SECTION 07570

COATED FOAMED ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. New sprayed polyurethane foam roofing with elastomeric coating.

B. New sprayed polyurethane foam roofing with aggregate cover.

C. Repair and re-coating of existing coated polyurethane foam roofing.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-ln-Place Concrete: Requirements for finishing and curing concrete roof deck.

B. Section 05300 - Metal Deck: Requirements for deck materials, support, deflection, and slope.

C. Section 06100 - Rough Carpentry: Requirements for wood deck materials, support, deflection, and slope.

D. Section 07600 - Flashing and Sheet Metal: Metal trim and flashings associated with roofing.

E. Section 07700 - Roof Specialties and Accessories: Roof expansion joints, vents, prefabricated copings and trim.

F. Section 08620 - Unit Skylights.

G. Section 13100 - Lightning Protection.

H. Division 15 - Mechanical: Plumbing and HVAC components penetrating roof.

I. Division 16 - Electrical: Electrical components penetrating roof.

1.3 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers--Tension.

D. ASTM D 822 - Standard Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

E. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

F. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

G. ASTM D 1863 - Standard Specification for Mineral Aggregate Used on Built-Up Roofs.

H. ASTM D 2856 - Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

K. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.

L. SPI Bulletin AX-119 - MDI-Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal; Society of the Plastics Industry, Inc., Spray Polyurethane Foam Division.

M. SPI SFPD - Sprayed Polyurethane Foam Surface Visual Guide; Society of the Plastics Industry, Inc., Spray Polyurethane Foam Division.

N. SSPC-SP 6 - Commercial Blast Cleaning (Part of Painting Manual, Volume 2); Steel Structures Painting Council.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data on products to be installed.
   1. Application or installation instructions.
   2. Listing, classification, and approval certifications.
   3. Safety and handling instructions for storage, handling and use of the materials.
   4. Warranty: A specimen copy of the applicable warranty.

C. Product Certification: SPI/SPDF accreditation test for materials.

D. Certifications: If manufacturer's published data sheets do not indicate compliance with all specification requirements, provide letter of certification that all products comply with the specification requirements; include primers (if required), foam and coatings.

E. Shop Drawings: Show materials and details of fabrication of sheet metal, accessories, or other fabricated items.

F. Qualification Statements:
   1. Manufacturer qualifications.
   2. Installer qualifications.
   3. Independent inspector qualifications.

G. Applicator's Field Quality Control Procedures: Written description of procedures to be utilized to insure proper preparation and installation of sprayed foam and coatings, detail work and follow-up inspection.

H. Executed warranty, at completion of work.

I. Maintenance Data: Manufacturers' recommended protection, cleaning, and repair procedures, including recommended frequency of inspection.
   1. Include proposal for annual inspection program.

1.5 QUALITY ASSURANCE

A. Foam Surface Finishes: As defined in SPI Spray Polyurethane Foam Division sprayed polyurethane foam surface visual guide. Provide two copies; maintain one copy on site at all times.
B. Foam and Coating Manufacturer Qualifications: Firms which can show evidence of ability to manufacture the products

specified and sufficient financial resources and manufacturing facilities to furnish materials on this project; evidence required includes references, past project descriptions, specimen warranty, product data, test data, and code approvals.

C. Installer Qualifications: A firm with experience installing roofing systems of the type specified.
   1. Show contractor/supplier level accreditation by SPI SPFD Accreditation Program.
   2. Approved or certified by the roofing system manufacturer as qualified to install the specified system.
   3. Provide information concerning projects similar in nature to the one proposed including location and person to be contacted.

D. Manufacturer Field Representation: Provide qualified representatives of the foam and coating manufacturers to monitor and inspect the installation of their products.

E. Independent Inspection: Provide inspection of the installation by a qualified SPI SPFD inspector member.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide materials packaged in the manufacturer's original, tightly sealed containers or unopened packages, clearly labelled 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. Store materials out of the weather and out of direct sunlight in locations where the temperatures are within the limits specified by the manufacturer.

