

GUIDE SPECIFICATION • POLYURETHANE FOAM ROOFING WITH PROTECTIVE ELASTOMERIC ROOF COATING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Work consists of any and all labor, materials, goods, supplies, equipment, tools, utilities, temporary facilities, transportation, delivery services, and other services and things of any nature whatsoever as are expressly and impliedly necessary to timely and satisfactorily complete the Project: (i) in strict accordance with the Contract Documents; and (ii) not later than the Required Completion Date specified in the Master Schedule.

1.02 SUMMARY

A. Provide:

1. Application of sprayed polyurethane foam;
2. Application of acrylic elastomeric coating system;
3. Preparation of roof deck to receive roofing system including priming;
4. Installation of sheet metal work relative to roofing system;
5. Preparation and submittal of required samples, certification's and manufacturer's literature and warranty;
6. Warranty related to roofing system:
7. Miscellaneous items and appurtenances as needed for a complete and proper job.

1.03 RELATED WORK

1. Sheet Metal
2. Carpentry
3. Plumbing
4. Electrical
5. HVAC

1.04 MANUFACTURER QUALIFICATIONS

Manufacturers shall be meet the requirements as follows:

- A. The foam and coating shall be listed as Class A over existing non-combustible roofing systems by Underwriters Laboratories per UL 790 at the thicknesses intended for use.
- B. The foam and coating shall be listed as Class B over existing combustible decks by Underwriters Laboratories per UL 790 at the thicknesses intended for use.
- C. Submit a copy of the California State Fire Marshall Certification.
- D. Submit a copy of the Bureau of Home Furnishing and Thermal Insulation License.

1.05 Submittals

- A. Manufacturer's Literature: Submit four (4) copies of the manufacturer's data sheets regarding specifications, application information and safety information, and safety instructions on each product proposed for use. Submit SDS to inspector of record and District for on-site review.
- B. Samples: Submit two (2) samples of the proposed coating system applied on urethane foam. Samples shall be two inches by four inches in size, minimum.

1.06 QUALITY ASSURANCE

A representative from the coating manufacturer shall inspect the roof after completion to assure that the detail work at the protrusions, drains, parapets and edges has been complete in conformance with good practice. The inspector shall also check the thickness of the coating with an optical comparator.

PART 2 - PRODUCTS

2.01 All primer, polyurethane foam, and coating shall be manufactured by the same manufacturer providing the warranty.

2.02 PRIMER

A. Roof deck shall be Ultra-Bond 10 as manufactured by General Coatings Manufacturing Corp. or prior approved equal, black in color and applied at the application rate of ¼ gallon to ½ gallon per 100 square feet.

8. Galvanized metal surfaces shall be primed with DTM wash primer or prior approved equal per manufacturer's recommendation.

2.03 POLYURETHANE FOAM

Polyurethane foam shall be a two-component polyurethane foam system formulated for use through airless equipment. The product shall meet or exceed the following typical physical properties listed for Ultra-Thane 230 as manufactured by General Coatings Manufacturing Corp. or prior approved equal:

PROPERTIES	TEST METHOD	VALUE,
Density (sprayed-in-place)	D-1622	3.0 pcf
K Factor Initial	C-518	.17
Compressive Strength	D-1621	50-60 psi
Tensile Strength	0-1623	90 psi
Shear Strength	C-273	50-60 psi
Closed Cell Content	D-1940	98% min.
Water Vapor Transmission	C-355	1.8 perms
Water Absorption	D-2842	.017
Flame Spread	E84	75 max
Roof Deck Classification;		
Combustible Deck		Class B
Non-combustible Deck		Class A

2.04 FLUID APPLIED ELASTOMERIC COATINGS

Base Coat and Top Coat Material

The base coat and top coat material shall be as follows: The elastomeric coating shall be an acrylic elastomer coating. The product shall be Ultra-Flex 1000 as manufactured by General Coatings Manufacturing Corp. or prior approved equal with the following typical physical properties:

