½ inches 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 the 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 grove 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 pressure, 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.
7. Make sure all surfaces are clean and dry prior to polyurethane foam application.

E. Other Surfaces

1. Contact manufacturer's technical service department for recommendations of surface preparations on other surfaces to receive the acrylic/polyurethane foam roof system.

3.03 Surface Primer

A. Inspection

1. Prior to application of the primer, inspect the substrates to be primed to ensure preparations required in Section 3.02 have been met.
2. Surface primer shall not be applied unless the environmental conditions of Section 1.06 are met.

B. Application

1. Apply the surface primer in strict accordance with the manufacturer's application instructions.
2. Confirm primer is cured before installing polyurethane foam insulation.

3.04 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. Apply the polyurethane foam in accordance with the polyurethane foam manufacturer's specifications and application instructions, using spray equipment recommended by the foam manufacturer.
2. Polyurethane foam shall be applied in a minimum of 1/2"inch thick and maximum 1.5 inch passes. The total thickness of the polyurethane foam shall be one and one half inch minimum over capsheet, smooth BUR, concrete, plywood, BUR with gravel, metal decks and two inches over insulation board, except where tapering is required to facilitate drainage. Additional foam thickness will be required as noted on the drawings. Note the low areas pointed out on the job walk. These areas will receive additional foam to eliminate ponding water.
3. Apply the full thickness of polyurethane foam in any area on the same day. Phasing of the polyurethane foam is not acceptable.
4. Polyurethane foam shall be applied to ensure proper drainage resulting in no gross ponding water. Gross 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."
5. The polyurethane foam shall be terminated neatly a minimum of four inches above the finished roof surface at roof penetrations. Foamed-in-place cants shall be applied to allow a smooth transition from the horizontal to vertical surface. Crickets shall be constructed of plywood, SPF insulation or polyiso board insulation.
6. 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 foam textures shall be removed and refoamed prior to coating application.

3.05 Acrylic Roof Coating Application

A. Inspection

1. Prior to the application of the acrylic roof 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 dust, dirt, debris and other contaminants that would impair the adhesion of the acrylic coating.
3. The polyurethane foam surface must be dry prior to the acrylic coating application.
4. If more than 24 hours elapse between the polyurethane foam application and the start of the acrylic coating application, the coating manufacturer shall thoroughly inspect the polyurethane foam surface for UV degradation and oxidation. If this condition is detected, the polyurethane foam surface shall be mechanically scarified, cleaned, primed and refoamed with ½" minimum thickness prior to the acrylic basecoat application.
5. Make sure all environmental conditions of Section 1.06 are met prior to acrylic coating application.

B. Application

1. The acrylic roof coating 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 and in no case more than 24 hours after the installation of the polyurethane insulation.
2. Apply acrylic roof coating basecoat in a uniform application to achieve a finished dry mil thickness of approximately $^{1}/_{4}$ the total millage required for the roof or 1½ gallons per 100 square feet or as is required to achieve a dry mil thickness of a minimum 12 mils.
3. The basecoat shall not be subjected to foot traffic or be disturbed until it is cured.
4. After the basecoat has cured, inspect the coating for pinholes, cracks, thin areas or other deviations. All deviations observed shall be caulked with buttergrade sealant and/or roller coated with additional acrylic roof coating prior to applying subsequent coats.
5. The basecoat must be cured, clean and free of all moisture prior to application of subsequent coats.
6. Apply the acrylic roof coating second and third coats in contrasting colors within 72 hours of the previous coating application. The second and third application shall be made at right angles to the previous application. Each coat shall be installed at 1½ gallons per 100 square feet or as is required to achieve a minimum 12 dry mil thickness.
7. The topcoat shall be a contrasting color to the intermediate coat. Topcoat shall be Energy Star approved. Total dry mil thickness of the coating shall be 35.
8. The acrylic roof coating shall be applied a minimum of two inches beyond all the terminated edges of the polyurethane foam. These terminations should be masked to provide a neat finished appearance.

9. Allow the topcoat to cure and inspect the finished coating surface for pinholes, cracks, thin areas or other deviations. Repair any deviations observed with buttergrade sealant and/or additional acrylic roof coating topcoat.
10. It is the contractor's responsibility to ensure the minimum total dry film thickness specified is achieved throughout the entire roof area.
11. Granule Application (Optional) Install Lucas Bright White # 11 granules into the wet topcoat at the rate of 40 lbs per 100 square feet. Once the coating has cured, remove areas of excessive granules from the roof.

3.06 Field Quality Control – Manufacturer Warranted Roofs

A. Core samples of the acrylic roof coating system will be secured 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 3 per roof, to test the coating thickness and coating adhesion. Sampled areas will be repaired using buttergrade sealant and replacement foam cores. The third party inspection firm shall be a licensed engineering firm with a minimum of 10 years experience and 5,000,000 square feet of foam roofs inspected, cord and evaluated.

3.07 Safety Requirements

A. Proper safety precautions shall be followed throughout the entire roofing operation OSHA and local regulations shall be strictly followed. Refer to the roofing product's Material Safety Data Sheets for specific safety information on handling and working with all materials. Dispose of all trash, debris and empty containers in accordance with local, state and federal regulations.

END OF SECTION