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Johns Manville is providing this draft specification to the user as a courtesy to consider in their determination of the optimal system specification for their project's specific needs. By receiving and considering the general information provided herein, the user agrees Johns Manville makes no warranty or representation regarding its contents, and it will not be relied upon as a substitute for professional engineering, design and/or documentation required by building code, contract, or applicable law. The general information in this draft specification must be reviewed/approved by a project designer before finalization and use. The user/recipient of this general information assumes sole responsibility for its use. Additional information, such as Data Sheets, SDS, Application Guides and other literature on the Johns Manville products identified in this draft specification, can be found at <https://www.jm.com/en/commercial-roofing/>.

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SECTION 075113

BUILT-UP ASPHALT ROOFING (BUR)

1. GENERAL
	* + 1. SECTION INCLUDES
				1. Built-up asphalt roofing system.
				2. Cover board.
				3. Roof insulation.
				4. Vapor retarder.
				5. Base sheet.
				6. Sheathing paper.
				7. Substrate board.
			2. Related Sections
				1. Division 03 Section “Concrete” for concrete.
				2. Division 05 Section "Steel Decking" for steel roof deck.
				3. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, cants, curbs, and blocking **[and for wood-based, structural-use roof deck panels].**
				4. Division 07 Section "Sheet Metal Flashing and Trim" for flashings and counter flashings.
				5. 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 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 Building Envelope Terms.”

* + - * 1. Sheet Metal Terminology and Techniques: SMACNA “Architectural Sheet Metal Manual.”
			1. DESIGN Criteria
				1. General: Installed roofing membrane system 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 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 and adhesive patterns.

* + - * 1. Verification Samples: Provide for each product specified.
				2. Installer Certificates: Confirmation that Installer is approved, authorized, or licensed by manufacturer 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. 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: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
				4. Test Reports:

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

Core cut, if required.

Roof deck fastener pullout 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 manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.
				2. Provide evidence of CERTA training for any installer of torch-applied modified bitumen membrane. Copies of certifications are required prior to award and shall be maintained on the jobsite for inspection at any time.
			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. guarantee
				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 plies, base flashings, liquid applied flashing, roofing membrane accessories, [**roofing membrane**], [**roof insulation**], [**fasteners**], **[adhesives],** [**cover board**], [**substrate board**], [**vapor retarder**], [**base sheet]** [**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**] years from date of Substantial Completion.

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, signed by Installer, covering work of this Section, 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. ROOFING MEMBRANE Felts
				1. Glass-Fiber Base Sheet: [ASTM D 4897, Type II, asphalt coated, fiberglass venting base sheet] [ASTM D 4601, Type II, asphalt coated, fiberglass base felt]. Basis of design: **[Ventsulation Felt] [PermaPly 28] [GlasBase Plus] [GlasTite Flexible]**
				2. Glass-Fiber Felts: ASTM D 2178, Type [IV] [VI], asphalt-impregnated, glass-fiber felt. Basis of design: **[GlasPly IV] [GlasPly Premier]**
			2. roofing membrane capSheet
				1. Cap Sheet: ASTM D 3909, asphalt-impregnated and -coated, glass-fiber cap sheet, with white [reflective] coarse mineral-granule top surfacing and fine mineral surfacing on bottom surface. Basis of design: **[GlasKap] [GlasKap Plus] [GlasKap CR G]**
			3. FLASHING MATERIALS
				1. Backer Sheet: ASTM D 2178, Type [IV] [VI], asphalt-impregnated, glass-fiber felt. Basis of design: **[GlasPly IV] [GlasPly Premier]**
				2. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides. Basis of design: **[PermaPly 28] [GlasBase Plus]**
				3. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and -coated composite sheet; smooth surfaced and reinforced with a composite polyester and glass-fiber core. Basis of design: GlasTite Flexible
				4. Backer Sheet: [ASTM D 6164, Grade S, Type I, polyester-reinforced] [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced] [ASTM D 6162, Grade S, Type II, composite polyester- and glass-fiber-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of design: **[DynaLastic 180 S] [DynaBase] [DynaPly T1]**
				5. Flashing Sheet: [ASTM D 6164, Grade G, Type II, polyester-reinforced] [ASTM D 6163, Grade G, Type I, glass-fiber-reinforced] [ASTM D 6221, Grade G, Type I, composite polyester- and glass-fiber-reinforced] [ASTM D 6298, embossed aluminum foil surfaced, glass-fiber-reinforce], SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Basis of design: [**DynaLastic 250 FR] [DynaLastic 250 FR CR G] [DynaFlex] [DynaFlex CR G] [DynaClad] [DynaKap]**
				6. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Basis of design: PermaFlash System
				7. High Wall Sheet Flashing Membrane: Basis of Design:

JM PVC: 60 mils, nominal; internally or scrim reinforced

JM TPO: 60 mils, internally or scrim reinforced

JM EPDM: 60 mils, **[non-reinforced] [internally or scrim reinforced]**

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

* + - 1. AUXILIARY ROOFING MEMBRANE Materials
				1. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.
				2. Roofing Asphalt: ASTM D 312-15, Type IV.
				3. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
				4. Asphalt Roofing Cement: ASTM D 4586, asbestos free, general purpose mastic as required by roofing system manufacturer for application. Basis of design: MBR Utility Cement
				5. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, one-part, trowel-grade mastic, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of design: MBR Utility Cement
				6. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, two-part, elastomeric, liquid-applied, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of design: MBR Flashing Cement
				7. Mastic Sealant: As required by Johns Manville.
				8. Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer. **[Roofing Granules] [CR Roofing Granules]**
				9. Aggregate Surfacing: ASTM D 1863, No. 6 or No. 67, clean, dry, opaque, [water-worn gravel or crushed stone, free of sharp edges] [crushed slag, free of sharp edges].
				10. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
			2. Reflective and PROTECTIVE coating
				1. Elastomeric Coating: ASTM D 6083. A multipurpose, acrylic elastomeric coating for use over a variety of substrates. Basis of design: **[TopGard 4000] [TopGard 5000]**
				2. Base Coat: One-part acrylic elastomeric, with bleed-blocking properties for coating over asphalt surfaces. Basis of design: TopGard Base Coat
			3. WALKWAYS
				1. Walkway Pads: Mineral-granule-surfaced, reinforced modified asphalt composition, slip-resisting pads, manufactured as a traffic pad for foot traffic provided by roofing system manufacturer, with a pad size of 32-inch x 32 inch. Basis of design: [DynaTred Walkway]
			4. Cover board
				1. Perlite Board: ASTM C 728, Type **[1] [2] [3]**; composed of expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated. Basis of design: **[1/2” Retro-Fit Board] [3/4” Fesco Board] [1” Fesco Board]** **[RetroPlus Roof Board]**
				2. 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]**
				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
			5. rOOF INSULATION
				1. General: Provide 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**] [**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] [3]**, Grade **[2 (20 psi)] [3 (25 psi)]**, provide factory-tapered insulation boards fabricated to slope of **[1/4 inch per 12 inches (1:48)]**, unless otherwise indicated. Basis of design: **[Tapered ENRGY 3] [Tapered ENRGY 3 25 PSI] [Tapered ENRGY 3 CGF] [Tapered ENRGY 3 25 PSI CGF]**
			2. 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 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 UltraFast Plates] [Lite-Deck Fasteners and Plates]**
				4. Polymer Fasteners: Glass-reinforced nylon fasteners with ¼" square drive and 1” head with Galvalume®\*-coated 3” metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate and furnished by roofing system manufacturer. Basis of design: Polymer Auger Fasteners and Plates
				5. 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]**
				6. Insulation Cant Strips: ASTM C 728, perlite insulation board. Basis of design: FesCant Plus
				7. Wood Nailer Strips: Comply with requirements in Division 06 Section **"**Miscellaneous Rough Carpentry**."**
			3. VAPOR RETARDER
				1. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt. Basis of design: GlasPly IV.
				2. Torch Applied SBS Vapor Retarder: [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced] [ASTM D 6164, Grade S, Type I, polyester-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of design: **[DynaWeld Base] [DynaBase HW] [DynaWeld 180 S].**
				3. 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.
				4. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
				5. 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 SAR].**
				6. Self-Adhered Primer: [One-part] [low VOC aerosol] penetrating primer solution to enhance the adhesion of self-adhering membranes. **[SA Primer] [SA Primer Low VOC] [JM All Season Sprayable Bonding Adhesive].**
				7. 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).
			4. 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. Composite Base Sheet: Roofing system manufacturer's asphalt-impregnated and -coated composite sheet; smooth surfaced and reinforced with a composite polyester and glass-fiber core. Basis of design: GlasTite Flexible
				4. Base-Sheet Fasteners: Twin legged, 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
				5. 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
				6. Base Sheet Fasteners: 32 gauge, 1-5/8” diameter tin caps with 11-gauge annular ring shank nails.
			5. 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, **[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]**
				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. Sheathing Paper
				1. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).
			2. 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 a snap-on 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]**
				3. Fascia System: Manufacturer’s factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee. Basis of design: **[Presto-Tite Fascia]**
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 cants, 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.**

**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.**

**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 base sheet fastener pull-out resistance.**

**Provide documentation of adhesion resistance values in accordance with ANSI/SPRI 1A-1 2015.**

**Lightweight Insulating Concrete:**

**Verify that lightweight insulating concrete substrate is visibly dry and free of moisture according to the lightweight insulating concrete manufacturer’s approved method.**

**Verify that lightweight insulating concrete has ability to provide minimum base sheet fastener pull-out resistance.**

**Provide documentation of adhesion resistance values in accordance with ANSI/SPRI 1A-1 2015.**

**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.**

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.

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. Sheathing Paper INSTALLATION
				1. Loosely lay sheathing paper in a single layer over all wood deck areas, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

Seal side and end laps with [**tape**] [**adhesive**].

