SECTION 07 54 23

THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

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\*\* NOTE TO SPECIFIER \*\* Johns Manville Roofing System; Thermoplastic Polyolefin (TPO) Membrane Roofing.
This section is based on the products of Johns Manville Roofing System, which is located at:717 17th St., P. O. Box 5108Denver, CO 80217-5108Toll Free Tel: 800-654-3103Tel: 303-978-2000Fax: 303-978-2071Email: [request info (rsspecservices@jm.com)](https://arcat.com/rfi?action=email&company=Johns%252BManville%252BRoofing%252BSystem&message=RE%253A%2520Spec%2520Question%2520(07545jma)%253A%2520&coid=43020&spec=07545jma&rep=&fax=303-978-2071)
Web: <https://www.jm.com>
 [ [Click Here](https://arcat.com/company/johns-manville-roofing-system-43020) ] for additional information.
Johns Manville is a leading manufacturer and marketer of premium-quality insulation and commercial roofing, along with glass fibers and nonwovens for commercial, industrial, and residential applications. Our history goes back to 1858, when the H.W. Johns Manufacturing Company began operations out of a tenement building in New York City.
Today, our products are used in a wide variety of industries including building products, aerospace, automotive and transportation, filtration, commercial interiors, waterproofing and wind energy. A proud member of the Berkshire Hathaway family of companies, we serve customers in more than 80 countries around the globe.
In business for more than 160 years, our commitment to our stakeholders is stronger than ever. We are dedicated to long-term partnerships with our customers and suppliers. We are passionate about providing a safe and equitable workplace for our 8,000 global employees. And we are committed to making a positive impact in the communities where we live and work.
Our goal is to live by our core values of People, Passion, Perform and Protect.
Our global headquarters is in Denver, Colorado. We also have 44 manufacturing facilities across North America and Europe. We continuously invest in our people and our infrastructure to anticipate employee, customer and community needs and provide long-lasting solutions. This approach gives us the strength we need to be the Employer of Choice and the Supplier of Choice in the markets we serve worldwide.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Adhered TPO membrane roofing system.
		2. Mechanically fastened TPO membrane roofing system.
		3. Induction welded TPO membrane roofing system.
		4. Self-Adhered TPO membrane roofing system.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 03 52 16 - Lightweight Insulating Concrete for lightweight insulating concrete.
		2. Division 03 Section - Concrete for concrete.
		3. Division 05 Section - Steel Decking for steel roof deck.
		4. Division 06 Section - Miscellaneous Rough Carpentry for wood nailers, cants, curbs, and blocking, and for wood-based, structural-use roof deck panels.
		5. Division 07 Section - Sheet Metal Flashing and Trim flashings and counter flashings.
		6. Division 22 Section - Storm Drainage Piping Specialties for roof drains.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Society of Civil Engineers (ASCE):
			1. ASCE-7 - Minimum Design Loads for Buildings & Other Structures.
		2. ASTM International (ASTM):
			1. ASTM C728 - Standard Specification or Perlite Thermal Insulation Board.
			2. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
			3. ASTM C1278 - Standard Specification for Fiber-Reinforced Gypsum Panel.
			4. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
			5. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing and Waterproofing.
			6. ASTM D312 - Standard Specification for Asphalt Used in Roofing.
			7. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing.
			8. ASTM D2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
			9. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
			10. ASTM D4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
			11. ASTM D4897 - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing.
			12. ASTM D6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
			13. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
			14. ASTM D6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
			15. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
		3. American National Standards Institute (ANSI) / Single Ply Roofing Industry (SPRI):
			1. ANSI/SPRI/ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
			2. ANSI/SPRI FX-1 - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
			3. ANSI/ SPRI 1A-1 - Standard Field Test Procedure for Determining the Uplift Resistance of Insulation and Insulation Adhesives over Various Substrates.
		4. FM Global:
			1. FMG Approval 4450 - Class 1 Insulated Steel Deck Roofs.
			2. FMG Approval 4470 - Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction.
		5. Underwriters Laboratories (UL):
			1. UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.
		6. Underwriters Laboratory of Canada (CAN/ULC):
			1. CAN/ULC S770 - Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
		7. Glossary of NRCA's - The NRCA Roofing and Waterproofing Manual.
		8. Roof Consultants Institute - Glossary of Building Envelope Terms.
		9. International Building Code (IBC).
		10. Sheet Metal Terminology and Techniques: SMACNA - Architectural Sheet Metal Manual.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00.
		2. Product Data:
			1. Manufacturer's data sheets on each product to be used.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Typical installation methods.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: Two representative units of each type, size, pattern, and color.
		2. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction, attachments to other work, and the following:
			1. Base flashings and membrane terminations.
			2. Tapered insulation, including slopes.
			3. Crickets, saddles, and tapered edge strips, including slopes.
			4. Insulation fastening and adhesive patterns.
		3. Installer Certificates: Confirmation that installer is approved, authorized, or licensed by manufacturer to install roofing system.
		4. Maintenance Data: Submit manufacturer's latest published documents.
		5. Guarantees: Submit manufacturer's current guarantee.
		6. Roofing sub-contractor will submit copy of the final System Assembly Letter issued by manufacturer, indicating that products and system installed are eligible to receive the specified manufacturer's guarantee when installed by a manufacturer certified contractor in accordance with manufacturer's application requirements, inspected and approved by manufacturer's Technical Representative.
		7. Prior to roofing system installation, roofing sub-contractor will provide a copy of the Guarantee Application Confirmation document issued by the manufacturer indicating project has been reviewed for eligibility to receive specified guarantee, and registered.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience.

\*\* NOTE TO SPECIFIER \*\* Delete FMG Approval, and/or Florid Product Approval if not applicable to the roofing system or project.

