SECTION 075416 – KETONE ETHYLENE ESTER (KEE) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanically fastened thermoplastic KEE roofing system on a prepared existing roof substrate, including:

2. Substrate board.

3. Walkway material.

1.2 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.

a. Indicate details meet requirements of NRCA required by this Section.

C. Samples for Verification: For the following products:

1. Sheet roofing.

2. Walkway pads.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

1. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

2. Product Compatibility: Indicate manufacturer has verified compatibility of roofing system components, including but not limited to: Roofing membrane, flashing sheets, adhesives, and sealants.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

E. Warranties: Unexecuted sample copies of special warranties.

F. Inspection Reports: Daily reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.5 CLOSEOUT SUBMITTALS

A. Executed copies of warranties.

B. Maintenance Data: To include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section, UL listed for roofing systems comparable to that specified for this Project, with minimum five years' experience in manufacture of thermoplastic roof membrane products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.

e. Sample warranty.

2. Substitutions following award of contract are not allowed.

3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute, retained by the Contractor or the Manufacturer and approved by the Manufacturer.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

E. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review drawings and specifications.

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 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 temporary protection requirements for roofing system during and after installation.

9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove temporary plugs from roof drains at end of each day.

4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.9 WARRANTY

A. Manufacturer's standard warranty form, covering work of this Section and extended system components indicated, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period. Failure includes roof leaks. Warranty shall be issued by same manufacturer issuing the roofing warranties for the restoration roof system, and metal roof system.

1. Warranty Period: 20 years from date of completion.

B. Installer's warranty signed by Installer, covering the Work of this Section and extended system components indicated, on form acceptable to Owner.

1. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer/Product: The roof system specified in this Section is based upon Tremco, Inc. products named in other Part 2 articles. Provide specified products or preapproved equal.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 10,000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746/C 3746M, ASTM D 4272/D 4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.

2. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated on Drawings. Identify products with appropriate markings of applicable testing agency.

E. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

2.3 MATERIALS, GENERAL

A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

2.4 THERMOPLASTIC MEMBRANE MATERIALS

A. KEE Roof Membrane:

1. Thermoplastic Ketone Ethylene Ester (KEE) coated polyester fabric-reinforced roof membrane sheet, ASTM D6754.

a. Breaking Strength, minimum, ASTM D751: Machine direction, 500 lbf; Cross machine direction, 400 lbf.

b. Tear Strength, minimum, ASTM D751: 125 lbf (N).

c. Elongation at Break, ASTM D751: 20 percent.

d. Dynamic Impact/Puncture Resistance, ASTM D5635: Pass.

e. Minimum Membrane Thickness, nominal, less backing, ASTM D751: 60 mils (1.5 mm).

f. Thickness over fiber, optical method: 0.014 inches.

g. Accelerated Weathering, ASTM G155 and ASTM G154: >5,000 hr., no cracking or crazing.

h. Abrasion Resistance, ASTM D3389: >2000 cycles, H-18 wheel, 1,000 g load.

i. Color: White.

j. Solar Reflectance Index (SRI), ASTM E1980: 110 (White, initial), 86 (White, 3-yr aged).

B. Sheet Flashing: Manufacturer's standard smooth-backed sheet flashing of same material, type, reinforcement, thickness, and color as KEE sheet membrane.

2.5 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.

C. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch (25 mm wide by 1.3 mm) thick, pre-punched.

D. Metal Stress Plates: Manufacturer's standard AZ50 Galvalume-coated steel formed plates, 0.047-inch-thick, with radial corners and membrane-engaging barbs engineered to enhance wind resistance for mechanically-attached KEE membrane roofing systems.

E. Flashing Membrane Adhesive:

1. Bonding adhesive, solvent based fast drying, VOC-compliant, for bonding KEE single ply membranes and flashings to substrates.

a. VOC, maximum, ASTM D 3960: 200 g/L.

F. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to membrane roofing system manufacturer.

G. Metal Coating: ASTM D 6083, solar-reflective acrylic elastomer emulsion coating.

H. Metal Primer: Manufacturer's recommended water-based metal primer.

I. Seam Reinforcing Mesh: Polyester mesh reinforcement.

J. Metal Mastic: Elastomeric acrylic-based compound providing a highly flexible seal.

K. Termination Joint Sealant: Silicone, S, NS, 25 or 50, NT: Single-component, nonsag, plus 25 to 50 percent and minus 25 to 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT, and compatible with adjacent materials.

L. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

M. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.6 SUBSTRATE BOARDS

A. Glass-mat-faced gypsum panel, ASTM C 1177/C 1177M.

1. Thickness: 1/4 inch.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.7 WALKWAY MATERIALS

A. Walkway Material:

1. Protection mat, reinforced KEE membrane mat with serrated slip-resistant surface and enhanced puncture resistance, fabricated for heat welding to compatible KEE membrane surface.

a. Mat Size: 28 inches by 48 feet (710 mm by 13.1 m).

b. Thickness: 0.234 inch (5.9 mm).

c. Puncture resistance: 850 lbf.

d. Tear strength: 350 lbf.

e. Color: Yellow.

B. Rubber blocks: 100% rubber blocks with steel channels and reflective strips designed for supporting conduit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Existing Prepared Roof Substrate: Verify that existing substrate is sound and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Remove and dispose of loose base flashings, scuppers, wall counterflashings, leader heads, downspouts, and any Owner identified equipment.

C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

D. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer’s written instructions and approved details.

B. NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.

3.4 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Mechanically fasten substrate board over all roof areas per manufacturer’s written instructions.

3.5 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.

1. For in-splice attachment, install membranes roofing with long dimension perpendicular to steel roof deck flutes.

B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. In-Seam Attachment: Secure one edge of membrane sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten membrane sheet to roof deck.

G. Welded Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.

2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.

3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing. Install umbrellas to counterflash.

D. Prime and seal all duct, pan, and other metal seams with acrylic mastic and polyester reinforcement. Surface ducts and pans with metal coating system.

E. Install new main and overflow scuppers.

F. At base flashings:

1. Remove and re-use existing counterflashings.

2. Install base flashings according to manufacturer approved details. Include continuous butyl tape between the substrate and top flashing membrane. Feather polyurethane sealant or acrylic mastic over the termination bar.

G. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

H. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products from roof access points to and surrounding all serviceable equipment. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Install new wood sleepers and oversized walkpad sections under new sleepers at units and other equipment.

C. Install rubber blocks under conduit. Insure at least a block every 8’ with additional blocks at changes in direction and where needed for proper support. Use red wood blocks under conduit that are too low for rubber blocks.

1. Set blocks on oversized walkpad sections.

3.8 FIELD QUALITY CONTROL

A. Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with applicable criteria established in ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 075419