PROPERTIES	TEST METHOD	VALUE
Solids by Volume	D-2697	56%
Solids by Weight	D-2697	70%
Flash Point	D-56	>212°F
Elongation	D-2370	300% (±25)
Tensile Strength	D-2370	310 psi (±50)
Dry Adhesion	D-903	8.0
Tear Resistance	D-624	130 pli
1000 hr Accelerated Weathering	D-2370	No Cracking or Checking
Elongation after Accelerated Weathering	D-2370	220% (±25)
Low Temperature Flexibility after Accelerated Weathering Permeance	D-522 D-1653	Pass 9
Water Swelling	C-471	2%
Fungi Resistance (zero = No Growth) Impact Resistance Tension Set @ 100%	G-21	Zero Rating >160 0%
Durometer Hardness: Shore A	D-2240	65-75

2.05 CAULKING OR SEALANTS

Caulking materials shall be single component polyurethane elastomeric such as "Vulkem-921". Sikaflex-1A, or equal. caulking of fabricated metal components or lapping metal joints shall use only the polyurethane sealants.

2.06 GRANULES (optional)

Granules shall be GCMC #11 white as manufactured by General Coatings Mfg. Corp. or equivalent. Granules shall be broadcast into the top coat application while it is still wet

2.07 FLUID APPLIED ELASTOMERIC COATING THICKNESS

The combine total minimum dry mil thickness of the base coat, intermediate coat and top coat shall be 24 mils exclusive of granules.

2.08 EQUIPMENT

Equipment for spraying foam shall be manufactured specifically for the application of polyurethane foam. The equipment shall be airless, capable of maintaining a 1:1 volume ratio and have primary and hose heaters. Coating equipment shall be an airless type as recommended by the coating manufacturer.

2.09 GALVANIZED SHEET METAL

- A. Galvanized sheet steel shall be 24-gauge unless otherwise shown on drawings or called for in the specifications. All material shall be copper bearing and heavily galvanized. Sheet metal shall be 1.25 oz/s.f., hot dipped galvanized coating conforming to standards as set forth in ASTM A-525.
- B. Solder shall be one-half (1/2) pure virgin lead and one-half pure tin.
- C. Nails shall be galvanized and selected for their intended use.
- D. Screws shall be cadmium plated oval head sheet metal screws.
- E. Washers shall be 4lb. lead washer 1-inch diameter.
- F. Rivets shall be soft annealed non-corrosion metal.
- G. Sheet Aluminum: Alcoa Aluminum sheets, 35 alloy aluminite satin finish. Gauge shall be .040, unless otherwise shown on drawings or called for in the specifications.

PART 3 PREPERATION & APPLICATION

3.01 SURFACE INSPECTION

- A. The Roofing Contractor is the Prime Contractor and shall be responsible for additional roof-related work that may include but not be limited to the following:
 - 1. The roofing Contractor shall be responsible for the verification of all measurements relative to this project.
 - 2. Raising, repairing, or modifying existing air conditioning systems for the installation of curbs, metal pans and duct work.
 - 3. Roof related carpentry work.
 - 4. Roof related metal work: All metal work to receive insulation directly shall be cleaned and free from oil, dirt and oxidation.
 - 5. Raising all utility rigid conduit sufficiently for the unobstructed application of roofing insulation materials underneath. The conduit may be raised permanently or temporarily and reset upon new wood sleepers on top of the new SPRS.
- B. The contractor shall be responsible for determining whether the roof deck is in compliance with applicable building codes.
- C. Before roof construction starts, water test all drain bowls/sumps and associated plumbing to ensure that they are water-tight and clear to the discharge level.
- D. Sufficient roof slope to maintain proper drainage must be engineered into the structure.

3.02 SURFACE PREPARATION

- A. If any areas of the roof or the roof components have asbestos containing roof mastic, it shall be the Contractor's responsibility to employ properly licensed, trained, and DOSH certified subcontractors to remove and dispose of all ACM and lead contaminated material. Contractors shall provide the Owner with copies of all hazardous waste disposal manifests and EPA notifications. All costs associated with the ACM and LCP abatement work shall be Included in the base bid and shall be performed at no additional cost to the Owner.
- B. Thoroughly clean the surface to be foamed. The surface shall be free from solvent, grease, dust, sediment, dirt and sticky mastic. AU extraneous equipment and equipment supports shall be

removed from the deck prior to the application of polyurethane foam.