* + - 1. Qualified domestic U.S. owned and based manufacturer that has UL listing, FMG Approval and Florida Product Approval, or accredited testing agency listing for roofing system identical to that used for this Project.
		1. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and who is eligible to receive the specified manufacturer's guarantee.
		2. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct testing indicated, as documented according to ASTM E 329.
		3. Test Reports:
			1. Roof drain and leader test or submit plumber's verification.
			2. Core cut, if required.
			3. Roof deck fastener pullout test, if required.
			4. Bonded pull test, if required.
		4. Moisture Survey, if required:
			1. 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:
				1. Infrared Thermography.
				2. Nuclear Backscatter.
		5. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system must be labeled by the single source roofing manufacturer issuing the guarantee.
	1. PRE-INSTALLATION CONFERENCE
		1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Store and handle TPO roofing assembly components in strict compliance with manufacturer's written instructions and recommendations. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
		2. 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.
		3. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, weather, excessive temperature, construction operations 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.
	3. COORDINATION
		1. Coordinate work of this Section with existing warranties with building Owner's representative to verify compliance.
		2. 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 or when rain is imminent.
			1. Tie-off and cover exposed roofing membrane sheets and insulation at end of each day's work.
			2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
			3. Remove and discard temporary seals before beginning work on adjoining roofing.
	4. PROJECT CONDITIONS
		1. Maintain environmental temperature, humidity, and ventilation conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits and guarantee requirements.
	5. GUARANTEE
		1. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.

\*\* NOTE TO SPECIFIER \*\* Delete roofing system components listed below if not required for installation, and not required as part of manufacturer's guarantee. Delete guarantee period not required.

* + - 1. Single-source special guarantee includes roofing membrane, base flashings, roofing membrane accessories, 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.
			2. Guarantee Period:
				1. 10 years from date of Substantial Completion.
				2. 15 years from date of Substantial Completion.
				3. 20 years from date of Substantial Completion.
				4. 25 years from date of Substantial Completion.
				5. 30 years from date of Substantial Completion.
			3. Specifier Account: Contractor is required to list INSERT FIRM NAME as the Specifier/Consultant of record in the appropriate fields when applying for the manufacturer's guarantee.
		1. Installer's Guarantee: Submit roofing Installer's guarantee, including all components of roofing system for the following guarantee period:
			1. Guarantee Period:

\*\* NOTE TO SPECIFIER \*\* Delete guarantee period not required

* + - * 1. Two years from date of Substantial Completion.
				2. Five years from date of Substantial Completion.
		1. Existing Guarantees: Guarantees on existing building elements should not be affected by scope of work.
			1. Installer is responsible for coordinating with building owner's representative to verify compliance.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Johns Manville Roofing System, which is located at:717 17th St., P. O. Box 5108Denver, CO 80217-5108Toll Free Tel: 800-654-3103Tel: 303-978-2000Fax: 303-978-2071Email: [request info (rsspecservices@jm.com)](https://arcat.com/rfi?action=email&company=Johns%252BManville%252BRoofing%252BSystem&message=RE%253A%2520Spec%2520Question%2520(07545jma)%253A%2520&coid=43020&spec=07545jma&rep=&fax=303-978-2071);Web: <https://www.jm.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00.
	1. PERFORMANCE AND DESIGN REQUIREMENTS
		1. General: Installed roofing membrane system will remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
		2. Material Compatibility: Roofing materials must 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 must comply with current code requirements based on authorities having jurisdiction.
		4. Wind Uplift Performance: Roofing system will 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. FMG Listing: Roofing membrane, base flashings, and component materials must comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraph if not required. If FM RoofNav requirements apply, add applicable RoofNav number.

* + - 1. Roofing system will comply with RoofNav No. \_\_\_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete Fire/Windstorm Classification options not required. If Class A is required, add applicable number.

* + - 1. Fire/Windstorm Classification: Class 1.
			2. Fire/Windstorm Classification: Class NC.
			3. Fire/Windstorm Classification: Class A-\_\_\_\_\_\_\_\_.
		1. Hail Resistance:

\*\* NOTE TO SPECIFIER \*\* Delete hail damage resistance type options not required. MH is for moderate hail, SH is for severe hail, VSH is for Very Severe Hail.

* + - 1. MH.
			2. SH.
			3. VSH.
		1. Fire-Test-Response Characteristics: Provide roofing materials with fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials must be identified with appropriate markings of applicable testing and inspecting agency.

\*\* NOTE TO SPECIFIER \*\* Delete exterior fire-test exposure options not required.

* + - 1. Exterior Fire-Test Exposure: Class A; UL 790, for application and roof slopes indicated.
			2. Exterior Fire-Test Exposure: Class B; UL 790, for application and roof slopes indicated.
			3. Exterior Fire-Test Exposure: Class C; UL 790, for application and roof slopes indicated.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE - TPO
		1. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D6878, uniform, flexible sheet formed from a thermoplastic polyolefin.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design products not required. Delete internally fabric reinforced or scrim reinforced option; whichever is not required.

* + - 1. Basis of Design: JM TPO.
				1. Scrim reinforced.
			2. Basis of Design: JM TPO FB 115.
				1. Scrim reinforced.
			3. Basis of Design: JM TPO FB 135.
				1. Scrim reinforced.
			4. Basis of Design: JM TPO FB 150.
				1. Scrim reinforced.
			5. Basis of Design: JM TPO FB 175.
				1. Scrim reinforced.
			6. Basis of Design: JM TPO SA 60.
				1. Scrim reinforced.

\*\* NOTE TO SPECIFIER \*\* Delete membrane thickness, fabric fleece backed membrane thickness and exposed face color not required. Self-adhered membrane is only available in white, 60 mil thickness.

* + - 1. Membrane Thickness: 45 mils (1.14 mm), minimum.
			2. Membrane Thickness: 60 mils (1.52 mm), nominal.
			3. Membrane Thickness: 80 mils (2.03 mm), nominal.
			4. Fabric Fleece Backed Membrane Thickness: 60 mils (1.52 mm), nominal.
			5. Fabric Fleece Backed Membrane Thickness: 80 mils (2.03 mm), nominal.
			6. Exposed Face Color: White.
			7. Exposed Face Color: Tan.
			8. Exposed Face Color: Grey.
			9. Serviceable Installation Temperature: 20 degrees F (-7 degrees C) and above.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. AUXILARY ROOFING MATERIAL - SINGLE PLY
		1. General: Auxiliary materials recommended by roofing system manufacturer for intended use, compatible with membrane roofing.
			1. Liquid-type auxiliary materials meeting VOC limits of authorities having jurisdiction.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design flashing option not required.

