**DESIGN A/E NOTE - GUIDE SPECIFICATION CONVENTIONS**

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**Red: Text updated in 1st quarter. April – June.**

**Strikethrough text and highlighting (not text) in previously issued quarters are deleted. Only 1st quarter highlighted updated text is indicated.**

**Turquoise: Text updated in 2nd quarter. July – September.**

**1st quarter updated text remains highlighted.**

**Pink: Text updated in 3rd quarter. October – December.**

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**IMPORTANT: Retain month and year under section title on first page indicating updated Guide Specification Section issue used.**

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SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

(DeCA June 2022 Design Criteria)

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Fully adhered two-ply SBS modified bitumen roof membrane roofing system.

Roof flashing systems.

Roof insulation and cover board

Walkways.

* + - * 1. Related Sections:

Division 07 Section Sheet Metal Flashing and Trim for sheet metal flashing and trim integral with membrane roofing.

Division 07 Section Roof Specialties for wind resistive metal flashing and trim integral with membrane roofing.

* + - 1. DEFINITIONS
				1. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
			2. PERFORMANCE REQUIREMENTS
				1. General:

Provide installed roofing membrane and flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

* + - * 1. Material Compatibility:

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

* + - * 1. Roofing System Description and Design:

Two-ply SBS modified bitumen roof membrane system consisting of modified bitumen interply sheet fully adhered in cold adhesive and modified bitumen granulated cap sheet fully adhered by torch application with flashing systems. Roofing system shall meet FM DS 1-28, FM DS 1-29, FM1-49, and wind uplift requirements, as well as local code requirements. Roofing system attachment shall have corner and perimeter wind uplift enhancements.

All materials in roofing system, such as, but not limited to, modified bitumen membranes, flashings, PMMA flashing system, cover board, insulation, adhesive, fasteners, perimeter metal, etc, shall be approved and supplied by roofing membrane manufacturer and included in specified warranty. Roofing manufacturer to provide a single source warranty to covering installation and material such as but not limited to: membrane, membrane flashings, cover board, insulation, PMMA flashing system, adhesives, fasteners, and perimeter metal flashing systems.

Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to either resist uplift pressure calculated according to ASCE/SEI 7 or in accordance with membrane manufacture’s written fastening density instructions, whichever is more resistive to prescribed wind loads. Submit licensed Engineer's wind uplift calculations and substantiating data to validate complete roof system.

Wind Load:

Provide roofing assemblies, including anchorage, capable of withstanding wind pressures acting inward and outward normal to the plane of the roof.

Refer to Division 01 Section Summary of Work for wind loading design criteria.

Determine design loads using the appropriate coefficients for the roof configurations indicated.

Complete roof covering assembly, including cover board and insulation, must be rated and installed to test wind loads in accordance with Local Code Requirements, ASCE/SEI 7, FM P7825 and ASTM D 4073 capable of withstanding an uplift pressure as indicated in the specifications and drawings and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Provide Factory Mutual (FM) RoofNav assembly number for roofing system.

Fire Resistance:

Complete roof covering assembly must be Class A rated in accordance with ASTM E 108, FM 4470, or UL 790.

Complete roof covering assembly to be listed as part of Fire-Classified roof deck construction in UL RMSD, or Class I roof deck construction in FM APP GUIDE. FM or UL approved components of the roof covering assembly must bear the appropriate FM or UL label.

* + - 1. SUBMITTALS
				1. Product Data:

For each type of product indicated.

* + - * 1. Sustainable **[LEED]** Submittals:

Retain subparagraph below if low-emitting materials are required for LEED-NC Credit EQ 4; coordinate with requirements selected in Part 2 for adhesives and sealants.

Product Data **[for Credit EQ 4]:** For adhesives and sealants, including printed statement of VOC content.

* + - * 1. Shop Drawings:

For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

Base flashings and membrane terminations.

Insulation, tapered insulation, crickets and saddles, including slopes.

Insulation and cover board attachment patterns. Roof plan depicting wind loads and boundaries of enhanced perimeter and corner attachments of roof system components, as applicable.

Design Data Wind Uplift Calculations: Provide Engineering calculation, signed, sealed and dated by qualified Engineer validating the wind resistance per ASCE7, ASTM D4073, and local requirements for roofing system.

* + - * 1. Installer Certificates:

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

RRC, RA or PE letter stating familiar with the installers work as indicated.

