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Johns Manville is providing this specification to the user as a courtesy to utilize in their determination of the optimal system for their project’s specific needs. By utilizing the general information provided herein, the user agrees such information will not be relied upon as a substitute for professional engineering design and/or documentation required by building code, contract or applicable law. The information in this specification must be reviewed/approved by a project designer before use. The user of this information assumes sole responsibility for its use of this specification. Additional information, such as Data Sheets, SDS, Application Guides and other literature on the Johns Manville products used in this specification, can be found at <https://www.jm.com/en/commercial-roofing/epdm-roofing-systems/>.

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This master specifications should be tailored for specific projects. Removing unneeded sections based on project type, deck type, warranty requirements, included components, application methods and other project requirements should be carefully considered. For further help, please contact JM Roofing Specifier Services.

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SECTION 075323

ETHYLENE PROPYLENE DIENE MONOMER (EPDM) MEMBRANE ROOFING

1. GENERAL
	* + 1. SECTION INCLUDES
				1. Adhered White EPDM membrane roofing system.
				2. Cover board.
				3. Roof insulation.
				4. Vapor retarder.
				5. Base Sheet.
				6. Substrate board.
			2. Related Sections
				1. Division 03 Section “Lightweight Insulating Concrete” for lightweight insulating concrete.
				2. Division 03 Section “Concrete” for concrete decks.
				3. Division 05 Section "Steel Decking" for steel roof deck.
				4. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking [**and for wood-based, structural-use roof deck panels**].
				5. Division 07 Section "Sheet Metal Flashing and Trim" for flashings and counter flashings.
				6. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.
			3. REFERENCES
				1. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms used in this Section:

ASTM D 1079 “Standard Terminology Relating to Roofing and Waterproofing.”

Glossary of NRCA’s “The NRCA Roofing and Waterproofing Manual.”

Roof Consultants Institute “Glossary of Roofing Terms.”

Single Ply Roofing Industry (SPRI)

International Building Code (IBC)

American Society of Civil Engineers (ASCE-7) Minimum Design Loads for Buildings & Other Structures

* + - * 1. Sheet Metal Terminology and Techniques: SMACNA “Architectural Sheet Metal Manual.”
			1. DESIGN CRITERIA
				1. General: Installed roofing membrane systems shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
				2. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
				3. Installer shall comply with current code requirements based on authority having jurisdiction.
				4. Wind Uplift Performance: Roofing system shall meet the intent of systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
				5. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

Exterior Fire-Test Exposure: Class [A] [B] [C]; UL 790, for application and roof slopes indicated.

* + - 1. SUBMITTALS
				1. Product Data: Manufacturer’s data sheets for each product to be provided.
				2. Detail Drawings: Provide roofing system plans, elevations, sections, details, and details of attachment to other Work, including:

Base flashings and membrane terminations.

Tapered insulation, including slopes.

Crickets, saddles, and tapered edge strips, including slopes.

Insulation fastening patterns.

* + - * 1. Verification Samples: Provide for each product specified.
				2. Installer Certificates: confirmation that installer is approved, authorized, or licensed by manufacture to install roofing system.
				3. Maintenance Data: Refer to Johns Manville’s latest published documents on www.JM.com.
				4. Guarantees: Provide manufacturer’s current guarantee specimen.
				5. Roofing sub-contractor shall provide a copy of the final System Assembly Letter issued by Johns Manville Roofing Systems indicating that the products and system to be installed shall be eligible to receive the specified manufacturer's guarantee when installed by a certified JM contractor in accordance with our application requirements, inspected and approved by a JM Technical Representative.
				6. Prior to roofing system installation, roofing sub-contractor shall provide a copy of the Guarantee Application Confirmation document issued by Johns Manville Roofing Systems indicating that the project has been reviewed for eligibility to receive the specified guarantee and registered.
			1. QUALITY ASSURANCE
				1. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product who is eligible to receive the specified manufacturer's guarantee.
				2. Manufacturer Qualifications: Qualified domestic U.S. owned and based manufacturer that has **[**UL listing**]** or accredited testing agency listing for roofing system identical to that used for this Project.
				3. Testing Agency Qualifications: Independent testing agency with the experience and capability to conduct the testing indicated, as documented in accordance with ASTM E329.
				4. Test Reports:

Roof drain and leader test or submit plumber’s verification.