* + 1. Basis of Design: JM TPO 60 Mil: Sheet Flashing:
			1. Manufacturer's internally reinforced.
			2. Manufacturer's scrim reinforced.
		2. Basis of Design: JM TPO SA - Flashing Membrane. Sheet Flashing (Self-Adhered): 60 mil (1.5 mm) thick, with weldable selvage edges on each side of roll, and one encapsulated edge.
			1. Manufacturer's internally reinforced.
			2. Manufacturer's scrim reinforced.
			3. Serviceable Installation Substrate Temperature: 20 degrees F (-7 degrees C) and rising.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design bonding adhesives not required. Verify correct bonding adhesive for use on fleece backed membranes prior to specifying.

* + 1. Basis of Design: JM Membrane Bonding Adhesive (TPO and EPDM): Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
			1. Serviceable Installation Ambient Air Temperature: 25 degrees F (-3.889 degrees C) and rising.
		2. Basis of Design: JM LVOC Membrane Adhesive (TPO and EPDM): Bonding Adhesive: Manufacturer's standard synthetic polymer-based bonding adhesive for membrane, and synthetic polymer-based bonding adhesive for base flashings.
			1. Serviceable Installation Ambient Air Temperature: 25 degrees F (-3.889 degrees C) and rising.
		3. Basis of Design: JM TPO Water Based Membrane Adhesive: Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and water-based bonding adhesive for base flashings.
			1. Serviceable Installation Ambient Air Temperature: 40 degrees F (-4 degrees C) and rising.
		4. Basis of Design: JM TPO 1168 Membrane Adhesive: Bonding Adhesive: Manufacturer's standard synthetic polymer-based bonding adhesive for membrane, and synthetic polymer-based bonding adhesive for base flashings.
			1. Serviceable Installation Ambient Air Temperature: 40 degrees F (-4 degrees C) and rising.
		5. Basis of Design: JM All Season Sprayable Bonding Adhesive: Bonding Adhesive: Manufacturer's standard sprayable aerosol bonding adhesive for membrane, and sprayable aerosol bonding adhesive for base flashings.
			1. Serviceable Installation Ambient Air Temperature: 25 degrees F (-3.889 degrees C) and rising.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design urethane adhesives not required.

* + 1. Basis of Design: JM Roofing Systems Urethane Adhesive (RSUA): Manufacturer's standard two component no VOC urethane adhesive for fleece-backed membranes.
		2. Basis of Design: JM Two-Part Urethane Insulation Adhesive Canister: Manufacturer's self-contained two-part, low-rise foam adhesive formulated to adhere fleece-backed membranes to substrate.

\*\* NOTE TO SPECIFIER \*\* Delete self-adhering membrane primer option not required.

* + 1. Basis of Design: SA Primer: Self-Adhered Primer: One-part penetrating primer solution to enhance the adhesion of self-adhering membranes.
		2. Basis of Design: SA Primer Low VOC: Self-Adhered Primer: One-part penetrating primer solution to enhance the adhesion of self-adhering membranes.

\*\* NOTE TO SPECIFIER \*\* The following three paragraphs are options. Delete options not required.

* + 1. Roofing Asphalt: ASTM D312-15, Type IV.
		2. Basis of Design: JM Asphalt Primer: Asphalt Primer: ASTM D41.
		3. Basis of Design: JM SP Liquid Flashing Resin and JM SP Liquid Flashing Scrim: Liquid Applied Flashing: Manufacturer's single ply liquid and fabric reinforced flashing system with a fleece polyester scrim and two-component polyurethane-based liquid applied flashing material, consisting of a liquid resin and a curing agent.
		4. Liquid Applied Flashing Primer: Manufacturer's single ply liquid flashing primer.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + - 1. Basis of Design: JM SP Liquid Flashing TPO and PVC Primer.
			2. Basis of Design: JM SP Liquid Flashing Concrete Primer.
			3. Basis of Design: JM SP Liquid Flashing Metal and Wood Primer.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design slipsheet option not required.

* + 1. Manufacturer's recommended slip sheet, of type required for application.

\*\* NOTE TO SPECIFIER \*\* Delete basis if design option not required.

* + - 1. Basis of Design: JM 3 -oz Polyester Slipsheet:
			2. Basis of Design: JM Polyester Mat Protection Slipsheet:
		1. Basis of Design: JM Termination Systems: Metal Termination Bars: Manufacturer's standard predrilled termination bars with anchors.

\*\* NOTE TO SPECIFIER \*\* Delete stainless-steel or aluminum bar option not required.

* + - 1. Stainless-steel bars.
			2. Aluminum bars.

\*\* NOTE TO SPECIFIER \*\* Delete fastener and plate options not required.

* + 1. Basis of Design: High Load Fasteners and JM VSH Plates: 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.
		2. Basis of Design: High Load Fasteners and Plates: 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.
		3. Basis of Design: Extra High Load Fasteners and Plates: 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.
		4. Basis of Design: JM Purlin 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.
		5. Basis of Design: All Purpose Fasteners and High Load Plates: 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.
		6. Basis of Design: Polymer Auger Fasteners and Plates: Polymer Fasteners: Glass-reinforced nylon fasteners with 1/4 inch (6.35 mm) square drive and 1 inch (25.4 mm) head with Galvalume-coated, 2 inch (50.8 mm) metal stress plates designed to lock into fastener head. Fasteners designed for fastening roof insulation to substrate furnished by roofing system manufacturer.
		7. Basis of Design: JM TPO RhinoPlates: Induction Welding Plate: Galvalume-coated round plate with recessed center and raised flat bonding surface designed for induction welding application.
		8. Miscellaneous Accessories: Provide all accessories to meet the roofing manufacturer's guarantee requirements.
	1. WALKWAY AND SAFETY STRIPS
		1. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design option not required.

* + - 1. Basis of Design: JM TPO Walkpad.
			2. Basis of Design: JM TPO Safety Walkpad.

\*\* NOTE TO SPECIFIER \*\* Delete safety strip option if not required.