- C. On installations over existing roofing, cut and remove blisters on the existing roofing that are larger than six inches in diameter. Blisters that are small than six inches in diameter shall be slit and nailed to the deck with one Inch square head roofing nails.
- D. All existing vertical flashings and built-up roofing material shall be removed to the substrate at HVAC curbs, platforms, perimeter vertical flashings to ensure a water tight (water block) bond to the substrate. All loose built-up roofing at parapet walls shall be removed or secured as directed by the manufacturer.
- E. All roof(s) with gravel shall have the gravel removed by means of power-vac
- power broom - power-vac method to remove all loose non-embedded gravel and dirt.
- F. Install all new sheet metal flashings as necessary to provide for a water tight system in accordance with industry standards. All new and existing galvanized steel surfaces shall be primed with DTM Wash Primer.
- G. If foam is applied directly to a combustible deck, surfaces are to be primed with $\frac{1}{2}$ gallon per square with Ultra-Bond 10 Primer.
- H. Install new perimeter edge metal as necessary during the preparation stage. The edge metal shall be made from 24-gauge galvanized metal that shall be painted to match existing. The edge metal shall be installed per plans and shall have a 1-inch high rise, with a $\frac{3}{8}$ -inch return. with drip edge.

The face shall be a minimum of $3\frac{1}{2}$ -inches or shall match existing if wider or if a wood nailer is used to raise the perimeter edge metal as per plans. The flange shall be a minimum 4-inches unless otherwise noted below and shall be attached over wood surfaces with galvanized composition roofing nails with length long enough to penetrate a minimum of $\frac{1}{2}$ -inch into the sheathing with two rows staggered 4-inches on center.

If gun nails are used, all nails must be set tight against the metal. Screws may be substituted for nails.

Perimeter edge metal attached over concrete substrates shall be attached over a treated wood nailer mechanically fastened to the substrate With a $\frac{1}{2}$ -inch redhead expanding type fastener a minimum 24-Inches on center, or if attached directly to the concrete. shall incorporate concrete

fasteners such as "Tap Con" concrete screws, "Rawl-Spike" or "Z-Mac" fasteners, or equal secured on 9-Inch centers. Shot driven (cartridge gun) fasteners shall not be allowed.

Perimeter metal attached to metal substrates shall be fastened using self-tapping screws on 6-inch centers. All equipment that is mounted with sufficient roof clearance may have Z-metal or skirt flashing added that requires additional sheet metal flashing to ensure water-tight seal.

Edge metal shall be interlocked 4-inches. All metal laps shall be buffered with elastomeric caulking as specified.

- I. All surfaces not to receive foam such as walls and roof mounted equipment shall be carefully masked with tape and paper to prevent over-spraying with foam and coating. All coating is to be terminated in clean straight lines.
- J. HVAC and Roof Mounted Equipment
 1. NOTE: It shall be the responsibility of the roofing contractor to verify that all roof mounted HVAC equipment is in proper working order before disturbance and after the conclusion of the roofing project.
 2. Air conditioners and swamp coolers are the most difficult areas of the roof to waterproof; therefore, all air conditioners and swamp coolers shall be prepared by one of the following methods.
 - A. Some air conditioners are elevated with equipment support legs allowing the applicator to reach the underneath with the spray gun. Bottom-drop air conditioners and swamp coolers often can be waterproofed with the foam spray gun with sufficient access. This method of waterproofing is acceptable if the applicator has at least 12-inches of distance between the tip of the spray gun and the surface to be sprayed without causing a rough foam surface due to an excessive angle between the surface and spray gun.
 - B. Skid mounted A/C units shall be raised and the existing skids removed. A new fully enclosed (boxed) platform constructed from 2x8 (minimum) lumber with 1/2-inch CDX plywood top shall be fabricated. The finished grade of the top of the platform shall be 6-inches (minimum) above the new roof level. A layer of singly-ply roofing shall be set over the plywood top of the platform and turned down at the edge one inch. A new 24-gauge galvanized seamless sheet metal cover shall be

Installed over the platform. Where large platform covers are required, all seams shall be soldered or constructed with 1½-inches minimum standing seam. Caulking of the seams shall not be acceptable. The new metal cover shall be 2-inches larger than the wood curb on all sides with a 2-inch x 60 degree turndown angle.