C. Deck Sheathing: Take special care to prevent these materials from getting wet in storage.

1.7 PROJECT CONDITIONS

A. During installation, keep the roof free of personnel other than the roofing installers.

B. Comply with the manufacturer's instructions and recommendations as to handling and safety procedures.

1.8 WARRANTY

A. Provide a roofing system warranted by a single entity, either the entire roofing system manufacturer, the foam or coating manufacturer, or the installer.
   1. Warranty Term: _____ years from Date of Substantial Completion.
   2. Conditions: Warrant roofing system against delamination, blistering, cracking, and failure of coating to keep foam dry.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide coated foam roofing system manufactured by Foam Enterprises, Inc., 13630 Water Tower Circle, Minneapolis, MN 55441. ASD. Tel: (800) 888-3342. Fax: (612) 559-0945.
B. Substitutions are not acceptable.
C. Submit requests for substitutions in accordance with provisions of Section 01600.

2.2 COATED FOAM ROOFING SYSTEM

A. Coated Foam Roofing System: Foam Enterprises, Inc., FE303-2.7 with FE Acrylic Coating.

B. Coated Foam Roofing System: Foam Enterprises, Inc., FE303-2.7 with FE Silicone Coating.

C. Coated Foam Roofing System: Foam Enterprises, Inc., FE303-2.7 with FE Urethane Coating.

D. Foam Roofing System: Foam Enterprises, Inc., RockFoam Roofing System.

E. Performance Characteristics:
   1. Underwriters Laboratories listed and classified.
   2. Factory Mutual approved.
   3. Tested as a component of a fire-resistive roof-ceiling assembly, with hourly rating of _____.
   4. Fire Classification in accordance with ASTM E 108: Class A.
   5. Fire Classification in accordance with ASTM E 108: Class B.
   6. Wind Uplift Classification: _____.
F. Foam Thickness: _____ inch(es) (_____ mm).

2.3 MATERIALS

A. Foam: Sprayed-in-place two-component closed-cell polyurethane made by combining an isocyanate (A) component with a polyol (B) component, with the following physical characteristics:
   1. Density in place, when tested in accordance with ASTM D 1622: 2.7 lb/cu ft (43 kg/cu m).
   2. Compressive Strength, when tested in accordance with ASTM D 1621: 35 to 60 psi (2.4 to 4.1 Pa).
   3. Closed Cell Content, when tested in accordance with ASTM D 2856: 85 percent, minimum.
   4. Thermal Conductivity ("K"), when measured in accordance with ASTM C 177 or C 518: 0.15.
   5. R-Value, aged: 6.67.
   6. Flame Spread Index, when tested in accordance with ASTM E 84: Less than 75.
   7. Smoke Developed Index, when tested in accordance with ASTM E 84: Less than 450.

B. Foam for Repair of Existing Foam Roofing: Same type as existing, or compatible type, with same density and compressive strength as original foam as-installed. (Many commercial "froth packs" and pour foams will not give satisfactory results.)

C. Primers: As recommended by the manufacturer of the spray foam materials specified.
D. Granules: Size and type as recommended by the coating manufacturer, for application in the top coat.
E. Secondary UV Barrier Coating: Permeability as applied not less than 5.0 perm inch (7.25 ng/Pa s m) when tested in accordance with ASTM E 96, Perm Inch Method, and as recommended by the foam manufacturer.
F. Aggregate: Gravel or slag complying with ASTM D 1863 Size No.7 (1/2 inch to sieve size 4) or Size No.67 (3/4 inch to sieve size 4).

2.4 ACCESSORY MATERIALS

A. Flashings and Waterproof Coverings for Expansion Joints: Compatible with the foam and coating system and as recommended by roofing system manufacturer.

B. Other Materials Used in Roofing System: Selected for compatibility with roofing system materials and as recommended by the roofing system manufacturer; including, but not limited to, adhesives, sealing and caulking compounds, metal flashings, vents and drains.

C. Deck Sheathing: Insulation boardstock.

D. Deck Sheathing: 5/8 inch (16 mm) thick gypsum sheathing.
E. Mesh Fabric: Open weave mesh as recommended by roofing system manufacturer.
F. Walkway Pads: Breathable type as recommended by the coating manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the instructions and recommendations of the roofing system manufacturer.

B. Familiarize all installers with correct and safe application and handling procedures:
   1. See SPI Bulletin AX- 119, "MDI-Based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal."
   2. Refer to appropriate Materials Safety Data Sheets (MSDS) for additional safety information.