* + 1. Safety Strips: Manufacturer's minimum 65 mils total thickness, comprised of 30 mil yellow non-reinforced TPO membrane laminated to 35 mil white cured seaming tape.
			1. Basis of Design: JM Single Ply Safety Strip. Exposed Face Color: Yellow.
	1. COVER BOARD

\*\* NOTE TO SPECIFIER \*\* Delete cover board options not required.

* + 1. Basis of Design: SeparatoR CGF: Polyisocyanurate Board: ASTM C 1289, Type II, Class 2, Grade 3 (25 psi) polyisocyanurate bonded in-line to inorganic coated glass facer.
			1. Thickness: 1/2 inch (13mm).
			2. R-value: 2.9.
		2. Basis of Design: ProtectoR HD: High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength.
			1. Thickness: 1/2 inch (13 mm).
			2. R-value: 2.5.
		3. Basis of Design: RetroPlus Roof Board: Perlite Board: ASTM C 728, Type 3; expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

\*\* NOTE TO SPECIFIER \*\* Delete roof board and thickness options not required.

* + 1. Basis of Design: Securock Ultralight Glass-Mat Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		2. Basis of Design: DEXcell Glass Mat Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		3. Basis of Design: Dens Deck Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		4. Basis of Design: DEXcell FA Glass Mat Roof Board: Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		5. Basis of Design: Dens Deck Prime Roof Board: Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		6. Basis of Design: Securock Gypsum-Fiber Roof Board: Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate.
			1. 1/4 inch (6 mm) thick.
			2. 3/8 inch (9.5 mm) thick.
			3. 1/2 inch (13 mm) thick.
			4. 5/8 inch (16 mm) thick.
	1. ROOF INSULATION - FLUTE FILLER
		1. General: Preformed roof insulation boards complying with requirements and referenced standards, selected from manufacturer's standard sizes and thickness indicated.
		2. Product: ENRGY 3: Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2.
			1. Include metal roof flute filler insulation package with thickness to fill flutes the height of standing seam.
	2. ROOF INSULATION
		1. General: Preformed roof insulation boards complying 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.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + - 1. Basis of Design: ENRGY 3:
				1. Class 1.
				2. Grade 2 (20 psi).
			2. Basis of Design: ENRGY 3 25 PSI:
				1. Class 1.
				2. Grade 3 (25 psi).
			3. Basis of Design: ENRGY 3 CGF:
				1. Class 2.
				2. Grade 2 (20 psi).
			4. Basis of Design: ENRGY 3 25 PSI CGF:
				1. Class 2.
				2. Grade 3 (25 psi).
		1. Insulation package minimum R Value:

\*\* NOTE TO SPECIFIER \*\* Revise and delete the following insulation paragraphs as required per project requirements.

* + - 1. R Value: \_\_\_\_\_\_\_\_.
			2. R Value: Minimum R-value required by applicable code.
			3. Insulation Package: \_\_\_\_\_\_\_\_ minimum thickness.
			4. Insulation Package: Multiple layers.
			5. Long-Term Thermal Resistance (LTTR): 5.7 per inch minimum.
				1. Determined according to CAN/ULC S770 at 75 degrees F (24 degrees C).
	1. TAPERED INSULATION
		1. Tapered Insulation: ASTM C 1289, Type II. Factory-tapered insulation boards fabricated to slope of 1/4 inch (6.35 mm) per 12 inches (304.8 mm) (1:48), unless otherwise indicated.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + - 1. Basis of Design: Tapered ENRGY 3:
				1. Class 1.
				2. Grade 2 (20 psi).
			2. Basis of Design: Tapered ENRGY 3 25 PSI:
				1. Class 1.
				2. Grade 3 (25 psi).
			3. Basis of Design: Tapered ENRGY 3 CGF:
				1. Class 2.
				2. Grade 2 (20 psi).
			4. Basis of Design: Tapered ENRGY 3 25 PSI CGF:
				1. Class 2.
				2. Grade 3 (25 psi).
	1. INSULATION ACCESSORIES
		1. General: Roof insulation accessories recommended by insulation manufacturer for intended use, compatible with membrane roofing.

\*\* NOTE TO SPECIFIER \*\* Delete insulation accessories options not required.

* + 1. Basis of Design: Tapered Fesco Edge Strips: Saddles, crickets, tapered edge strips, and other insulations shapes indicated for sloping to drain. Fabricate to slopes indicated.
		2. Basis of Design: UltraFast Fasteners and UltraFast Plates: Factory-coated steel fasteners and metal or plastic plates meeting FMG 4470 corrosion-resistance requirements designed for fastening roof insulation to substrate, furnished by roofing system manufacturer.
		3. Basis of Design: UltraFast Fasteners and JM VSH Plates: Factory-coated steel fasteners and metal or plastic plates meeting FMG 4470 corrosion-resistance requirements, designed for fastening roof insulation to substrate, furnished by roofing system manufacturer.
		4. Basis of Design: All Purpose Fasteners and UltraFast Plate: Factory-coated steel fasteners and metal or plastic plates meeting FMG 4470 corrosion-resistance requirements, designed for fastening roof insulation to substrate, furnished by roofing system manufacturer.
		5. Basis of Design: Lite-Deck Fasteners and Plates: Factory-coated steel fasteners and metal or plastic plates meeting FMG 4470 corrosion-resistance requirements, designed for fastening roof insulation to substrate, furnished by roofing system manufacturer.
		6. Basis of Design: Polymer Auger Fasteners and Plates: Glass-reinforced nylon fasteners with 1/4 inch (6.35 mm) square drive and 1 inch (25.4 mm) head with Galvalume-coated 3 inch (76.2 mm) metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate furnished by roofing system manufacturer.
		7. Basis of Design: JM Two-Part Urethane Insulation Adhesive (UIA): Manufacturer's two component polyurethane adhesive to adhere insulation to substrate.
		8. Basis of Design: JM One-Step Foamable Adhesive: Manufacturer's two component polyurethane adhesive to adhere insulation to substrate.
		9. Basis of Design: Roofing Systems Urethane Adhesive (RSUA): Manufacturer's two component polyurethane adhesive to adhere insulation to substrate.
		10. Basis of Design: JM Two-Part Urethane Insulation Adhesive Canister: Manufacturer's two component polyurethane adhesive to adhere insulation to substrate.
		11. Wood Nailer Strips: Comply with requirements in Division 06 Section - Miscellaneous Rough Carpentry.
	1. VAPOR RETARDER

\*\* NOTE TO SPECIFIER \*\* Delete Glass-fiber felts, SBS-modified asphalt sheet, vapor retarder and primer options not required.