Core cut, if requested.

Roof deck fastener pullout test, if required

Bonded pull test, if required.

* + - * 1. Moisture Survey, if required:

Submit prior to installation, results of a non-destructive moisture test of roof system completed by approved third party. Utilize one of the approved methods:

Infrared Thermography

Nuclear Backscatter

* + - * 1. Source Limitations: Obtain all components from the single source roofing system manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing system manufacturer issuing the guarantee.
			1. DELIVERY, STORAGE, AND HANDLING
				1. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
				2. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
				3. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
				4. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
			2. PROJECT CONDITIONS
				1. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.
			3. guaranteeS
				1. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.

Single-source special guarantee includes roofing membrane, base flashings, roofing membrane accessories, **[roof insulation], [fasteners], [adhesives], [cover board], [substrate board], [vapor retarder], [walkway products], [manufacturer’s expansion joints], [manufacturer’s edge metal products],** and other approved single-source components of roofing system marketed by the manufacturer.

Guarantee Period: **[10] [15] [20] [25] [30\*]** years from date of Substantial Completion. **\*Additional requirements apply for 30 year warranties. Consult Johns Manville for more information\***

Contractor is required to list “**INSERT FIRM NAME**” as the Specifier/Consultant of record in the appropriate fields (“Specifier Account”) when applying for the manufacturer’s warranty.

* + - * 1. Installer’s Guarantee: Submit roofing Installer's guarantee, including all components of roofing system for the following guarantee period:

Guarantee Period: [**Two**] [**Five**] years from date of Substantial Completion.

* + - * 1. Existing Guarantees: Guarantees on existing building elements should not be affected by scope of work.

Installer is responsible for coordinating with building owner’s representative to verify compliance.

1. PRODUCTS
	* + 1. Ethylene Propylene Diene Monomer Roofing Membrane - EPDM
				1. Non-reinforced uniform, flexible sheet made from Ethylene Propylene Diene Monomer, ASTM D 4637, Type I. Basis of design: **JM WHITE EPDM NR**

Thickness (minimum): **[60 mils (1.5 mm)] [90 mils (2.2 mm)]**

Exposed Face Color: White

* + - 1. AUXILIARY Roofing Materials
				1. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

* + - * 1. Sheet Flashing: Manufacturer’s internally reinforced or scrim reinforced. Basis of design: JM White EPDM Peel & Stick Flashing
				2. Primer Material: Manufacturer’s standard synthetic-rubber polymer primer. Basis of design: **[JM Single Ply Membrane Primer (low VOC)] [JM TPO Membrane Primer]**
				3. Liquid Applied Flashing: Manufacturer’s single ply liquid and fabric reinforced flashing system created with a fleece polyester scrim and a two-component polyurethane-based liquid applied flashing material, consisting of a liquid resin and a curing agent. Basis of design: JM SP Liquid Flashing Resin and JM SP Liquid Flashing Scrim
				4. Liquid Applied Flashing Primer: Manufacturer’s single ply liquid flashing primer. Basis of design: JM Single Ply Membrane Primer (Low VOC), JM SP Liquid Flashing Concrete Primer, or JM SP Liquid Flashing Metal and Wood Primer
				5. Seaming Material: Manufacturer’s standard [3-inch- (75-mm)] [6-inch- (150-mm)] wide minimum, butyl splice tape with release film. Basis of design: JM White EPDM Seam Tape Plus
				6. Sealing Strip: Manufacturer's standard **[6-inch- (150-mm)] [9-inch- (200-mm)] [12-inch- (300-mm)]** wide, 60 mil (1.52 mm) thick minimum, cured EPDM with factory-laminated, self-adhering seam tape. Basis of design: JM White EPDM Peel & Stick Sealing Strip
				7. Bonding Adhesive: Manufacturer’s standard [solvent] [water]-based bonding adhesive for membrane. Basis of design: **[JM All Season Sprayable Bonding Adhesive] [JM LVOC Membrane Adhesive] [JM Membrane Bonding Adhesive (TPO&EPDM)] JM EPDM Water Based Membrane Adhesive]**