C. Before starting to apply foam or coating, shut off all HVAC equipment on the roof and seal air intakes and exhausts. Seal other potential sources of air entry into the building.

3.2 PREPARATION OF EXISTING BUILT-UP ROOFING (RETROFIT)

A. Remove all loose gravel, dust and residue using power vacuum equipment, power sweeper, air blowing, or other suitable means.

B. Thoroughly inspect or test the roofing to determine if moisture is present within the roof assembly. Remove moisture-saturated insulation and replace with compatible materials.

C. Thoroughly inspect the roofing for adhesion between felts, insulation, and deck. Fasten down areas of poor adhesion. Cut out or fasten down blisters, buckles, wrinkles and fishmouths.

D. Remove all soft mastic or other materials that might interfere with foam adhesion.

E. Remove or refasten all loose base flashing, counterflashing and gravel stops as required.

F. Inspect existing expansion joints and repair if necessary.

G. Mask lightning rods and remove lightning rod cables prior to foaming.

H. Relocate electrical and mechanical conduits or temporarily raise them above the finished roof surface.

3.3 PREPARATION OF EXISTING SPRAY POLYURETHANE ROOFING FOR RECOATING

A. Conduct a complete roof inspection to determine the repairs to be performed and the type of materials to be used.
   1. Perform a visual inspection to identify:
      a. Blisters and delaminated areas in the original roof.
      b. The condition of the roofing system at all flashing and termination points.
      c. Splits and cracks in the foam.
      d. Damage from impact such as foot traffic, hail, dropped tools, etc.
      e. Pinholes in the foam and/or coating.
      f. Exposed areas of foam and areas of eroded (thin) coating.
      g. Areas of ponding water.
   2. Perform a non-destructive moisture survey. Further inspect suspected moisture laden areas with a moisture probe or core samples.
   3. Probe to determine foam thickness.
   4. Take samples of the existing system as required by the manufacturer of the re-coat system to be applied.

B. Submit a report of the inspections and results of analysis:
   1. Analyze samples for:
      a. Adhesion of existing foam to the substrate.
      b. Interlaminar adhesion of foam.
      c. Presence of moisture.
      d. Adhesion of base coat to foam.
      e. Adhesion of top coat to base coat.
      f. Type and condition of protective coating.
      g. Thickness of protective coating.
   2. On a roof sketch indicate the following items and deficiencies:
      a. Location of core and slit samples.
      b. Areas of pinholes.

c. Uncured coating.
d. Blisters in foam or coating.
e. Mechanical damage.
f. Poor drainage.
g. Repairs required for foam stops, parapet walls, gutters, scuppers, edge terminations, expansion joints, counterflashing, and other perimeter items.
h. Repairs required to soil and vent pipes, drains, roof hatches, equipment curbs or supports, guy wires, hot stacks, skylights, mechanical units, walkways, sleepers, pitch-pans and other penetration items.
i. Water saturated sub-roofs, insulation, or foam.
j. Sub-roof damage or deterioration.
k. Areas of special consideration.

C. From the inspection, determine items that need to be corrected.

D. Replace or repair substrate that is unacceptable.

E. Remove and replace blistered foam, using the following guidelines:
1. Take test cuts (core or slit samples) in areas of blistered foam to determine the cause and extent of the problem. It may be necessary to remove foam beyond the actual area of an individual blister in order to prevent reoccurrence. The surface area adjacent to the cut should be prepared and cleaned.
2. If a number of blisters are found clustered in one area, remove the top pass or top two passes in the area rather than attempting to repair individual blisters.
3. Do not cut out a blister and fill with coating. Such a procedure will result in either a depression in the surface which will hold water or an unacceptable thickness of coating which may itself blister or crack.
4. After opening a blister or removing a foam layer, inspect the lower layer for degradation or moisture. No repair procedure should be attempted to a degraded or moist surface. Dry the surface and remove degraded area before proceeding to repair.

F. Remove unacceptable coating. Consult coating manufacturer for definition of unacceptable coating and methods of removal.
   1. Apply new coating to proper thickness to repaired areas.
   2. Two or more coats should be used. Final dry mil thickness of repaired areas should be as specified.

