

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

1.1 GENERAL

- A. The Contractor is to construct a sprayed polyurethane foam roof based on the following specification. The primary roof system a 20-year warranted roof.
 - 1. The fluid applied roofing system shall be a complete system of compatible materials creating a seamless, warranted, urethane roof membrane and approved for application on University of Kentucky projects.
 - 2. The foam for all University foam roofs shall be approved nominal 3.0 pcf density in place (ASTM D1622)
 - 3. Provide Owner with 20 Year Full System warranty as identified in the individual foam-roof project.
 - 4. Standard colors for top-coatings shall be white, or approved alternate color.
- B. The foam shall be applied in a manner that insures positive flow of water from the roof system to the drains.

Note: It is the intent of the specification to construct a urethane foam-roof system with positive flow to the drains. Therefore, whether the new or existing roof deck or the existing roof system is tapered or not, the contractor shall install foam to provide positive flow whether or not the drawings or project description indicates such.
- C. Sand granules shall be applied as a surface toughener. (See Section III - Execution for application instructions).
- D. In every category, all foam-roof coatings shall be equal or superior in every category to those supplied by Neogard Inc, Gaco, Carlisle, Greenshield or approved equal and as specified elsewhere in this document.

1.2 CONTRACTOR QUALIFICATIONS

- A. Contractor to have, and have maintained, fully accredited status with Spray Polyurethane Foam Alliance for a minimum of the past 5 years.
- B. Contractor shall be approved by the Coating and Foam Manufacturers as licensed applicators for the product specified and used on this project.
- C. The Contractor shall be able to show proof that all supervising personnel on site will have current 30-hour O.S.H.A. cards prior to the start of the project.
- D. Contractor shall provide proof that he has installed a minimum of 1,000,000 square feet of urethane foam roofing with urethane or silicone coatings and provide addresses of two roofs within one day's drive for inspection.
- E. Bidder shall provide proof that he is able to respond (after notification by Owner) to leaking repairs within 24 hours and non-leaking repairs within 5 working days.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

1.3 SUBMITTALS

A. Contractor shall submit:

1. Proof of fully accredited status with Spray Polyurethane Foam Alliance for a minimum of the past 5 years.
2. Proof of approval by the Coating and Foam Manufacturers as licensed applicator for the product specified and used on this project.
3. A sample copy of the warranty document(s) with bid.
4. Proof that all supervising personal on site will have current 30-hour O.S.H.A. cards prior to the start of the project.
5. List of clients that bidding contractor has installed foam insulated roofs on for the past 3 years.
6. Addresses and contacts of two urethane roofs within one day's drive for inspection by PPD staff (if the bidder has applied urethane roofs on the University of Kentucky campus within the last 5 years, this requirement is waived).
7. Proof that bidding contractor is able to respond (after notification by Owner) to leaking repairs within 24 hours and non-leaking repairs within 5 working days.
8. The Architect shall not review individual submittal items separately. All submittals shall be submitted simultaneously as a single package.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in original sealed containers, clearly marked with supplier's name, brand name, and type of material. Containers are to bear UL labels.
- B. Contractor shall provide the necessary storage facilities for the materials throughout the project. Recommended storage temperature is 75 degrees F. The material shall not be stored in direct sunlight for extended periods.

1.5 CONTRACTOR REQUIREMENTS

A. Prior Notification and Property Damage Precautions

1. It is the sole responsibility of the Contractor to protect all unmovable objects within the area of spraying operations and restore to original condition items or areas that are over sprayed or damaged.
2. The Contractor shall notify the University of Kentucky Project Manager on the previous day in advance of spray operations in order that occupants of the building, adjacent and/or affected buildings, and possibly parking lots may be notified. This is to give ample time for occupants and owners of automobiles to prepare for the roofing application.
3. Should there be an incident of property damage, jointly or separately, the Contractor

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

and/or his Insurance carrier shall promptly handle the situation to the satisfaction of the individual and/or entity damaged.