**Solvent-base adhesive** serviceable Installation Ambient Air Temperature: 25°F and rising

**Water-based adhesive** serviceable Installation Ambient Air Temperature: 40°F and rising

* + - * 1. Flashing Adhesive: Manufacturer’s standard[solvent] [water]-based bonding adhesive for base flashings. Basis of design: **[JM LVOC Membrane Adhesive] [JM Membrane Bonding Adhesive (TPO&EPDM)] JM EPDM Water Based Membrane Adhesive]**

**Solvent-base adhesive** serviceable Installation Ambient Air Temperature: 25°F and rising

**Water-based adhesive** serviceable Installation Ambient Air Temperature: 40°F and rising

* + - * 1. High Wall Sheet Flashing Membrane: Basis of Design:

**JM White EPDM: 60 mils, non-reinforced**

Adhesive Basis of Design: **[JM Membrane Bonding Adhesive (TPO & EPDM)] [All Season Sprayable Bonding Adhesive (TPO & EPDM)]**

* + - * 1. Slip Sheet: Manufacturer’s recommended slip sheet, of type required for application.
				2. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors. Basis of design: JM Termination Systems
				3. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer. Basis of design: **[High Load Fasteners and Plates] [Extra High Load Fasteners and Plates] [JM Purlin Fasteners] [All Purpose Fasteners and High Load Plates]**
				4. Miscellaneous Accessories: Provide all accessories to meet the roofing manufacturer's guarantee requirements.
			1. WALKWAYS
				1. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer. Basis of design: JM White EPDM Peel & Stick Walkpads
			2. Cover board
				1. Polyisocyanurate Board: ASTM C 1289, Type II, Class 2, Grade 3 (25 psi), polyisocyanurate bonded in-line to inorganic coated glass facer. Basis of design: SeparatoR CGF

Thickness: 1/2 inch (13 mm)

R-value: 2.85-2.9

* + - * 1. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs. of compressive strength. Basis of design: ProtectoR HD

Thickness: 1/2 inch (13 mm)

R-value: 2.5

* + - * 1. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer **[with Eonic primed face]**, water-resistant gypsum substrate for adhered roof applications **[1/4 inch (6 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)]** thick.  Basis of design: **[DEXcell FA Glass Mat Roof Board] [Dens Deck Prime Roof Board]**
				2. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, **[1/2 inch (13 mm)] [5/8 inch (16 mm)]** thick. Basis of design: Securock Gypsum-Fiber Roof Board
				3. Perlite Board: ASTM C 728; composed of expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated. Basis of design: RetroPlus Roof Board
				4. Cement Roof Board: ASTM C 1325, lightweight cementitious core with fiberglass mesh surfacing and reinforced edges, 7/16 inch (11 mm) thick.  Basis of design: **[DEXcell Cement Roof Board] [Securock Cement Roof Board]**
			1. ROOF INSULATION – Flute filler

Edit as required. Coordinate insulation selection and thicknesses indicated on Drawings with adjoining construction, Johns Manville Guarantee requirements, as well as, HVAC design and energy program.

* + - * 1. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
				2. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, Product: ENRGY 3

Choose performance standard or prescriptive thickness. Remove if desired.

Provide metal roof flute filler insulation package with thickness to fill flutes the height of the standing seam.

* + - 1. ROOF INSULATION
				1. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
				2. Lightweight insulating concrete in accordance with Section 03 52 16 – Lightweight Insulating Concrete.
				3. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class [**1**] [**2**], Grade **[2 (20 psi)] [3 (25 psi)]**, Basis of design: [**ENRGY 3] [ENRGY 3 25 PSI] [ENRGY 3 CGF] [ENRGY 3 25 PSI CGF**]

Provide insulation package with minimum R Value: **[insert R Value] [minimum required by applicable code].**

Provide insulation package with minimum thickness: **[insert thickness].**

Provide insulation package in multiple layers.