* + - * 1. Manufacturer Certificates:

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

Sample and Actual Manufacturer's Certificate of Analysis, Bill of Lading

Factory Mutual RoofNav Number

Provide roof assembly letter from manufacturer

Submit evidence of meeting performance requirements. Include the following roofing system design considerations:

Corner uplift pressure.

Perimeter uplift pressure.

Field-of-roof uplift pressure.

* + - * 1. Product Test Reports:

Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

* + - * 1. Maintenance Data:

For roofing system to include in maintenance manuals.

* + - * 1. Warranties:

Special warranties specified in this Section.

* + - * 1. Inspection Report:

Copy of roofing system manufacturer's inspection report of roofing installation.

* + - * 1. Submittal List:

 Reference Submittal Item Quantity Action

 1.4A Product Data X R

 1.4B Sustainable **[LEED]** Submittals X I

 1.4C Shop Drawings X R

 1.4D Installer Certificates X I

 1.4E Manufacturer Certificates X R

 1.4F Product Test Reports X I

 1.4G Maintenance Data X I

 1.4H Warranties X R

 1.4I Inspection Report X I

 X Submit quantity specified in Division 01 Section Administrative Requirements.

 R Review each submittal, mark to indicate action taken, and return.

 I Submittal is for information or record purposes only. No action will be taken*.*

* + - 1. QUALITY CONTROL
				1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
	1. ASSE/SAFE A10.24 - Safety Requirements of Low-Sloped Roofs, current edition.
	2. ASSE/SAFE Z87.1 - Standard for Occupational and Educational Eye and Face Protection, current edition.
	3. ARMA 410BUR88 - Manual of Roof Maintenance and Repair, current edition
	4. ARMA 460LSR97 - NRCA/MRCA Repair Manual for Low Slope Membrane Roof Systems, current edition
	5. ARMA PMBRG98 - Quality Control Guideline for the Application of Polymer Modified Bitumen Roofing, current edition
	6. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, current edition
	7. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; current edition.
	8. ASTM D 4586 - Asphalt Roof Cement, Asbestos-Free, current edition
	9. ASTM D 5147 - Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Materials; current edition
	10. ASTM D 5849 - Standard Test Methods for Evaluating Resistance of Modified Bituminous Roofing Membrane to Cyclic Fatigue; current edition
	11. ASTM D 6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements; current edition
	12. ASTM D 7051 – Standard Test Method for Cyclic Thermal Shock of Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet with Factory-Applied Metal Surface
	13. ASTM E 108 - Fire Tests of Roof Coverings, current edition
	14. FM 4470 - Class I Roof Covers, current edition
	15. FM DS 1-28 - Design Wind Loads; Factory Mutual Research Corporation; current edition
	16. FM P7825 - Approval Guide, current edition
	17. FM P7825c - Approval Guide Building Materials, current edition
	18. INTERNATIONAL CODE COUNCIL (ICC) ICC IBC International Building Code
	19. MIDWEST ROOFING CONTRACTORS ASSOCIATION (MRCA)
	20. CERTA NRCA/MRCA Certified Roofing Torch Applicator Program, current edition
	21. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations, current edition NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
	22. NRCA Details NRCA Roof Perimeter Flashing Systems Construction Details for Class 1 Roof Construction, current edition
	23. NRCA RWM Roofing and Waterproofing Manual, current edition
	24. Architectural Sheet Metal Manual, Seventh Edition
	25. 29 CFR 1910 Occupational Safety and Health Standards
	26. 29 CFR 1910.12 Construction Work
	27. 29 CFR 1926 Safety and Health Regulations for Construction
	28. 29 CFR 1926.16 Rules of Construction UNDERWRITERS LABORATORIES (UL)
	29. UL 790 - Test Methods for Fire Tests of Roof Coverings, current edition
	30. UL RMSD Roofing Materials and Systems Directory, current edition
		+ 1. QUALITY ASSURANCE
				1. Installer Qualifications:

Roofing system applicator must be approved, authorized, or licensed in writing by the modified bitumen roofing system manufacturer and have a minimum of five years experience as an approved, authorized, or licensed applicator with that manufacturer and be approved at a level capable of providing the specified warranty. The applicator must supply the names, locations and client contact information of five projects of similar size and scope that the applicator has constructed using the manufacturer's roofing products submitted for this project within the previous three years. Provide letter from a RRC, RA or PE that they are familiar with the installers work and that the installer has demonstrated the skill and workmanship necessary to meet NRCA, SMACNA, and Industry Standards.