G. Small blisters, small cracks, breaks in the foam or coating, bird pecks, or hail damage may be repaired with a compatible sealant.
   1. Do not install sealant in a greater area or thickness than is recommended by the manufacturer for proper cure.
   2. Install sealant so as to insure the final surface is higher than the surrounding area so that water will not remain on the repair area.
   3. Use the type of sealant recommended by the coating manufacturer.
   4. Make the area to be repaired clean, dry, and bevel the edges to assure proper adhesion.
   5. In some cases, foam core plugs can be used with sealant to make small repairs.

H. If weathering has caused the surface of the coating and the foam to degrade (pitting), grind off or scarf the surface to expose clean, dry foam.

I. Build up low areas to eliminate ponding by applying foam. Follow manufacturer's recommendation for surface preparation.

J. Repair or replace deteriorated flashings, roof jacks, metal work, curbs, supports, penetrations, drains, etc.

K. Thoroughly clean the existing coated roof surface of dust, dirt, oils, and other contaminants by power washing, brooming, and/or blowing as recommended by the coating manufacturer.

3.4 PREPARATION OF METAL DECK

A. Ferrous Metal: Sandblast iron and steel surfaces which are not primed, shop painted, or otherwise protected in accordance with SSPC SP-6. Remove loose rust and unsound primer from shop primed iron and steel surfaces by scraping or wire brushing.

B. Non-Ferrous Metal: Clean galvanized metal, aluminum, and stainless steel surfaces as recommended by the roofing system manufacturer.

C. If metal surface is free of loose scale, rust, weathered or chalking paint, clean using compressed air jet, vacuum equipment, and hand or power broom to remove loose dirt. Remove grease, oil and other contaminants using proper cleaning solutions.

D. Fluted Metal Deck: Cover or fill flutes by method recommended by roofing manufacturer.

E. Fluted Metal Deck: Cover with deck sheathing, fastened to achieve wind uplift requirements specified for roofing system.
   1. Butt boards firmly butted together along all edges without gaps or openings. Calk joints more than 1/4 inch (6 mm) wide with a suitable sealant material.
   2. Special care must be taken to prevent these materials from getting wet in storage on the job site and after installation prior to being protected by foam. Moisture exposure will damage these materials and may be a cause for replacement.
   3. Remove loose dirt and debris by using compressed air, vacuum or light brooming. Do not power broom sheathing due to possibility of damage.
   4. Protect installed sheathing from spills of contaminants such as oil, grease, solvents, etc., as these materials cause soiling that cannot be readily removed from the board surfaces.

3.5 PREPARATION OF CONCRETE DECK

A. New Concrete: Allow to cure for twenty-eight (28) days prior to the application of primer or foam.

B. Remove loose dirt, dust and debris by using compressed air, vacuum equipment or brooming. Remove oil, grease, form release agents, laitance, and other contaminants using proper cleaning solutions.

C. Grout or calk all joint openings in concrete decks that exceed 1/4 inch (6 mm) in width prior to application of foam.

D. Prime all concrete surfaces.

3.6 PREPARATION OF WOOD DECK

A. Prime all untreated and unpainted surfaces with an exterior grade primer.

B. Tape or fill plywood joints more than 1/4 inch (6 mm) wide with a suitable material.

C. Clean deck of loose dirt, grease, oil and other contaminants prior to priming or foam application. Remove loose dirt or debris by use of compressed air, vacuum or brooming. Do not wash with water.

D. Tongue & Groove Sheathing and Planking: Cover with deck sheathing, fastened to achieve wind uplift requirements specified for roofing system.

3.7 FOAM APPLICATION

A. Do not begin application of foam until all preparation requirements have been completed.

B. Inspect substrate to determine whether sufficient slope exists to eliminate excessive ponding of water. Ponding is defined as an area of 100 square feet (9.2 sq m) or more which holds in excess of 1/2 inch (13 mm) of water as measured 24 hours after a rainfall.

C. Do not apply foam during inclement weather or when the temperature or humidity is below that specified by the manufacturer for ambient air and substrate. Use wind barriers if wind conditions could affect the quality of installation.

D. Apply foam in accordance with the manufacturer's specifications and instructions.

E. Build up low areas that could cause ponding by filling in with sprayed foam before the specified thickness of sprayed foam is applied to the entire roof surface.