Minimum Long-Term Thermal Resistance (LTTR): 5.7 per inch.

Determined in accordance with CAN/ULC S770 at 75ºF (24ºC)

* + - 1. Tapered insulation
				1. Tapered Insulation: ASTM C 1289, Type II, Class [**1**] [**2**], Grade **[2 (20 psi)] [3 (25 psi)]**, Basis of design: [**ENRGY 3] [ENRGY 3 25 PSI] [ENRGY 3 CGF] [ENRGY 3 25 PSI CGF**]

provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.

* + - 1. INSULATION ACCESSORIES
				1. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
				2. Provide saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Basis of design: Tapered Fesco Edge Strip
				3. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer. Basis of design: **[UltraFast Fasteners and UltraFast Plates] [All Purpose Fasteners and High Load Plates], [All Purpose Fasteners and UltraFast Plates], [Lite-Deck Fasteners and Plates]**
				4. Urethane Adhesive: Manufacturer’s two component polyurethane adhesive formulated to adhere insulation to substrate. Basis of design: **[JM Two-Part Urethane Insulation Adhesive (UIA)] [JM One-Step Foamable Adhesive] [Roofing Systems Urethane Adhesive (RSUA)] [JM Two-Part Urethane Insulation Adhesive Canister]**
				5. Wood Nailer Strips: Comply with requirements in Division 06 Section **"**Miscellaneous Rough Carpentry**."**
			2. VAPOR RETARDER
				1. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt. Basis of design: GlasPly IV.
				2. SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.

ASTM D 6164, Grade S, TypeI, polyester-reinforced, Basis of design**: [DynaLastic 180 S] [DynaBase PR].**

ASTM D 6163, Grade S, Type **[DynaBase] [DynaBase HW] [DynaWeld Base].**

* + - * 1. One-part, solvent-free, moisture-curing, elastomeric cold-application adhesive specially formulated for compatibility and use with SBS membrane applications. Basis of design: **DynaSet 1k**
				2. Self-Adhered SBS Vapor Retarder: ASTM D 4601, glass-fiber-reinforced, SBS-modified asphalt sheet; sand surfaced; suitable for application method specified. Basis of design: **DynaGrip Base SD/SA.**
				3. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
				4. Self-Adhered SBS Vapor Retarder: Tri-laminate woven polyethylene, nonslip UV protected top surface; suitable for application method specified. Basis of design: **[JM Vapor Barrier SA] [JM Vapor Barrier SAR]**.
				5. Self-Adhered Primer: **[One-part] [low VOC aerosol**] penetrating primer solution to enhance the adhesion of self-adhering membranes. Basis of design: **[SA Primer] [SA Primer Low VOC] [JM All Season Sprayable Bonding Adhesive].**
				6. Polyethylene Vapor Retarder: ASTM D 4397, **[6 mils (0.15 mm)] [10 mils (0.25 mm)]** thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
			1. BASE-SHEET MATERIALS
				1. Base Sheet: ASTM D 4601, Type II non-perforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides. Basis of design: **[PermaPly 28] [GlasBase Plus]**
				2. Base Sheet: ASTM D 4897, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface. Basis of design: Ventsulation Felt
				3. Base-Sheet Fasteners: Factory-coated steel fasteners and Galvalume metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: Lightweight Concrete (LWC) Base Sheet Fasteners
				4. Base-Sheet Fasteners: Tube, disk and locking staple design**,** factory-coated steel fasteners and Galvalume metal battens meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: UltraLok Locking Impact Fastener
				5. Base Sheet Fasteners: 32 gauge, 1-5/8” diameter tin caps with 11-gauge annular ring shank nails.
			2. SUBSTRATE BOARD
				1. Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications, **[1/4 inch (6 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)]** thick. Basis of design: **[Securock Ultralight Glass-Mat Roof Board] [DEXcell Glass Mat Roof Board] [Dens Deck Roof Board]**
				2. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications, 5/8 inch (16 mm) thick.  Basis of design: [**DEXcell FA Glass Mat Roof Board] [Dens Deck Prime Roof Board]**
				3. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, **[1/4 inch (6 mm)] [3/8 inch (9.5 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)]** thick. Basis of design: Securock Gypsum-Fiber Roof Board
				4. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs. of compressive strength. Basis of design: ProtectoR HD