* + 1. Basis of Design: GlasPly IV: Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.
		2. Basis of Design: DynaLastic 180 S: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
			1. ASTM D6164, Garde S, Type 1, polyester-reinforced.
		3. Basis of Design: DynaBase: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
			1. ASTM D 6163, Grade S, Type 1, glass-fiber-reinforced.
		4. Basis of Design: DynaBase HW: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
			1. ASTM D 6163, Grade S, Type 1, glass-fiber-reinforced.
		5. Basis of Design: DynaWeld Base: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
			1. ASTM D6163, Grade S, Type 1, glass-fiber-reinforced.
		6. Basis of Design: DynaGrip Base SD/SA: Self-Adhered SBS Vapor Retarder: SBS-modified asphalt sheet; sand surfaced; suitable for application method specified.
			1. ASTM D 6163, Grade S, Type I, glass-fiber-reinforced.
		7. Polyethylene Vapor Retarder: ASTM D 4397.
			1. 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
			2. 10 mils (0.25 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
		8. Basis of Design: JM Vapor Barrier SA: Self-Adhered SBS Vapor Retarder: Tri-laminate woven polyethylene, nonslip UV protected top surface; suitable for application method specified.
		9. Basis of Design: JM Vapor Barrier SAR: Self-Adhered SBS Vapor Retarder: Tri-laminate woven polyethylene, nonslip UV protected top surface; suitable for application method specified.
		10. Basis of Design: JM Asphalt Primer: Asphalt Primer: ASTM D 41.
		11. Basis of Design: SA Primer: Self-Adhered Primer: One-part, sprayable, penetrating primer for self-adhering membranes.
		12. Basis of Design: SA Primer Low VOC: Self-Adhered Primer: One-part, low VOC, sprayable, penetrating primer for self-adhering membranes.
		13. Basis of Design: JM All Season Sprayable Bonding Adhesive: Self-Adhered Primer: Low VOC, aerosol, penetrating primer for self-adhering membranes.
	1. BASE-SHEET MATERIALS

\*\* NOTE TO SPECIFIER \*\* Delete base sheet and base sheet fastener options not required.

* + 1. Basis of Design: PermaPly 28: Base Sheet: ASTM D 4601, Type II, non-perforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
		2. Basis of Design: GlasBase Plus: Base Sheet: ASTM D 4601, Type II, non-perforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
		3. Basis of Design: Ventsulation Felt: Base Sheet: ASTM D 4897, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet.
			1. Coarse granular surfacing on bottom surface.
			2. Embossed venting channels on bottom surface.
		4. Product: Lightweight Concrete (LWC) Base Sheet Fasteners: Twin legged factory-coated steel fasteners and Galvalume metal plates meeting FMG 4470 corrosion-resistance requirements, designed for fastening base-sheet to substrate. Tested by manufacturer for required pullout strength and provided by roofing system manufacturer.
		5. Product: UltraLok Locking Impact Fastener: Base-Sheet Fasteners: Tube, disk and locking staple design, factory-coated steel fasteners and Galvalume metal battens meeting FMG 4470 corrosion-resistance requirements, designed for fastening base-sheet to substrate. Tested by manufacturer for required pullout strength and provided by roofing system manufacturer.
		6. Base Sheet Fasteners: 32 gauge (0.246 mm), 1-5/8 inch (41.3 mm) diameter tin caps with 11-gauge (1.4 mm) annular ring shank nails.
	1. SUBSTRATE BOARD

\*\* NOTE TO SPECIFIER \*\* Delete substrate board and thickness options not required.

* + 1. Basis of Design: Securock Ultralight Glass-Mat Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		2. Basis of Design: DEXcell Glass Mat Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		3. Basis of Design: Dens Deck Roof Board: Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications.
			1. 1/4 inch (6 mm) thick.
			2. 1/2 inch (13 mm) thick.
			3. 5/8 inch (16 mm) thick.
		4. Basis of Design: DEXcell FA: Glass Mat Roof Board 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.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 1/4 inch (6 mm).
			2. Thickness: 1/2 inch (13 mm).
			3. Thickness: 5/8 inch (16 mm).
		1. Basis of Design: Dens Deck Prime Roof Board: Glass Mat Roof Board 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.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 1/4 inch (6 mm) thick.
			2. Thickness: 1/2 inch (13 mm) thick.
			3. Thickness: 5/8 inch (16 mm) thick.
		1. Basis of Design: Securock Gypsum-Fiber Roof Board: Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate.
			1. 1/4 inch (6 mm) thick.
			2. 3/8 inch (9.5 mm) thick.
			3. 1/2 inch (13 mm) thick.
			4. 5/8 inch (16 mm) thick.
		2. Basis of Design: ProtectoR HD: High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength.
			1. Thickness: 1/2 inch (13 mm).
			2. R-value: 2.5.
	1. EDGE MATERIAL COMPONENTS

\*\* NOTE TO SPECIFIER \*\* Delete expansion joint, coping, fascia, metal edge, and roof drainage product or system options not required.