* + - * 1. Manufacturer Qualifications:

A qualified manufacturer that has UL and FM listing approvals for membrane roofing system identical to that used for this Project.

Fire Resistance and Wind Uplift classification; Submit the roof system assembly wind uplift and fire rating classification listings

Modified bitumen roofing system manufacturer must have a minimum of 10 years experience in manufacturing modified bitumen roofing products.

Manufacturer to provide quality control/quality assurance program description for the primary roofing products supplied which includes but not limited to interply membrane, cap sheet membrane, membrane flashing membranes, PMMA liquid flashing membranes, etc. The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide written confirmation of manufacturer's certificate of analysis for reporting the tested values of the actual material being supplied for the project and that the materials meet or exceed the project requirements. Testing shall be in accordance with ASTM D 5147, ASTM D 5849, and ASTM D 7051. Manufacturer shall provided example of certificate of analysis and an actual certificate of analysis of the material supplied for this project upon supplying the material to the site.

* + - * 1. Source Limitations:

Obtain components for membrane roofing system from same manufacturer as roofing membrane.

* + - * 1. Fire-Test-Response Characteristics:

Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FM 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; ASTM E 108, for application and roof slopes indicated.

* + - * 1. Preliminary Roofing Conference:

Before starting roof deck construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 01 Section Administrative Requirements. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:

Meet with Contracting Officer; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

Review methods and procedures related to roofing installation, including manufacturer's written instructions.

Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

Examine deck substrate conditions and finishes for compliance with requirements, including flatness, attachment and fastening.

Review structural loading limitations of roof deck during and after roofing.

Review drainage elevations of drains, scuppers, etc as related to roof conditions for proper drainage.

Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

Review governing regulations and requirements for insurance and certificates.

Review temporary protection requirements for roofing system during and after installation.

Review roof observation and repair procedures after roofing installation.

* + - * 1. Preinstallation Conference:

Conduct conference at Project site. Comply with requirements in Division 01 Section Administrative Requirements. Review methods and procedures related to roofing system including, but not limited to, the following:

Meet with Contracting Officer; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

Review methods and procedures related to roofing installation, including manufacturer's written instructions.

Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

Review drainage elevations of drains, scupper, etc as related to roof conditions for proper drainage.

Review structural loading limitations of roof deck during and after roofing.

Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

Review governing regulations and requirements for insurance and certificates.

Review temporary protection requirements for roofing system during and after installation.

Review roof observation and repair procedures after roofing installation.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Delivery:

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

* + - * 1. Storage and Handling:

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

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

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

Protect roofing materials against moisture absorption and contamination or other damage. Avoid crushing or crinkling of roll materials. Store roll materials on end on clean raised platforms or pallets one level high in dry locations with adequate ventilation, such as an enclosed building or closed trailer. Maintain roll materials at a minimum of temperatures above 50 degrees F for 24 hours immediately before application, following manufacturer’s written instruction for application. Completely cover materials stored outdoors, on and off roof, with waterproof canvas protective covering. Do not use polyethylene sheet as a covering. Tie covering securely to pallets to make completely weatherproof. Provide sufficient ventilation to prevent condensation. Do not store more materials on roof than can be installed the same day and remove unused materials at end of each day’s work.

Immediately remove wet, contaminated or otherwise damaged or unsuitable materials from the site. Damaged materials may be marked by the Contracting Officer.

Maintain a minimum distance of 35 foot for all stored flammable materials, including materials covered with shrink wraps, craft paper and/or tarps from all torch/welding applications

Prevent damage to edges and ends of roll materials. Do not install damaged materials in the work. Select and operate material handling equipment to prevent damage to materials or applied roofing.

Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck. Distribute materials temporarily stored on roof to stay within live load limits of the roof construction.

* + - 1. PROJECT CONDITIONS
				1. Weather Limitations:

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

Do not install roofing system when air temperature is below 40 degrees F, during any form of precipitation, including fog, or when there is ice, frost, moisture, or any other visible dampness on the roof deck. Follow manufacturers’ printed instructions for Cold Weather application as well as Hot Weather application.

* + - * 1. Sequencing

Coordinate the work with other trades to ensure that those components which are to be secured to or stripped into the roofing system are available and that permanent flashing and counter flashing, per roofing manufacturer and NRCA details, and are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing must immediately follow application of cover board and insulation as a continuous operation. Coordinate roofing operations with cover board and insulation work so that all roof cover board/insulation applied each day is covered with roof membrane installation the same day.