Thickness: 1/2 inch (13 mm)

R-value: 2.5

* + - 1. EDGE METAL Components
				1. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee. Basis of design: **[Expand-O-Flash] [Expand-O-Gard]**
				2. Coping System: Manufacturer’s factory fabricated coping consisting of a base piece and cap. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee. Basis of design: **[Presto-Lock Coping]** **[Presto-Lock Gold Coping] [Rapid-Lok Ultra Coping] [Rapid-Lok SL Coping] [Rapid-Lok Coping] [Continuous Cleat Coping]**
				3. Fascia System: Manufacturer’s factory fabricated fascia consisting of a base piece and cover. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee. Basis of design: **[Presto-Tite Fascia] [Presto-Tite Edge One Fascia] [Rapid-Lok Extruded Fascia] [Rapid-Lok Fascia] [Edge-Lok 2 Fascia]**
				4. Metal Edge System: Manufacturer’s factory fabricated metal edge system used to terminate the roof at the perimeter of the structure. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.  Basis of design: **[Drip Edge] [Gravel Stop]**
				5. Metal/Membrane Flashing: Specially designed and manufactured flashing for sealing and waterproofing. JM EPDM Metal/Membrane Flashing
				6. Shop-Fabricated Edge Metal: Custom-fabricated edge metal meeting the criterion of ANSI/SPRI ES-1. Must be approved by manufacturer technical representative. Minimum requirements:

Steel: 24 gauge, fastened 6 inches on center.

Aluminum: 0.05 inch thick, fastened 6 inches on center.

* + - * 1. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."
				2. Roof Edge Drainage Systems: **Gutter Systems**: Manufactured in section lengths not exceeding 12 feet with 0.100-inch mill aluminum internal Gutter Hangers, 24 inches on center, and 2-inch-wide formed external wind straps 6’-0” on center
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of roofing system.

General:

Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

**Steel Decks:**

Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

Verify that decking is visibly dry and free of moisture.

Verify that the decking is smooth and free of large cracks, holes or sharp changes in elevation of the surface.

When applicable perform pull test with the specific fastener being used on the project to confirm the fastener resistance meets the requirements for that particular system.

**Existing Standing Seam and Light Gauge Decks:**

Verify that decking is visibly dry and free of moisture.

Verify that the decking is smooth and free of large cracks, holes or sharp changes in elevation of the surface.

When applicable perform pull test with the specific fastener being used on the project to confirm the fastener resistance meets the requirements for that particular system.

Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1 2016.

**Concrete Decks:**

Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

Verify that concrete substrate is visibly dry and free of moisture.

**Wood Decks:**

Verify that wood decking is visibly dry and free of moisture.

Verify that wood has ability to provide minimum fastener pull-out resistance.

Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1 2016.

**Cementitious Wood Fiber Decks (Tectum):**

Verify that cementitious wood fiber substrate is visibly dry and free of moisture.

Verify that cementitious wood fiber has ability to provide minimum pull-out resistance.

Provide documentation of minimum pull-out (ANSI/SPRI FX-1 2016) or adhesion resistance (ANSI/ SPRI 1A-1 2015) values using manufacturers approved procedures, whichever is applicable.

**Lightweight insulating Concrete:**

Verify that lightweight insulating concrete substrate is visibly dry and free of moisture.

Provide documentation of minimum base sheet fastener pull-out (ANSI/SPRI FX-1 2016) or adhesion resistance (ANSI/ SPRI 1A-1 2015) values using manufacturers approved procedures, whichever is applicable.