* + 1. Basis of Design: Expand-O-Flash: 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. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		2. Basis of Design: Expand-O-Gard: 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. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		3. Basis of Design: Presto-Lock Coping: Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		4. Basis of Design: Presto-Lock Gold Coping: Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		5. Basis of Design: Presto-Tite Fascia: Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		6. Basis of Design: Presto-Tite Edge One Fascia: Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		7. Basis of Design: Presto-Weld Drip Edge: Metal Edge System: Manufacturer's factory fabricated metal edge system used to terminate the roof at the perimeter of the structure. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		8. Basis of Design: JM TPO-Coated Metal: Metal Edge System: Manufacturer's factory fabricated metal edge system used to terminate the roof at the perimeter of the structure. Product must be from single-source roofing system supplier included in the No Dollar Limit guarantee.
		9. Shop-Fabricated Edge Metal: ANSI/SPRI ES-1 compliant custom-fabricated edge metal. Must be approved by manufacturer technical representative. Minimum requirements:
			1. Steel: 24 gauge (0.607 mm), TPO coated fastened 6 inches (152.4 mm) on center.
			2. Aluminum: 0.05 inch (1.27 mm) thick, fastened 6 inches (152.4 mm) on center.
		10. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section - Sheet Metal Flashing and Trim.
		11. Roof Edge Drainage Systems: Gutter Systems: Manufactured in section lengths not exceeding 12 feet (3.658 m) with 0.100-inch (2.54 mm) mill aluminum internal Gutter Hangers, 24 inches (609.6 mm) on center, and 2-inch (50.8 mm) wide formed external wind straps 6 feet (1.829 m) on center.
1. EXECUTION
	1. EXAMINATION
		1. General:
			1. Examine substrates, areas, and conditions for compliance with requirements affecting performance of roofing system.
			2. Verify roof openings and penetrations are in place and set and braced and roof drains are securely clamped in place.
			3. Verify wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and nailers match thicknesses of insulation.

\*\* NOTE TO SPECIFIER \*\* Delete steel, existing standing seam and light gauge, concrete, wood, cementitious wood fiber, lightweight insulating concrete or gypsum decks options not required

* + 1. Steel Decks:
			1. Verify surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section - Steel Decking.
			2. Verify decking is visibly dry and free of moisture.
			3. Verify decking is smooth and free of large cracks, holes, or sharp changes in elevation of the surface.
			4. When applicable perform pull test with specific fastener being used on project to confirm fastener resistance meets requirements for that particular system.
		2. Existing Standing Seam and Light Gauge Decks:
			1. Verify decking is visibly dry and free of moisture.
			2. Verify decking is smooth and free of large cracks, holes, or sharp changes in elevation of the surface.
			3. When applicable, perform pull test with specific fastener being used on project to confirm fastener resistance meets requirements for that particular system.
				1. Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1 2016.
		3. Concrete Decks:
			1. Verify concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
			2. Verify concrete substrate is visibly dry and free of moisture.
		4. Wood Decks:
			1. Verify wood decking is visibly dry and free of moisture.
			2. Verify wood has ability to provide minimum fastener pull-out resistance.
				1. Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1.
		5. Cementitious Wood Fiber Decks /Tectum:
			1. Verify cementitious wood fiber substrate is visibly dry and free of moisture.
			2. Verify cementitious wood fiber has minimum pull-out resistance.
			3. Include documentation of minimum pull-out or adhesion resistance values using manufacturers approved procedures in accordance with ANSI/SPRI FX-1 or ANSI/ SPRI 1A-1, whichever is applicable.
		6. Lightweight Insulating Concrete:
			1. Verify lightweight insulating concrete substrate is visibly dry and free of moisture.
			2. Verify lightweight insulating concrete has minimum base sheet fastener pull-out resistance.
			3. Include documentation of adhesion resistance values in accordance with ANSI/SPRI 1A-1.
		7. Gypsum Deck:
			1. Verify gypsum is visibly dry and free of moisture with no signs of staining.
			2. Inspect deck for cracking and deflection of bulb tees.
			3. Verify gypsum has minimum fastener pull-out resistance.
				1. Include documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1.
			4. Include documentation of adhesion resistance values in accordance with ANSI/SPRI 1A-1.
		8. Ensure general rigidity and proper slope for drainage.
		9. Verify deck is securely fastened with no projecting fasteners and no adjacent units more than 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
		10. Bring unacceptable panels to the attention of the General Contractor and Project Owner's Representative. Correct prior to installation of roofing system.
		11. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
		12. Do not begin installation until the substrates have been properly constructed and prepared.
	1. PREPARATION
		1. Clean surfaces thoroughly prior to installation. Remove sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation from substrate in accordance with roofing system manufacturer's written instructions.
		2. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions.
		3. Prevent materials from entering and clogging roof drains and conductors and spilling or migrating onto surfaces of other construction.
		4. If applicable, prime surface of deck at rate recommended by roofing manufacturer. Allow primer to dry.
		5. Proceed with each step of installation only after unsatisfactory conditions have been corrected.

\*\* NOTE TO SPECIFIER \*\* Delete articles not required.

* 1. RE-ROOF PREPARATION
		1. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc.
			1. Remove area no larger than can be re-roofed in one day.
		2. Tear out all base flashings, counter flashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
		3. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations.
			1. Install decking to match existing as directed by Owner's Representative.
		4. Raise, or disconnect by licensed craftsmen, if necessary, all HVAC units and other equipment supported by curbs to conform with the following:
			1. Modify curbs as required to a minimum 8 inch (203.2 mm) base flashing height measured from the surface of new membrane to top of flashing membrane.
			2. Secure flashing and install new metal counterflashing prior to re-installation of unit.
			3. Perimeter nailers must be elevated to match elevation of new roof insulation.
		5. Immediately remove all debris from roof surface. Demolished roof system may not be stored on roof surface.
	2. RE-COVER PREPARATION
		1. Prepare existing roof according to roofing system manufacturer's written instructions, applicable recommendations of roofing manufacturer, and requirements in this Section.
		2. Tear out all base flashings, counterflashing, 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, or disconnect by licensed craftsmen, if necessary, all HVAC units and other equipment supported by curbs to conform with the following:
			1. Modify curbs as required to provide a minimum 8 inch (203.2 mm) base flashing height measured from surface of new membrane to top of flashing membrane.
			2. Secure top of flashing and install new metal counterflashing prior to re-installation of unit.
			3. Perimeter nailers must be elevated to match elevation of new roof insulation.
		8. Immediately remove all debris from roof surface. Demolished roof system may not be stored on roof surface.
		9. Install polyester slip sheet as a loosely laid single layer beneath new single ply membrane, side and end lapping each sheet a minimum of 3 inches (76.2 mm) and 6 inches (150 mm). Sheet may be tacked into place, as necessary.
	3. 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.