- C. Slide the new full platform under the raised A/C unit and lower the unit into place. It *may* be necessary to foam the vertical sides of the platform prior to setting it into place if clearance on all four sides is not sufficient for proper foaming. Do not foam the sheet metal cover into the roof.
 - D. AU A/C condensate lines shall run to a drain or off the roof. Condensate shall not be discharged into soil pipes or other vents.
- 3. All ductwork shall receive 1-Inch of foam. NOTE: The duct walls at the roof penetration shall receive 1-inch of foam on all four sides with a smooth flashing transition to both the roof and the A/C platform sides. (This may require either disassembly of the ductwork or moving the A/C prior to foaming.)
 - 4. All electrical connections and gas connections must be disconnected prior to raising the unit and reconnected and tested after the unit is reset.
 - 5. All conduit and gas lines must be raised off the roof. After the roof has been foamed, the conduit shall be reset on new 2x4's. The old conduit support shall not be reused.
- K. Internal Drains
- 1. All internal roof drains shall be flushed with water to insure that the drains are clear to the discharge level prior to starting the roofing work.
 - 2. Remove the clamping ring from the drain bowl. Apply a bead of elastomeric caulking to the drain bowl clamping ring contact areas and refasten the clamping ring with new bolts. Remove excess caulking from inside the drain bowl and clamping ring. Mask the inside of the drain and spray a "water block" from the deck to the top of the clamping ring. The elastomeric coating shall be applied and "back rolled" in a "picture frame" fashion to achieve double the specified thickness of coating around the water entry area. Flush drains (a second time) with water to insure that the drains are clear to the discharge level after all

roofing work is completed. All Internal drains shall be fitted with appropriate strainers or leaf catchers. Strainers or catchers shall be metal. Plastic strainers and leaf catchers shall not be used.

- L. Low areas over 100 s.f. in size and greater than 1/2-inch deep shall be filled with foam to match the surrounding grade and prior to the application of the specified thickness of foam.
- M. All soil pipes and other roof vents shall be masked and remain fully open after foaming.
- N. All 'T' tops and other roof vents shall be raised as necessary to remain fully open after foaming.
- O. All scuppers shall comply with local codes regarding the size of the water entry opening. Scuppers must extend a minimum of 2-inches past the wall.
- P. All antennae shall be attached to curbs or antenna mounts. Guy wires shall not be secured through the roof.
- Q. All skylights shall be raised and on new 2x6-inch (minimum) wood curbs or factory metal curbs. The finish of the inside of the new curb shall be discussed at the jobwalk. All skylights shall have appropriate "Fall-through" protection.
- R. All roof fields adjacent to gutters shall be free from obstruction of water flow into the gutter.
- S. Conduit and Piping
 - 1. All small conduit and gas lines, 1 1/2-inches and under, must be raised off the roof. After the roof has been foamed, the conduit shall be reset on new redwood 2x4's set on top of the foam.
 - 2. Large conduit and piping, 2-inches and larger, shall be supported on new metal stands fastened with appropriate fasteners to the roof deck.

Note: Use oversized clamps to secure conduit and piping. Conduit and piping which move during use such that the roof system may be damaged shall be set upon appropriate roller saddle supports or other vibration isolating devices.

- 3. When blocking conduit or piping, use minimum 4x4 redwood blocks, if possible, to keep the lines as high as possible above the foam roof. Use 12-inch minimum length blocks set on spaghetti walkpad material. If more

than one conduit or piping line will be set on *the* same blocking, increase blocking size so that 6-inches of blocking shall extend at each side of conduit and piping. Space blocking at every joint and mid-span (maximum of 5-feet between blocks). Align all blocking, conduit and piping lines prior to final anchorage. All lines that are not straight and true prior to commencement of the roof work shall be adjusted prior to final anchorage to the new roofing. Secure small conduit lines and piping with galvanized clamps using

galvanized fasteners. Secure large conduit and piping with unistrut brackets with mounting plates securely fastened to the roof deck.