4. The contractor shall provide protection for all building components, landscaping and equipment that may be damaged as the work progresses.
5. Overspray on the building visible from the ground is unacceptable. The Contractor will be required to mask and protect such areas where such overspray might occur. The Owner shall approve of such masking prior to spraying operations.
6. The contractor shall protect all roofing-materials transportation hoses at potential wear points such as parapet walls, eaves, gutters, etc. There can be no exception. Ruptured hoses and/or spills of roofing materials are unacceptable, and the Contractor will be physically and/or financially responsible for damages and for removal of stains and/or replacement of building elements damaged.

Note: Should Contractor generated damages occur to the University's property, final payment will not be processed until the damage is cleaned and/or repaired to the Owner's satisfaction.

1.6 QUALITY ASSURANCE

- A. All work by the Contractor shall be done in a professional manner by experienced, qualified applicator(s).
- B. Industry standards shall dictate acceptance of all equipment, application techniques, safety requirements, and meet OSHA standards, etc.
- C. Underwriter's Laboratories (ASTM E108/UL 790) shall rate the complete fluid applied roofing system Class A.
- D. Contractor shall provide Owner with 20 Year Full System warranty.
 1. Manufacturer and Applicator agree to repair leaks and/or polyurethane foam and/or membrane failures with no exclusion for the following:
 - a. Faulty materials,
 - b. Faulty workmanship (includes blistering and delaminating),
 - c. Ordinary wear and tear,
 - d. Severe hail damage, in accordance with Factory Mutual Research Corporation (FMRC) simulated hail tests,
 - e. 90 mph wind forces,
 - f. Damage caused by birds,
 - g. Ponding water, and
 - h. Normal (non-public) pedestrian traffic.
- E. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- F. Manufacturer Qualifications: A qualified manufacturer that has Factory Mutual Global (FMG) and FM Approvals for the membrane roofing system identical to that used for this Project.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

Page 3 of 10

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

- G. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.
- H. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
- I. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
1. Provide documentation that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the roofing manufacturer.
 2. Meet with Owner, General Contractor, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 6. Review structural loading limitations of roof deck during and after roofing.
 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 8. Review governing regulations and requirements for insurance and certificates if applicable.
 9. Review temporary protection requirements for roofing system during and after installation.
 10. Review roof observation and repair procedures after roofing installation.

PART 2 - PRODUCTS

A. The materials listed following are the items normally used in the construction of a foam roof for the University of Kentucky. These may or may not be used on any particular project. This list of products is not exhaustive of those required to produce a completed foam roof.

1. Fiber Board (coated 6 sides)

- a. If or when specified and/or required, fiber Board shall be 1/2-inch, thick board mechanically fastened to metal or other type deck. The contractor shall provide samples or obtain approval prior to installation of the fiberboard.

Note: Fiber Board is being included in the list of materials for use under foam roofs; however, it will be considered the last choice and must always be approved by the Owner prior to proposal and/or use.

2. Gypsum Board

- a. If or when specified and/or required, gypsum board shall be 5/8-inch and shall be mechanically fastened to metal or other type deck (must be used over metal decks prior to foam application).

3. Densdeck 1/2 "

- a. If or when specified and/or required, 1/2-inch densdeck and shall be mechanically fastened to metal or other type deck (if chosen for use, must be used over metal decks prior to foam application)

4. Vapor Barrier on metal decks

- a. If or when specified and/or required, vapor barrier shall be Kwik-Ply by Hyload Roofing Systems or approved equal. Kwik-Ply is a 30 mil self-adhering membrane. Kwik-Ply is a membrane of Elvaloy®, coal tar pitch, and dispersed polyester fibers. As a vapor barrier, it is to be applied directly to a 5/8-inch gypsum board attached to the metal deck.

5. Primers

- a. If or when specified and/or required, primers shall be manufacturer approved for the application intended. Recommended primers are Mule Hide and Tremco QD or approved equal.