\*\* NOTE TO SPECIFIER \*\* Delete steel, mechanically fastened, adhered, or loose laid substrate board options not required. Delete FMG Approval Guide if project has no FMG approval requirements. Delete steel or wood deck options not required.

* + 1. 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.
			1. Fasten substrate board to top flanges of steel deck according to recommendations in FMG's Approval Guide for specified Windstorm Resistance Classification.
			2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof per roofing system manufacturer's written instructions.
			3. Fasten substrate board to top flanges of wood deck to resist uplift pressure at corners, perimeter, and field of roof per roofing system manufacturer's written instructions.
		2. Loose Laid Substrate Board: Loose lay substrate board, staggering joints with insulation board substrate.
		3. Adhered Substrate Board: Adhere substrate board to substrate as follows:
			1. Install in two-part urethane adhesive according to roofing system manufacturer's instruction.
			2. Install to resist uplift pressure at corners, perimeter, and roof field.
	1. BASE SHEET INSTALLATION
		1. Install one lapped base sheet course and mechanically fasten to substrate per roofing system manufacturer's written instructions.
			1. Enhance fastening rate in perimeter and corner zones per code requirements, wind uplift system approvals, or manufacturer's guarantee requirements, whichever is more stringent.
		2. Comply with roofing system manufacturer's written instructions for installing roof insulation.
	2. VAPOR-RETARDER INSTALLATION

\*\* NOTE TO SPECIFIER \*\* Delete polyethylene-sheet, glass-fiber felt piles, or modified bituminous vapor-retarder options not required.

* + 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).
			1. Seal side and end laps.
		2. Install two 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 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:
			1. Unroll roofing membrane sheets and allow to relax for minimum time required by manufacturer.
			2. Heat weld vapor retarder to substrate per roofing system manufacturer's written instructions.
			3. Adhere vapor retarder in a full mopping of hot asphalt to substrate per roofing system manufacturer's written instructions.
			4. Self-adhere vapor retarder to substrate per roofing system manufacturer's instructions.
		4. 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.
			1. Repair tears and voids in laps and lapped seams not completely sealed.
		5. Completely seal vapor retarder at terminations, obstructions, and penetrations.
	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 metal roof standing seams.
	2. 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 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 must 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.

\*\* NOTE TO SPECIFIER \*\* Delete preliminary fastened, preliminary fastened for mechanically fastened membrane systems, adhered, loose laid with top layers mechanically fastened, loose laid, or mechanically fastened with subsequent layers adhered insulation options not required.

* + 1. Preliminarily Fastened Insulation: Install insulation with fasteners at rate required by roofing system manufacturer.
			1. Fasten top layer to resist uplift pressure at corners, perimeter, and roof field.
		2. Preliminarily Fastened Insulation for Mechanically Fastened Membrane Systems: Install insulation with fasteners at rate required by roofing system manufacturer.
			1. Fasten top layer to resist uplift pressure at corners, perimeter, and roof field.
		3. Adhered Insulation: Adhere insulation to substrate as follows:
			1. Install each layer in two-part urethane adhesive according to roofing system manufacturer's instruction.
			2. Install each layer in solid mopping of hot roofing asphalt according to roofing system manufacturer's instruction.
			3. Install each layer to resist uplift pressure at corners, perimeter, and roof field.
		4. 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.

\*\* NOTE TO SPECIFIER \*\* Delete FMG Approval Guide subparagraph if not required.

* + - 1. Fasten top layer according to requirements in FMG's Approval Guide for specified Windstorm Resistance Classification.
			2. Fasten top layer to resist uplift pressure at corners, perimeter, and roof field.
		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.

\*\* NOTE TO SPECIFIER \*\* Delete FMG Approval Guide subparagraph if not required.

* + - 1. Fasten first layer according to requirements in FMG's Approval Guide for specified Windstorm Resistance Classification.
			2. Fasten first layer to resist uplift pressure at corners, perimeter, and roof field.
			3. Install subsequent layers in two-part urethane adhesive according to roofing system manufacturer's instruction.
			4. Install subsequent layers in solid mopping of hot roofing asphalt according to roofing system manufacturer's instruction.
			5. Install each layer to resist uplift pressure at corners, perimeter, and roof field.
	1. COVER BOARD 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 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 must be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
			1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
		4. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
			1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

\*\* NOTE TO SPECIFIER \*\* Delete preliminary fastened for mechanically fastened systems, adhered, or mechanically fastened cover board options not required.

* + 1. Preliminarily Fastened Cover Board for Mechanically Fastened Systems: Install cover board with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
		2. Adhered Cover Board: Adhere cover board to substrate as follows:
			1. Install in two-part urethane adhesive according to roofing system manufacturer's instruction.
			2. Install to resist uplift pressure at corners, perimeter, and roof field.
		3. 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.

\*\* NOTE TO SPECIFIER \*\* Delete FMG Approval Guide subparagraph if not required.

* + - 1. Fasten according to requirements in FMG's Approval Guide for specified Windstorm Resistance Classification.
			2. Fasten to resist uplift pressure at corners, perimeter, and roof field.
	1. ROOFING MEMBRANE INSTALLATION, GENERAL
		1. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of 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. 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.
			1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
			2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
			3. Remove and discard temporary seals before beginning work on adjoining roofing.
		4. 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 temperature exceeding finished blowing temperature for more than 4 hours.
			1. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
	2. ADHERED ROOFING MEMBRANE INSTALLATION
		1. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.
			1. Unroll roofing membrane and allow to relax before installing.
			2. Install sheet in accordance with roofing system manufacturer's written instructions.
		2. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

\*\* NOTE TO SPECIFIER \*\* Delete bonding and membrane adhesive options not required.