- T. If a technique other than one of the above methods is proposed, the technique must be approved by the Owner or Architect

3.03 APPLICATION OF URETHANE FOAM

A. Environmental Conditions

1. Wind Velocity shall not exceed 12 miles per hour.
2. Wind screens shall be used throughout the project to minimize the possibility of over spray on adjacent areas.
3. Application of sprayed polyurethane foam shall not proceed if ambient temperature is less than 40 deg. F, or if the substrate temperature is less than 50 deg. F.
4. Sprayed polyurethane foam shall not be applied over moist surfaces or when rain or inclement weather is imminent
5. All foam Insulation shall be performed in accordance with the manufacturer's published recommendations.

B. Spray Application

1. The sprayed polyurethane foam shall be applied in minimum ½-inch passes to achieve a minimum thickness of 1-Inch. NOTE: Freshly sprayed foam shall be allowed to set for 15 minutes before being walked upon.
2. Only as much area as can be brought to final thickness should be attempted in a day. Phasing of the foam is strictly forbidden. If additional foam must be added after the 24 hour period, the existing foam must be primed with neoprene primer and a minimum ½-inch of foam in a single pass can be applied.

3. The foam shall be free from bumps, pinholes and ridges. The surface shall exhibit a smooth or orange peel surface texture. Popcorn or tree bark surfaces shall be deemed unacceptable.
4. The foam thickness shall be checked every 500 square feet prior to coating application.
5. The field of the polyurethane foam shall be applied in minimum ½ inch lifts to a thickness of 1-inch or. as otherwise specified. Polyurethane foam may be gradually tapered to the edge metal (1-inch rise metal), roof drains and scuppers from a distance of up to 3-feet from edge or drain outlet Polyurethane foam may be applied at thicknesses greater than ½ inch per lift if all other requirements and conditions are met. The maximum polyurethane foam thickness shall not exceed 4-inches. Low areas over 100 sf in size and greater than 1/2-inch deep shall be filled with foam to match the surrounding grade and prior to the application of the specified thickness of foam. All parapet walls and ductwork shall receive a minimum of 1-inch of foam and the specified protective coating. Additional foam thickness shall be applied to provide positive slope-to-drain. The Contractor shall employ the use of a laser level to Insure accurate positive slope to drain. No exceptions.
6. GRANULES (optional): Granules shall be GCMC #11 White granules as manufactured by General Coatings Mfg. Corp. or equivalent Granules shall be broadcast into the top coat application at 35-40 lbs per square while it is still wet.

3.04 APPLICATION OF FLUID APPLIED PROTECTIVE COATING

- A. General: Sprayed polyurethane foam must be protected from ultra-violet light in order to avoid degradation of the polymer. Coating also protects the foam from water and adverse weather conditions. Coatings must be specifically formulated for use over urethane foams.

- B. Spray Application

The coating is to be applied to the surface of the sprayed polyurethane foam in two or three uniform passes. A total of 24 TOM shall be applied to the roof as determined by an optical comparator exclusive of granules.

- C. Base Coat Material

The base coat shall be applied at a minimum rate of 1 ½ gallons per square to achieve a minimum finished dry mil thickness of 12

TDM. The total minimum thickness for the base coat shall be 12 TOM.

D. Top Coat Material

The top coat shall be applied at a minimum rate of 1½ gallons per square to achieve a finished dry film thickness of 12 TOM. There shall not be any voids or base coat showing. The total minimum thickness for the top coat shall be 12 TOM.

E. Total thickness shall be a minimum of 24 mils or greater.

Coating materials such as Silicone, Single-Component or Catalyzed Polyurethane Elastomers, Plasticized Acrylics, Vinyls, EVA, Terpolymer and PVA materials shall not be considered.

F. Granules (Optional)

Granules shall be GCMC #11 White granules as manufactured by General Coatings Mfg. Corp. or equivalent. Granules shall be broadcast into the top coat application at 35-40 lbs per square while it is still wet.