**Gypsum Deck:**

Verify that gypsum is visibly dry, free of moisture, and that there are no signs of staining.

Inspect deck for cracking and deflection of bulb tees.

Verify that gypsum has ability to provide minimum fastener pull-out resistance.

Provide documentation of minimum pull-out (ANSI/SPRI FX-1 2016) or adhesion resistance (ANSI/ SPRI 1A-1 2015) values using manufacturers approved procedures, whichever is applicable.

Ensure general rigidity and proper slope for drainage.

Verify that deck is securely fastened with no projecting fasteners and with no adjacent units more than 1/16 inch (1.6 mm) out of plane relative to adjoining deck.

* + - * 1. Unacceptable panels should be brought to the attention of the General Contractor and Project Owner’s Representative and shall be corrected prior to installation of roofing system.
			1. PREPARATION
				1. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
				2. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
				3. If applicable, prime surface of deck with primer at a rate recommended by roofing manufacturer and allow primer to dry.
				4. Proceed with each step of installation only after unsatisfactory conditions have been corrected.
			2. Re-roof Preparation
				1. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc.

Remove an area no larger than can be re-roofed in one day.

* + - * 1. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
				2. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations.

Install decking to match existing as directed by Owner's Representative.

* + - * 1. Raise (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:

Modify curbs as required to provide a minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane.

Secure of flashing and install new metal counterflashing prior to re-installation of unit.

Perimeter nailers shall be elevated to match elevation of new roof insulation.

* + - * 1. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.
			1. Re-cover Preparation
				1. Prepare existing roof according to roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer, and requirements in this Section.
				2. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
				3. **Disable existing roof membrane per manufacturer’s written instruction.**
				4. **Remove existing membrane per manufacturer’s written instructions.**
				5. Remove and replace wet, deteriorated or damaged roof insulation and decking as identified in moisture survey.
				6. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations. Install decking to match existing as directed by Owner's Representative.
				7. Raise, (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:

Modify curbs as required to provide a minimum 8-inch base flashing height measured from the surface of the new membrane to the top of the flashing membrane.

Secure top of flashing and install new metal counterflashing prior to re-installation of unit.

Perimeter nailers shall be elevated to match elevation of new roof insulation.

* + - * 1. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.
			1. SUBSTRATE BOARD INSTALLATION
				1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
				2. **Mechanically Fastened Substrate Board**: Install substrate board and secure to deck using mechanical fasteners designed and sized for fastening specified substrate board to deck type.

Fasten substrate board to **[top flanges of steel deck] [wood deck]** to resist uplift pressure at corners, perimeter, and field of roof per roofing system manufacturer's written instructions.

* + - * 1. **Loose Laid Substrate Board:** Loose lay substrate board, staggering joints with insulation board substrate.
				2. **Adhered Substrate Board:** Adhere substrate board to substrate as follows:

Install in a two-part urethane adhesive according to roofing system manufacturer’s instruction.

Install to resist uplift pressure at corners, perimeter, and field of roof.

* + - 1. Base-sheet installation
				1. Install one lapped base sheet course and mechanically fasten to substrate per roofing system manufacturer's written instructions.

Enhance fastening rate in perimeter and corner zones per code requirements, wind uplift system approvals or manufacturer’s guarantee requirements, whichever is more stringent.

* + - * 1. Comply with roofing system manufacturer's written instructions for installing roof insulation.
			1. VAPOR-RETARDER INSTALLATION
				1. Install polyethylene-sheet vapor retarder as a loosely laid single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively. Seal side and end laps.
				2. Install 2 glass-fiber felt plies lapping each sheet 19 inches (483 mm) over preceding sheet.  Embed each sheet in a solid mopping of hot roofing asphalt per manufacturer’s written instructions.
				3. Install modified bituminous vapor retarder sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate at edge of roof, installing as follows:

Unroll roofing membrane sheets and allow them to relax as required by manufacturer.