* + 1. Solvent Based Bonding Adhesive for Smooth Backed Membranes: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer. Allow it to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
		2. Water Based Bonding Adhesive for Smooth Backed Membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
		3. Water Based Bonding Adhesive for Fleece Backed Membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
		4. Urethane Membrane Adhesive for Fleece Backed Membranes: Apply urethane adhesive to substrate at rate required by manufacturer and install fleece-backed roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
		5. Asphalt for Fleece Backed Membranes: Adhere to substrate in a solid mopping of hot roofing asphalt applied at temperatures recommended by roofing system manufacturer.
		6. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
		7. Apply roofing membrane with side laps shingled with roof slope, where possible.
		8. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure watertight seam installation.
			1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
			2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
				1. Remove and repair any unsatisfactory sections before proceeding with installation.
			3. Repair tears, voids, and incorrectly lapped seams in roofing membrane that do not meet requirements.
		9. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
	1. MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION
		1. Install roofing membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.
			1. Unroll roofing membrane and allow to relax before installing.
			2. Install sheet in accordance with roofing system manufacturer's written instructions.
		2. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
		3. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
		4. Always install membrane laps perpendicular to the steel deck flutes. Picture Frame installation method is not permitted.
		5. Apply roofing membrane with side laps shingled with roof slope, where required.
		6. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure watertight seam installation.
			1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
			2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
				1. Remove and repair any unsatisfactory sections before proceeding with work.
			3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
		7. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

\*\* NOTE TO SPECIFIER \*\* Delete fastening plate or metal batten option not required.

* + 1. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
		2. Install roofing membrane and auxiliary materials to tie into existing roofing.
	1. INDUCTION WELDED ROOFING MEMBRANE INSTALLATION
		1. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
		2. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
		3. Always install membrane laps perpendicular to the steel deck flutes. Picture Frame installation method is not permitted.
		4. Apply roofing membrane with side laps shingled with roof slope, where required.
		5. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure watertight seam installation.
			1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
			2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
				1. Remove and repair any unsatisfactory sections before proceeding with work.
			3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
		6. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
		7. Induction Welding Installation:
			1. Calibrate and set-up as detailed by the Induction Welder Owner's Manual
			2. Center the Induction Welder over the first plate in pattern and activate the weld.
				1. Induction Welder must be centered over the plate to create a 100% bond.
				2. If an error occurs during activation, refer to the Induction Welder Owner's Manual for corrective action.
			3. Prior to every use, clean face of Heat Sink Magnet.
			4. Place Heat Sink Magnet over the welded plate.
				1. Keep Heat Sink Magnet in place for at least 45 seconds while the assembly cools.
			5. Repeat process for each plate.
	2. SELF-ADHERED ROOFING MEMBRANE INSTALLATION
		1. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.
			1. Unroll roofing membrane and allow to relax before installing, minimum 15-30 minutes. Colder temperatures might require longer relaxation times.
			2. Install sheet in accordance with roofing system manufacturer's written instructions.
		2. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer.
		3. Align sheet end laps of consecutive membranes. End laps will be stripped in with minimum 8-inch (203.2 mm) JM TPO Reinforced Cover Strip per manufacturer's written instructions.
		4. Self-adhere membrane to approved substrate per manufacturer's written instructions.
			1. Keep all flammable materials away while peeling the release liner.
			2. Adjust speed and tension on membrane to avoid winkles in material.
			3. Broom membrane in once both sides are down to promote adhesion and assist in removing air pockets.
			4. Roll-in adhered membrane with 100lb split roller.
		5. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
		6. Apply roofing membrane with side laps shingled with roof slope, where required.
		7. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side laps of roofing membrane according to manufacturer's written instructions to ensure watertight seam installation.
			1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
			2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
				1. Remove and repair any unsatisfactory sections before proceeding with installation.
			3. End laps are seamed by stripping with 8-inch (203.2 mm) reinforced cover strip following standard practices.
			4. Repair tears, voids, and incorrectly lapped seams in roofing membrane that do not meet requirements.
		8. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
		9. Install roofing membrane and auxiliary materials to tie into existing roofing.
	3. BASE FLASHING INSTALLATION
		1. Install sheet flashings and preformed flashing accessories and adhere to substrates per membrane roofing system manufacturer's written instructions.

\*\* NOTE TO SPECIFIER \*\* Delete solvent-based, water-based, or self-adhering base flashing and primer options not required.

* + 1. Apply solvent-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
		2. Apply water-based bonding adhesive in two-sided application, at required rate, and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
		3. Self-Adhere membrane to smooth approved substrates, when substrate temperatures are 40 degrees F (4.5 degrees C) and rising.
			1. The use of SA Primer or SA LVOC Primer is required for flashing applications on curbs and parapet walls for temperatures between 40 degrees F (4.5 degrees C) and 20 degrees F (-7 degrees C).
			2. The use of SA Primer or SA LVOC Primer is required for flashing applications over approved substrates with a porous or rough surface, including Dens Deck Prime, Dens Deck, DEXcell, concrete and smooth faces CMU.
		4. Apply single ply liquid applied flashing system per manufacturer's written instructions.
		5. Flash penetrations and field-formed inside and outside corners per manufacturer's installation instructions.
		6. Clean seam areas and overlap and firmly roll sheet flashings into adhesive. Weld side and end laps to ensure watertight seam installation.
		7. Terminate and seal top of sheet flashings, and mechanically anchor to substrate through termination bars.
	1. EDGE METAL INSTALLATION
		1. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify 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. SLIP SHEET INSTALLATION
		1. Install polyester slip sheet as a loosely laid single layer above single ply membrane per manufacturer's written instructions.
	3. WALKWAY INSTALLATION

\*\* NOTE TO SPECIFIER \*\* Delete walkway option not required.

* + 1. Flexible Walkways: Heat weld and adhere walkway products to substrate according to roofing system manufacturer's written instructions in locations indicated.
		2. Roof-Paver Walkways: Install walkway roof pavers with applicable slip sheet per manufacturer's written instructions in locations indicated.
	1. FIELD QUALITY CONTROL
		1. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
		2. Owner or designated representative will provide on-site observation and inspection during installation.
		3. Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and prepare test reports.
		4. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.
			1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
		5. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
		6. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

\*\* NOTE TO SPECIFIER \*\* Include if manufacturer provides field quality control with onsite personnel for instruction or supervision of product installation, application, erection, or construction. Delete if not required.

* + 1. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
	1. CLEANING AND PROTECTION
		1. Clean products in accordance with the manufacturer's recommendations.
		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 according to guarantee requirements.
		3. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
		4. Protect roofing system from damage and wear during remainder of construction period.

END OF SECTION