6. Spray-applied Insulation

- a. The insulation shall be a sprayed-in-place, two-component, rigid-class urethane foam having a nominal density of 3.0 lbs. per cubic foot. It shall have a thermal conductance ("K" Factor) of 0.15 Btu/hr/sq. ft./°F/in. at 70 degrees Fahrenheit. Foam shall be that required by Neogard Inc., GacoRoofFoam Low GWP, Carlisle PremiSEAL 60 or approved equal (or the foam roof warrantor) in order to meet the terms of and qualify for the specific roof warranty.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

7. Polyurea Base Coating and Walkways
 - a. The base coat shall be a high tensile pure fire retardant polyurea coating. The basis for design is Green Shield Products, LLC GreenTuff 100 polyurea base coat. Physical property requirements are as follows: Note: Contractor to follow manufacturer guidelines for foam density. Products accepted are GreenTuff 100, Hailcoat Polyurea or approved equal.

<u>Property</u>	<u>Value</u>	<u>Test Method</u>
As Supplied:		
Solids Content by weight, percent	100	ASTM D2697
Volatile Organic Content (VOC), (g/L)	0	EPA Method 24
As Cured:		
Tensile Strength, psi	3100min.	ASTM D2240
Elongation, percent	500 min	ASTM D412
Hardness, Shore D	50	ASTM D2240
Impact Strength (direct)	>700lbs.	ASTM C14
Tear Strength, Die C	650pli	ASTM D624

8. Elastomeric Coatings
 - a. Silicone coatings shall be Neogard HS SPF Silicone, GACOFLEX S20, GreenSil 70, or approved equal.
9. Granules
 - a. If or when specified and/or required and unless otherwise specified, granules shall as supplied by 3M Industrial Mineral Products Division, Wausau, Wisconsin and shall be #11 grey roofing granules gauge or approved equal.
10. Ladders
 - a. If required, ladders shall be installed as shown on the project drawings and are to be as manufactured by O'Keeffe or approved substitute. Ladders shall have platforms at the top with safety rails.
11. Miscellaneous Materials
 - a. Miscellaneous materials such as adhesives, caulking, sealant and other similar materials shall be compatible with other specified products and approved for use by the Coating Manufacturer.

2.1 PHYSICAL PROPERTIES

A. Foam

1. Foam Physical Properties
 - a. The insulation shall be a sprayed-in-place, two-component, rigid-class urethane foam having a nominal density of 3.0 lbs. per cubic foot. It shall have a thermal conductance ("K" Factor) of 0.15 Btu/hr/sq. ft./°F/in. at 70 degrees Fahrenheit. Foam shall be that required by Neogard Inc., GacoRoofFoam Low GWP or approved equal in order to meet the terms of and qualify for the roof warranty.
2. Foam Performance Requirements
 - a. The performance requirements for the urethane foam to be provided for use with the contract are listed in the following chart. These numbers are MINIMUMS.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

Products that do not meet or exceed these specifications in every category will be rejected.

ROOFING FOAM		
PHYSICAL PROPERTY	URETHANE FOAM	ASTM TEST
Density	3.0 pcf	D1622
Compressive Strength	54-65 psi	D1621
Tensile Strength	60-75 psi	D1623
Closed Cell Content	90% min	D1940
Dimensional Stability (158 degrees F, 100% RH, 28 days)	+4% max	D2126
K factor (aged)	0.15	C518
Flame Spread	40 max	E84

1. Silicone Coatings Performance Requirements
 - a. The performance requirements for the elastomeric coating system to be provided for use with the contract are listed in the following chart. These numbers are MINIMUMS.

Products that do not meet or exceed these specifications in every category will be rejected.

	Test Method	Results
Tensile Strength	ASTM D412	247 psi
Elongation	ASTM D412	237%
Permanent Set	ASTM D412	<5%
Tear Resistance	ASTM D1004	1.35 (lbs-force)
Shore A Hardness	ASTM D2240	37

PART 3 EXECUTION

3.1 URETHANE FOAM APPLICATION

- A. Deck Surface and equipment requirements and conditions
 1. All surfaces to receive urethane foam insulation shall be clean, dry and oil free,
 2. The urethane shall be properly formulated, mixed, and sprayed through equipment recommended and approved by the Foam Manufacturer,
 3. All spraying equipment must be in tiptop shape, and
 4. Foam spray gun and coating sprayers must be clean and free of previous job materials before starting work.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

