Appendix VIII

Specification for Spray Applied Polyurethane Foam to Ducting

SPECIFICATION FOR SPRAY APPLIED POLYURETHANE FOAM TO DUCTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, tools and equipment necessary for the application of a SPF insulation system of ducting, including accessory items, subject to the general provisions of the contract.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Rough Carpentry Section 06100
- B. Insulation, Other Section 07200
- C. Thermal Barrier Section 07220
- D. Vapor Retarder Section 06100
- E. Mechanical Division 15
- F. Electrical Division 16

1.03 QUALITY ASSURANCE

Contractor Qualifications: The contractor should provide information concerning projects similar in nature to the one proposed, including location and person to be contacted.

1.04 SUBMITTALS

- A. Manufacturer's published data sheets or letter of certification that their products comply with the materials specified. This is to include SPF and, if required, coatings, primers, thermal barriers, and vapor retarders.
- B. Shop drawings on sheet metal, accessories, or other fabricated items, if required.
- C. Manufacturer's application or installation instructions.
- D. Contractor/applicator certification from SPF supplier and/or coating and thermal barrier manufacturers and references. See Section 1.03.
- Safety and handling instructions for storage, handling and use of the materials to include Material Safety Data Sheets (MSDS).
- F. Field quality control procedures to be utilized by the contractor/applicator to insure proper preparation and installation of SPF, coating, and thermal barriers, detail work and follow-up inspection.

1.05 MATERIALS DELIVERY AND STORAGE

- A. Materials shall be delivered in the manufacturers original, tightly sealed containers or unopened packages, all clearly labeled with the manufacturer's name, product identification, safety information, and batch or lot numbers where appropriate. Where materials are covered by a referenced specification, the labels shall bear the specification number, type and class, as applicable.
- B. Containers shall be stored out of the weather and direct sun, where the temperatures are within the limits specified by the manufacturer.
- C. All materials shall be stored in compliance with local fire and safety requirements.

SPECIFICATION FOR SPRAY APPLIED POLYURETHANE FOAM TO DUCTING

1.06 ENVIRONMENTAL CONDITIONS

- A. Do not apply the SPF below the temperature and/or above humidity specified by the manufacturer for ambient air or substrate. If foam is being applied to the metal building's exterior, do not apply during inclement weather.
- B. Do not apply protective coatings when there is ice, frost, surface moisture, or dampness present on the surface to be coated. Prior to applying the coatings, check the polyurethane foam to insure the surface is dry. Apply protective coatings in accordance with the coating manufacturer's application instructions.

1.07 SEQUENCE AND SCHEDULING

In new construction projects the SPF is installed when the preparation of the ducting is in place and in coordination with other building trades.

1.08 SAFETY REQUIREMENTS

- A. See API Bulletin MDI-Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal, Stock Number AX-119.
- B. Refer to appropriate Material Safety Data Sheets (MSDS) for additional safety information.
- C. Before starting to apply spray polyurethane foam or coating, all HVAC equipment on the roof must be turned off. These units and any other potential sources of air entry into the building must be sealed.
- D. Proper disposal of waste materials and containers must be done in compliance with the manufacturer's guidelines and/or federal, state, and local regulatory agencies.
- E. For protection against exposure to higher levels of MDI (greater than 1 ppm) or for entry into confined spaces, workers must wear either a self-contained breathing apparatus, with full face piece, operated in a pressure-demand or other positive-pressure mode, or a combination respirator, including a Type C air-supplied respirator, with full face piece, operated in a pressure-demand or other positive-pressure mode, and an auxiliary self-contained breathing apparatus, operated in a pressure-demand or other positive-pressure mode. See API Bulletin MDI-Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal, Stock Number AX-119.
- F. Personal protective clothing should be worn. This includes the wearing of the appropriate protective clothing, including eye protection (face shield or chemical worker's goggles), gloves and coveralls. This is essential to preventing skin exposure and is strongly recommended for most individuals who work with PMDI.

PART 2 - PRODUCTS

2.01 POLYURETHANE FOAM

- A. The polyurethane foam to be applied shall be a two component system made by combining an isocyanate (A) component with a polyol (B) component and shall possess the following physical characteristics (use the appropriate table):
- B. Polyurethane Foam Primers: Primers used shall be as recommended by the manufacturer of the SPF materials specified.
- C. Fire Safety Requirements: See API Publication MDI-Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal, Stock Number AX-119.

VIII

SPECIFICATION FOR SPRAY APPLIED POLYURETHANE FOAM TO DUCTING

EXTERIOR POLYURETHANE FOAM

PROPERTIES	ASTM TEST	VALUE	UNITS
Density (sprayed-in-place)	D-1622	40 - 50 (2.5 - 3.0)	kg/m3 (lbs/ft3)
Compressive Strength	D-1621	280 (40) (Minimum)	kPa (lb/in2)
Closed Cell content	D-2856	90% (Minimum)	%Value
R-Value		1.1 (6.2) Aged	K·m²/W (⊕F·ft₂·hr/Btu)
Flammability *	E-84	<75	
Smoke *	E-84	<450	

^{*}This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions. This numerical flame spread rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

2.02 PROTECTIVE COATING SYSTEM

- A. The elastomeric coating system may be one or more of the following types:
 - 1 Acrylic
 - 2 Silicone
 - 3 Polyurethane Elastomer
- B. Physical Properties: The elastomeric coating system shall possess the following physical characteristics (NOTE: Specifier shall list physical properties of selected elastomeric coating system):
- C. General: It is recommended that the coating system be elastomeric in nature (at least 100% elongation). Within these generic-coating types are both vapor retardant and breathable systems.