**Torch-apply vapor retarder to substrate according to roofing system manufacturer’s instruction.**

**Adhere vapor retarder in a full mopping of hot asphalt to substrate according to roofing system manufacturer’s instruction.**

**Self-adhere vapor retarder to substrate according to roofing system manufacturer’s instruction.**

* + - * 1. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

Repair tears and voids in laps and lapped seams not completely sealed.

* + - * 1. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.
			1. FLUTE FILLER INSULATION INSTALLATION
				1. Coordinate installation of roof system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
				2. Comply with roofing system manufacturer's written instructions for installing roof insulation.
				3. Loose lay polyisocyanurate flute filler insulation between the metal roof standing seams.
			2. INSULATION INSTALLATION
				1. Coordinate installation of roof system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.
				2. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.
				3. Install tapered insulation under area of roofing to conform to slopes indicated.
				4. Install insulation boards with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer’s written instructions. Fill gaps exceeding 1/4 inch (6 mm) with like material.
				5. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
				6. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.
				7. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
				8. **Adhered Insulation:** Adhere each layer of insulation to substrate as follows:

Install each layer in a two-part urethane adhesive according to roofing system manufacturer’s instruction.

Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

* + - * 1. **Loose Laid Insulation with Top Insulation Layer Mechanically Fastened**: Loose lay insulation with staggered joints and secure top layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.

Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.

* + - * 1. **Mechanically Fastened with Subsequent Layers Adhered Insulation**: Secure first layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.

Fasten first layer to resist uplift pressure at corners, perimeter, and field of roof.

Install subsequent layers in [a two-part urethane adhesive] [hot asphalt] according to roofing system manufacturer’s instruction.

Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

* + - 1. Cover board installation
				1. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
				2. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
				3. Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer’s written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.

Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.

* + - * 1. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.

Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

* + - * 1. **Adhered Cover Board**: Adhere cover board to substrate as follows:

Install in a two-part urethane adhesive according to roofing system manufacturer’s instruction.

Install to resist uplift pressure at corners, perimeter, and field of roof.

* + - * 1. **Mechanically Fastened Cover Board:** Install cover board and secure to deck using mechanical fasteners designed and sized for fastening specified cover board to deck type.

Fasten to resist uplift pressure at corners, perimeter, and field of roof.

* + - 1. ROOFING MEMBRANE INSTALLATION, GENERAL
				1. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
				2. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing.
				3. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
				4. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.

Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.

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

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

* + - 1. ADHERED ROOFING MEMBRANE INSTALLATION
				1. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.

Unroll roofing membrane and allow to relax before installing.

* + - * 1. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
				2. Bonding Adhesive: Apply **[solvent-based] [water-based]** bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
				3. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
				4. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
				5. **Field Fabricated Seam Installation:** Clean and prime both faces of splice areas, apply splice tape, 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.
				6. **Tape to Standard Sheet Installation:** Align membrane for appropriate overlap, clean and prime non-taped face of splice area, remove release liners and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation.
				7. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
				8. Install roofing membrane and auxiliary materials to tie into existing roofing.
			1. BASE FLASHING INSTALLATION
				1. Install sheet flashings and preformed flashing accessories and adhere to substrates in accordance with membrane roofing system manufacturer's written instructions.
				2. **Apply solvent-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.**
				3. **Apply two-sided water-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.**
				4. Apply single ply liquid applied flashing system per manufacturer’s Apply single ply liquid applied flashing system per manufacturer’s written instructions.
				5. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
				6. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive.
				7. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
			2. Edge Metal Installation
				1. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
				2. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."
				3. Join individual sections in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."
			3. WALKWAY INSTALLATION
				1. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
				2. Roof-Paver Walkways: Install walkway roof pavers with applicable slip sheet per manufacturer's written instructions in locations indicated, to form walkways.
			4. FIELD QUALITY CONTROL
				1. Owner or designated representative will provide on-site observation and inspection during installation.
				2. Owner will engage a qualified testing agency to perform tests and inspections.
				3. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.
				4. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
				5. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
			5. PROTECTION AND CLEANING
				1. Protect roofing system from damage and wear during remainder of construction period.
				2. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
				3. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075323