Page 7 of 10

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

- B. Foam application requirement and conditions
1. Foam application techniques used to apply the urethane foam shall be those recognized as an industry standard and approved by the Foam Manufacturer,
 2. The finished surface shall be free of excessive ridges and humps,
 3. Any soft or spongy foam sprayed on roof because of improper mixing must be completely removed and new foam applied, and
 4. Foam reapplication repairs shall be relatively unnoticeable.
- C. Finished Foam Surface application requirements and conditions
1. The preferred surface texture of the foam shall be smooth,
 2. "Orange peel" to "verge of popcorn" texture is acceptable, but the contractor must know that this shall require 20% to 60% additional coating respectively and at no additional cost to the Owner,
 3. "Popcorn" or "tree bark" finish is not acceptable,
 4. All areas that do not meet the finish requirements shall be ground smooth or completely removed and replaced to meet the acceptable surface textures, and the Owner's decision shall be final as to acceptability.
- D. Foam Thickness
1. Unless otherwise noted or required, the foam shall be applied in no less than 1/2" layers.
 2. Basic thickness of foam for each roof project shall be stated prior to the project quote.
 3. Minimum thickness of foam for any roof project shall be 1 inch.
 4. The minimum thickness in any given area must be applied the same day.
 5. Foam application shall have a tolerance of 0" to +1/4" for the chosen thickness.
- Note: The minimum thickness does not limit the average thickness of the foam application applied in one day when taper must be applied over the entire roof to obtain the proper slope to drains.
- E. Foam application requirements and conditions
1. Urethane foam should be coated with base coat the same day the foam is sprayed,
 2. If foam is not coated within 48 hours, surface shall be primed using the coating manufacturer recommended primer prior to applying base coating, and
 3. Under no circumstance shall "burnt" (orange color) foam be coated prior to surface preparation(priming).

3.2 POLYUREA BASE COAT APPLICATION

- A. The Polyurea base coating 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 in two coats to achieve a finished dry film thickness (DFT) of approximately 50 dry mils. 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 repaired. The base coat and any sealant must be cured clean and free of all moisture prior to application of topcoat.

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

3.2 SILICONE TOP COAT APPLICATION

- A. 20-Year Warranty System (30 dry mills total): Installer to provide installation schedule for product used, and the dry mil thickness at the end of each coat. Two vendors, Neogard and Gaco are used as examples but any vendor providing an "or equal" can be substituted.
1. Apply the silicone topcoat within 12-24 hours of the base coat application. The subsequent applications shall be made at right angles to the base coat application. Surface texture and conditions may require additional quantities of silicone coating to insure proper thickness.
 2. Apply the topcoat in a uniform application to achieve a minimum total finished dry film thickness (DFT) of 30 mils. 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. The 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.
 4. 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.
 5. Granular Coat: Apply mineral granules over wet topcoat using pressure equipment at a rate of 30-40 pounds per 100 square feet of roof area. Remove excess granules after topcoat has cured. Bare spots in the granulated surface shall be filled in by applying additional coating and granules.

3.3 WEATHER CONDITIONS

- A. Foam nor coating shall be applied to exterior surfaces during a period of rain or imminently expected rain.
- B. Coatings nor foam shall be applied until exterior surfaces are thoroughly dry, and
- C. Foaming operations should cease when the ambient outside temperature is within five (5) degrees of dew point.

3.4 CLEANING

- A. Daily, all debris and refuse shall be removed from job-site and disposed of properly.

3.5 PRE-WARRANTY INSPECTION AND TESTING

- A. Upon the declaration by the contractor that the roof has been completed, an inspection shall be undertaken by the architect generating a "punch-list."
- B. The Contractor shall correct any and all deficiencies and/or damages found by the inspection after which a second joint inspection will be undertaken.
- C. The owner's representative has the option of taking core samples to verify

075713S3 SPRAYED POLYURETHANE FOAM ROOFING, POLYUREA/SILICONE COATING

- compliance with the standard. Cut out sections shall be immediately repaired by the applicator at its expense
- D. No traffic shall be permitted on the completed surface for a minimum of three (3) days.

END OF SECTION 07 5702