* + - 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.**

* + - * 1. **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.**
				2. **Install modified bituminous vapor retarder sheet per roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:**

**Unroll roofing membrane sheets and allow them to relax for minimum time required by manufacturer.**

**Heat weld vapor retarder to substrate per roofing system manufacturer’s written instructions.**

**Adhere vapor retarder in a full mopping of hot asphalt to substrate per roofing system manufacturer’s written instructions.**

**Self-adhere vapor retarder to substrate per roofing system manufacturer’s instructions.**

* + - * 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. 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 solid mopping of hot roofing asphalt according to roofing system manufacturer’s instruction.**

**Install each layer using a cold fluid-applied adhesive according to roofing system manufacturer’s instruction.**

**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. **Loose Laid Insulation: Loose lay all layers of insulation with staggered joints.**
				2. **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 according to roofing system manufacturer’s instruction.**

**Install subsequent layers in a solid mopping of 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 solid mopping of hot roofing asphalt according to roofing system manufacturer’s instruction.**

**Install using a cold fluid-applied adhesive according to roofing system manufacturer’s instruction.**

**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 specifically designed and sized for fastening specified board-type roof 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. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
				3. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and back nailing
				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. Asphalt Heating: Heat roofing asphalt to temperature recommended by roofing manufacturer to flux modified membrane. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
				2. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
			1. ROOFING MEMBRANE INSTALLATION
				1. Install [two] [three] [four] [**five**] ply sheets starting at low point of roofing system. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.

Install each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without subsequent ply sheets touching.

* + - * 1. Cap Sheet: Install lapped granulated cap sheet starting at low point of roofing system. Offset laps from laps of preceding ply sheets and align cap sheet without stretching. Lap in direction to shed water. Extend cap sheet over and terminate beyond cants.

**Adhere cap sheet to substrate in a solid mopping of hot roofing asphalt applied at temperatures recommended by roofing system manufacturer.**

**Adhere cap sheet to substrate in a cold fluid-applied adhesive according to roofing system manufacturer’s instruction.**

**Heat weld modified bituminous roofing membrane cap sheet cap sheet according to roofing system manufacturer’s instruction.**

* + - * 1. Aggregate Surfacing: Promptly after installing and testing roofing membrane, base flashing, and stripping, flood-coat roof surface with 60 lb/100 sq. ft. (3 kg/sq. m) of hot roofing asphalt. While flood coat is hot and fluid, cast the following average weight of aggregate in a uniform course:

Aggregate Weight: 300 - 400 lb/100 sq. ft. (15 - 20 kg/sq. m).

If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 10 lb/100 sq. ft. (0.5 kg/sq. m).

* + - 1. FLASHING AND STRIPPING INSTALLATION
				1. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

Prime substrates with asphalt primer if required by roofing system manufacturer.

**Backer Sheet Application: Mechanically fasten backer sheet to walls or parapets.**

**Backer Sheet Application: Adhere backer sheet to substrate in a solid mopping of hot roofing asphalt.**

**Backer Sheet Application: Adhere backer sheet to substrate in approved adhesive applied at rate required by roofing system manufacturer.**

**Backer Sheet Application: Self-adhere backer sheet to substrate as required by roofing system manufacturer.**

**Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.**

**Flashing Sheet Application: Adhere flashing sheet to substrate in approved adhesive applied at rate required by roofing system manufacturer.**

**Flashing Sheet Application: Heat weld flashing sheet to substrate as required by roofing system manufacturer.**

* + - * 1. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane. Refer to manufacturer’s standard flashing details.
				2. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

Seal top termination of base flashing with a strip of glass-fiber fabric set in MBR Flashing cement.

* + - * 1. Roof Drains: Set [30-by-30-inch (760-by-760-mm)] <Insert size> 4 lb lead flashing sheet in a bed of MBR Flashing Cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches (100 mm) beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
				2. Roof Drains: Flash drain using liquid applied flashing system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.

Install stripping according to roofing system manufacturer's written instructions.

* + - * 1. Flash all penetrations using liquid applied flashing system.
			1. 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."
			2. Coating Installation
				1. Ensure that all surfaces are clean, dry and free of any dirt, grease, oil or other debris that may interfere with proper adhesion.
				2. Apply coating to roofing membrane and base flashings as recommended by the manufacturer. Apply in two coats allowing the first coat to completely dry before applying the second coat.
			3. WALKWAY INSTALLATION
				1. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

Sweep away loose aggregate surfacing and set walkway pads in additional flood coat of hot roofing asphalt.

* + - * 1. Walkway Cap Sheet Strips: Install roofing membrane walkway cap sheet strips over roofing membrane [in hot roofing asphalt] [in cold-applied adhesive] [by heat weld application].
				2. Roof-Paver Walkways: Install walkway roof pavers with applicable slip sheet according to manufacturer's written instructions in locations indicated, to form walkways.
			1. 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.
			2. 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 075113