PROPERTIES	ASTM TEST
Tensile Strength	D-412
Elongation	D-412
Hardness Shore A	D-2240
Tear Resistance	D-624
Light Exposure and Weathering	G-151/154
Moisture Vapor Transmission	E-96 Procedure E
Chemical Resistance	D-1308

2.03 SYSTEM REQUIREMENTS

- A. Insulation System by United Coatings. Contact Brady Kolden (509) 988-6268
- B. Approved Applicators:

Stone Roofing Company Inc. 730 North Coney Avenue Azusa, CA 91702 (626) 969-6515

VIII

Cook Coatings Company 33834 Zeiders Rd. Menifee, CA 92584 (951) 679-3336

- C. Polyurethane foam insulation shall be spray-applied to a minimum thickness of 2.5"(plus or minus 1/4") to equal and average R-7.
- D. Coating shall be applied in a minimum of three (3) separate coats. Acrylic coating to be 60% solids.
 - 1) The base coat shall be applied at a rate of 1 gallon per 100 square feet.
 - 2) The mid coat shall be applied at a rate of 1-1/4 gallons per 100 square feet.
 - 3) The top coat shall be applied at a rate of 1-1/4 gallons per 100 square feet, yielding a total system thickness for both coats of 28-30 Total Dry Mils.
 - 4) During the final top coat application, size #11 granules will be embedded into the wet top coat material at a rate of 40 pounds per 100 square feet.

2.04 RELATED PRODUCTS

- A. 15-Minute Rated Thermal Barriers.
 - 1 Sprayed-in-place cementitious.
 - 2 Sprayed-in-place fiber.
 - 3 Minimum 13 mm (½-inch) gypsum board.
 - 4 Other.
- B. Vapor Retarder That which is rated at or less than 3 ng/m²·s·Pa (0.05 perm) ASTM E-96, Method E.
 - 1 Modified asphalt.
 - 2 Butyl rubber.
 - 3 Polyethylene film.
 - 4 Other.
- C. Substrate Primers (if required) The primer to be applied must be specifically selected for the given substrate to be primed and must be compatible with the SPF.

PART 3 - EXECUTION

3.01 APPLICATION OF PRODUCTS

The products intended for use in insulation systems must be applied within the manufacturer's guidelines for temperature, humidity, and other atmospheric conditions. In addition, they must be sequenced so as to take into consideration substrate preparation, proper cure times, and inter-coat adhesion.

3.02 SUBSTRATE CONSIDERATION AND PREPARATION

Surface preparation for is outlined below:

- A. Primed: If the primed metal surface is free of loose scale, rust, weathered or chalking paint it can be cleaned using pressure washing, steam cleaning, solvent cleaning, vacuum equipment and hand or power tools to remove loose dirt, grease, oil, or other contaminants.
- B. Non-Ferrous Metals (including galvanized and stainless steel): When required, clean surfaces as recommended by the primer manufacturer.
- C. Unpainted Steel: Clean as recommended by primer manufacturer in order to prepare the steel surface for the primer

SPECIFICATION FOR SPRAY APPLIED POLYURETHANE FOAM TO DUCTING

3.03 PRIMER APPLICATION

When required, the primer shall be applied to the properly prepared substrate and allowed to cure in accordance with the manufacturer's guidelines.

3.04 SPRAY POLYURETHANE FOAM APPLICATION

- A. The spray polyurethane foam components (A) and (B) shall be processed in accordance with the manufacturer's instructions.
- B. The polyurethane foam shall be sprayed within the manufacturer's guidelines for temperature, humidity, and other atmospheric conditions. Take precautions to protect surroundings from overspray.
- C. The polyurethane foam shall be sprayed in minimum 13 mm (½ inch) thick passes (lifts) with the overall thickness to be a minimum of mm (inches). The full thickness of SPF to be applied within any given area should be completed in one day.
- D. The final sprayed polyurethane foam surface shall be "smooth, orange peel, coarse orange peel, or verge of popcorn." Polyurethane foam surfaces termed "popcorn" or "treebark" are not acceptable and should be corrected. See SPFA Publication *Spray Polyurethane Foam Systems for New and Remedial Roofing* for foam texture photographs, Stock Number AY-104.
- E. Any damage or defects to the polyurethane foam shall be repaired prior to applying protective coatings, vapor retarders, or thermal barriers.
- F. The polyurethane foam surface shall be free of contaminants that will impair adhesion of the protective coatings, vapor retarders, or thermal barriers.

3.05 PROTECTIVE COATING APPLICATION

C.

- A. Inspection Prior to the application of the protective coatings, the polyurethane foam shall be inspected to insure that conditions required by Section 3.04 have been met.
- B. The coating application shall not proceed during inclement weather. The applicator shall apply the protective coating within the temperature and humidity ranges specified by the manufacturer for ambient air and substrate. Wind barriers should be used if wind conditions could affect the quality of the installation.

	Ap	plication
1.	•	Base Coat
		The base coat shall be applied the same day as the polyurethane foam when possible. If more than 24 hours elapse prior to the application of the base coat, the polyurethane foam shall be inspected for UV degradation, oxidation, and contaminants. The manufacturer's recommendations shall be followed to prepare the foam surface before coating applications.
		The base coat shall be applied at a uniform thickness with the rate of application governed by the polyurethane foam surface texture. Coatings shall be applied at a rate to achieve the minimum dry film thickness (DFT) specified by the protective coating manufacturer. The coating shall be allowed to cure and be inspected for pinholes, thinly coated areas, uncured
		areas, and other defects. Defects shall be corrected.
2.		Top Coat and/or Subsequent Coat
		Inspect the base coating for defects and thin coating. Correct defects.
		Subsequent coating should be applied in a timely manner to insure proper adhesion between coats.
		Final coat shall be inspected for defects and thin coating. Correct defects in accordance with manufacturer's recommendations.