F. Apply foam with minimum pass thickness of 1/2 inch (13 mm).

G. Apply foam uniformly over the entire surface with a tolerance of plus 1/4 inch per inch (6 mm per 25 mm) of thickness minus 0 inch (0 mm), except where variations are required to insure proper drainage or to complete a feathered edge.

H. Complete the full thickness of foam in any area prior to the end of each day. If due to weather conditions more

than 24 hours elapse between foam application and coating application, inspect the foam for UV degradation, oxidation or contamination and, if any of these conditions exist, prepare the surface in accordance with the recommendations of the roofing system manufacturer.

I. Uniformly terminate foam a minimum of 4 inches (100 mm) above the roof line at all penetrations (except drains, parapet walls, or building junctions). Make foamed-in-place cants smooth and uniform to allow positive drainage.

J. Skylights: Terminate foam below weep holes. Do not cover weep holes with foam or coating.

K. Finish the final sprayed foam surface to "smooth," "orange peel," "coarse orange peel," or "verge of popcorn" as defined in the SPI Sprayed Foam Surface Visual Guide. Remove surfaces classified as "popcorn" and "treebark" and reapply to an acceptable surface.

L. Allow the foam surface to cure sufficiently.

M. Repair damage and defects to the surface prior to the protective coating application.

N. Keep the foam surface free of moisture, frost, dust, debris, oils, tars, grease or other materials that could interfere with adhesion of the protective coating.

3.8 PROTECTIVE COATING APPLICATION

A. Apply coating over entire surface of existing foam roofing.

B. Apply coating over entire surface of foam.

C. Apply coating over foam at sloped surfaces exceeding 1/2 inch in 12 inches (1:24), vertical surfaces and other surfaces which will not hold aggregate, including exposed roof edges.
   1. Extend coating a minimum of 12 inches (300 mm) onto the flat area of the roof, from penetrations or vertical surfaces.
   2. Apply coating at minimum thickness of 30 dry mils (0.08 mm) total.

D. Inspect the foam surface prior to the application of the protective coating for suitability of base coat application.

E. Do not apply coating during inclement weather. Do not apply when the temperature is below or the humidity is above that specified by the manufacturer for ambient air and substrate. Use wind barriers if wind conditions could affect the quality of installation.

F. Base Coat: Apply the same day as the foam application when possible.
   1. Wait at least two hours after application of the foam before application of the base coat.
   2. If more than 24 hours elapse prior to the application of base coat, inspect the foam for UV degradation.
   3. Apply the base coat at a uniform thickness with the rate of application being governed by the foam surface texture.
   4. Apply coating at such a rate as to give the specified minimum dry film thickness.
   5. Allow the coating to cure.
   6. Inspect for pinholes, thinly coated areas, uncured areas or other defects. Repair defects prior to subsequent coats.
   7. Keep the base coat free of dirt, dust, water, and other contaminants until application of the top coat.

G. Top Coat and/or Subsequent Coat:
   1. Apply subsequent coats in a timely manner to insure proper adhesion.
   2. Apply additional material in areas of coarse foam profile.

H. Inspect the cured dry film thickness of the finished coating by taking slit samples and examining under magnification. Apply additional coating to areas that are found to have less than the thickness specified.

I. Apply granules in the top coat at the rate recommended by the coating manufacturer.

3.9 AGGREGATE APPLICATION

A. Apply secondary UV barrier coating over entire uncoated area of foam, with minimum thickness to achieve required perm rating.

B. Apply aggregate to achieve a minimum 3/4 inch (20 mm) thickness over all flat portions of the roof at a rate of 500 to 600 lbs per square (24 to 30 kg/sq m).
   1. Store aggregate on the roof in small piles near the roof perimeter to minimize stresses to the roof deck.
   2. Rake aggregate after most has been applied to insure uniform distribution.
   3. Add additional gravel to areas thinner than 3/4 inch (20 mm).

C. Inspect the entire flat roof surface visually to verify that the foam is completely covered with at least 3/4 inch (20 mm) of aggregate.

3.10 WALKWAYS

A. Install walkway pads where indicated on drawings.

END OF SECTION