SECTION 075323 - EPDM SINGLE-PLY MEMBRANE ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 0 - Bidding and Contract Requirements and Division 1 General Requirements apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fully adhered sheet roofing.
2. Roof insulation.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking; and wood-based, structural-use roof deck panels.
2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 7 Section "Roof Accessories."
4. Division 7 Section "Joint Sealants."
5. Division 15 Section "Plumbing Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

    a. Fire/Windstorm Classification: Class 1A-90.

D. Roofing System Design: Provide a roofing system that complies with roofing system manufacturer's written design instructions and with the following:

1. SPRI's "Wind Design Guide for fully adhered Roofing Systems."
2. ANSI/RMA/SPRI RP-4, "Wind Design Guide for Ballasted Single-Ply Roofing Systems."

    a. Exposure Category: As derived from the referenced SPRI Guide or ASCE 7.
    b. System Design: Derive from design tables in the referenced SPRI Guide or ANSI/RMA/SPRI RP4, based on building height, parapet height, wind speed, and exposure category.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

G. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

H. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

I. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class B; ASTM E 108, for application and slopes indicated.

C. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Meet with the same participants and review the same items listed for the pre-installation conference. In addition, review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.

D. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; 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.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.

7. Review temporary protection requirements for roofing system during and after installation.
8. 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, 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 roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 20 years.

C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including

membrane roofing, sheet flashing, roof insulation, fasteners, and vapor retarders, if any, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include one of the following:

1. EPDM Sheet:

   a. Carlisle Syntec Systems; Carlisle Corp.
   b. Celotex Corp. (The).
   c. ERSystems.
   d. Firestone Building Products Co.
   e. GenFlex Roofing Systems; GenCorp Polymer Products.
   f. HPG Roofing Systems.
   g. Roofing Products International, Inc.
   h. Schuller Roofing Systems.

2. Polyisocyanurate Board Insulation:

   a. Apache Products Co.
   b. Atlas Roofing Corporation.
   c. Celotex Corp. (The).
   d. GAF Materials Corp.
   e. NRG Barriers, Inc.

2.2 EPDM SHEET

A. EPDM Sheet: Uniform, flexible sheet formed from a terpolymer of ethylene-propylene-diene, complying with ASTM D 4637, Type 1, of the following grade, class, thickness, backing, and exposed face color:

1. Grade and Class: Grade 1 or 2 and Class SR, scrim or fabric internal reinforced.
2. Thickness: 60 mils

3. Exposed Face Color: Black.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- thick EPDM, uncured or cured, according to application.

C. Epichlorohydrin Sheet: 60-mil- thick, unreinforced flexible sheet with the following properties as determined per ASTM test method indicated:

1. Tensile Strength: 1500 psi; ASTM D 412.
2. Ultimate Elongation: 200 percent; ASTM D 412.
3. Tear Resistance: 150 lbf/in.; ASTM D 412.
4. Brittleness Temperature: Minus 20 deg F; ASTM D 746.
5. Resistance to Ozone Aging: No cracks after 168 hours' exposure of 50 percent elongated sample at 104 deg F and 100-pphm ozone; ASTM D 1149.
6. Resistance to Oil Aging: 15 percent maximum mass change after 168 hours' immersion in diesel fuel No. 2 at 158 deg F; ASTM D 471.

D. Bonding Adhesive: Manufacturer's standard bonding adhesive.

E. Splice Adhesive and Cleaner: Single-component butyl splicing adhesive and solvent-based splice cleaner.

F. Splice Primer and Tape: Manufacturer's standard synthetic rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

G. Lap Sealant: Manufacturer's standard single-component sealant.

H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

I. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch wide, roll formed and prepunched.

J. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

L. Cold fluid applied membrane adhesive: Manufacturers standard cold fluid applied bonding adhesive formulated to adhere EPDM and insulation to substrate(s).

1. Prime surface of deck with Fast 100 by Carlisle or equal at rate recommended by manufacturer.

2.4 INSULATION MATERIALS

A. General: Provide preformed roof insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.

1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:

   a. 1/4 inch per 12 inches, unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Polyisocyanurate Board Insulation: Minimum of R22 or 4" thickness of rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents to comply with ASTM C 1289, classified by facer type as follows:

1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.

C. Rigid Mineral Wool Insulation Board: Fire and water repellant 2 inch thick rigid mineral wool fiber insulation made form basalt rock and slag. Application: For use on Auditorium and stage roof under Polyisocyanurate Board Insulation.

Basis of Design: Roxul "RockBoard 60."

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric mat, water permeable and resistant to ultraviolet degradation, type and weight as recommended by roofing system manufacturer for application.

C. Metal Securement System: L-shaped securement flashing and other required insulation strapping fabricated from stainless steel, a minimum of 0.031 inch thick. Provide fasteners as recommended by insulation manufacturer.

2.6 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or IV.

B. Asphalt Primer: ASTM D 41.

2.7 WALKWAYS

A. Walkway Pads: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and acceptable to roofing system manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.

D. Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. 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.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the 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 INSULATION INSTALLATION

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

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

C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

3.4. ADHERED ROOFING MEMBRANE INSTALLATION

A. Install EPDM roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

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

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

D. Adhesive: Apply adhesive to substrate at rate required by manufacturer and install EPDM roofing membrane.

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

F. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

G. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

I. Install roofing membrane and auxiliary materials to tie in to existing roofing.

J. Apply epichlorohydrin sheet over roofing membrane at locations indicated.

3.6 SEAM INSTALLATION

A. Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

B. Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

C. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.7 FLASHING INSTALLATION

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

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

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

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

3.9 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

3.10 PROTECTING AND CLEANING

A. Protect sheet membrane roofing 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 Architect and Owner.

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of

damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work:
6. Acceptance Date:
7. Warranty Period:
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding <INSERT WIND SPEED> mph (m/sec);
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until

cost and expense thereof has been paid by Owner or by another responsible party so designated.

3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <DAY> day of <MONTH>, 20<YEAR>.

1. Authorized Signature:
2. Name:
3. Title:

END OF SECTION