* + - 1. TORCH APPLIED MODIFIED BITUMEN MEMBRANE SAFETY
1. Property Protection
	1. Take all precautions necessary to prevent ignition of combustible materials during torch application of roofing. Immediately call the fire department if a fire commences. Review all fire safety procedures as outlined at the pre-roofing conference.
	2. Install materials using the techniques recommended by CERTA NRCA/MRCA Certified Roofing Torch Applicator Program available from the National Roofing Contractors Association (NRCA) and the Midwest Roofing Contractors Association (MRCA} as endorsed by the Asphalt Roofing Manufacturers Association (ARMA) and the United Union of Roofers, Waterproofers and Allied Workers. Application procedures must comply with NFPA 241, OSHA 29 CFR 1910 and 29 CFR 1910.12, 29 CFR 1926.16, 29 CFR 1926 Subpart F., UL Fire Resistance Directory Volume No. 1, NRCA R&W Manual, ICC IBC, and applicable codes. Note that Only NRCA/MRCA CERTA certified roofing applicators are allowed to operate any torching equipment.
	3. Do not store flammable liquids on the roof.
	4. Provide a minimum of two 2.65 gallon containers of water and two fully charged minimum fire extinguishers of appropriate type for work underway as recommended by the roofing materials manufacturer in separate, easily accessible locations on the roof and within 10 foot of each torch work area at all times.
	5. Maintain a minimum separation of 20 foot between LP-Gas Cylinders and kettle. Provide protective fire retardant blanket barrier or shield between any building structure to a minimum height of 8 foot and a clear surround distance of 4 foot if operations force placement of kettle within a distance of 20 foot. Do not obstruct or place Cylinder storage within 10 foot of exits, means of egress, gates, roadways, and entrances.
	6. Provide a minimum of two portable fully charged fire extinguishers of appropriate type as recommended by the roofing material manufacturer in easily accessible and identifiable locations. Also provide two multipurpose 2-A:20-B:C portable fire extinguisher on the roof being covered or repaired.
	7. Do not use flammable liquids with a flash point below 100 degrees F (gasoline and similar products) for cleaning purposes.
	8. Check all fire extinguishers prior to commencement of work, and upon completion of the day's work, to ensure fullness and operability.
	9. Project supervisor must make daily inspections with the facility manager of all conditions and operations which could present hazards during torching applications and issue directives to address all such concerns and items of the work and existing conditions.
	10. Identify and protect all combustible roof components, possible fire traps, and hidden hazards. Seal off voids or openings in the substrate with non-combustible materials prior to installing torch-applied materials in the area. Install protective fire retardant blankets and shields at building walls, eaves, parapets and equipments curbs constructed of combustible materials within 3 foot radius of the area of torch work prior to commencement of the work.
	11. When working around intakes and openings, temporarily disconnect and block to prevent flame of torch from being drawn into the opening. Provide non-combustible shielding or flame guard protection where gaps or voids occur in the construction in area of torch work.
	12. Coordinate torch related work with requirements of the Government.
2. Fire Watch
	1. All personnel on the roof during torch application must be properly trained to use a fire extinguisher. Provide a fire watch for a minimum of two hours after completion of all torch work at the end of each work shift. Maintain the fire watch for additional time required to ensure no potential ignition conditions exist. Utilize heat sensing meters to scan for hot spots in the work. For torch applications, provide and utilize a minimum of one certified heat detection gun per torch for use during the fire watch to verify cool, safe and non-combustible conditions exist. Provide a minimum duration fire watch of two hours conducted by personnel properly trained to survey the underside of the roof deck (where possible) and the topside of possible smoldering elements.
	2. Do not torch in areas of poor and/or no visibility (curbs, corners, eaves, expansions joints, flashing, other voids and small penetrations) which could allow a torch flame to ignite combustible material(s) hidden from view or within the underside of the roof deck or building interior. Use cold finish applications in these areas whenever possible and per manufacturer's printed instructions, NRCA 4002, MRCA R&NW manual for "cold adhered" materials.
	3. Do not leave the rooftop unattended during breaks in work during a work shift. Walk and scan all areas of application checking for hot spots, fumes, or smoldering, especially at wall and curb areas, prior to departure at the end of each work shift. Ensure any and all suspect conditions are eliminated prior to leaving the site each work shift.
3. Open Flame Application (Torch) Equipment and Personnel Safety
	1. Only NRCA/MRCA CERTA certified roofing applicators are allowed to operate any torching equipment. Verify that all such applicators maintain and are currently carrying a valid Certified Roofing Torch Applicator (CERTA) card which is current.
	2. All crew members must be trained in preventive measures for indirect and direct dangers and hazards associated with roofing work, which include, but are not limited to the following:
		1. Heat Stress: Wear light colored clothing, a hat for ultra-violet protection, and other eye protective devices. Drink sufficient quantities of non-alcoholic, non-caffeine liquids. Stage shifts for crew members to allow for breaks from heat and sun exposure without interfering with work progress.
		2. First Aid for Burns: Immediately call for an ambulance. Contact local Occupational Health Services (OHS).
	3. All crew members must wear correct personal protective equipment (PPE), including, but not limited to the following items:
		1. Long-sleeved shirts buttoned at the collar and cuffs, and must be made of non-flammable materials. Polyester materials are not allowed.
		2. Work boots covering ankles with rubber or composite soles.
		3. Long pants without cuffs to extend over the top of the work boots, and must be made of non-flammable materials. No polyester allowed.
		4. Heavy leather gloves and/or flame retardant gauntlets which must be worn during all handling of a torch, whether operating or not. \
		5. OSHA and ASSE/SAFE Z87.1 approved face shields, goggles and/or safety glasses to be worn during torching and any other applicable roofing functions.
		6. OSHA and ANSI approved hard hats.
4. Wind Conditions
	1. Use side shields with all torching operations when winds are occurring to prevent flame distortion of end burners. Use torch machine equipment with bottom shield plate to prevent flame spread on to roof deck and substrate. When high wind gusts are present, notify the safety officer and cease all use of torching equipment until wind conditions lower and authorization from the safety officer to proceed is received
		* 1. WARRANTY
				1. Special Warranty:

Manufacturer's standard total system form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks. Manufacturer's standard total system shall include coverage and all requirements as listed below.

Total system warranty includes roofing membranes, membrane flashings, PMMA flashing, sealants, insulation, cover board, adhesives, fasteners, fastener plates, perimeter metal flashing, and other components of membrane roofing system.

Warranty Period: 20-year (from date of final acceptance) manufacturer's standard warranty of labor and materials for water-tightness of the roofing system.

Insert wind speed limit that is appropriate for warranty period and deck/membrane underlayment specified.

Warranty shall include roofing damage resulting from wind speeds up to and including <**Insert number**> mph (3-second gust speed at 33 feet above ground for exposure category indicated) following UFC 3-110-03 Roofing, Section 2-2.7 in accordance with ASCE 7 uplift requirements.

The maximum amount of the system warranty shall not be prorated over the life of the warranty.

Upon completion of construction, ownership of the building will be transferred to the Installation upon which the facility is located, via DD Form 1354 "Transfer and Acceptance of Military Real Property". Warranty shall be issued to the Installation as identified in Division 01 Closeout Procedures.

* + - * 1. Special Roofing System Warranty

The General Contractor and Roof Installer must warrant for a period of not less than five (5) years (from date of final acceptance by the Government) that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Make warranty directly to the Government. Correction of defective workmanship and replacement of damaged or affected materials are the responsibility of the roof system installer. All costs associated with the repair or replacement work are the responsibility of the General Contractor and Roof Installer.

* + - * 1. Signage

Provide one 10 by 12 inch (minimum size) sign made of aluminum for each distinct roof area, with a dark background and contrasting lettering. Use paint suitable for aluminum. The signs are to read "Do not make alterations or repairs to this roof without written approval from the Government. This roof is under Contractor's warranty until (insert month and year 5 years after substantial completion date) and roofing manufacturer's warranty until (insert month and year of expiration of roofing manufacturer's warranty); include roof manufacturer's name and warranty reference number. Locate sign as directed by the Government.

1. PRODUCTS
	* + 1. MANUFACTURERS
				1. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in‑service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.
				2. Basis of Design: Two-Ply Styrene-Butadiene-Styrene (SBS) modified bitumen system cold applied interply sheet and a torch applied cap sheet; with torched applied aluminum clad SBS modified bitumen flashing and liquid applied PMMA flashings for rigid penetrations and roof drains: Provide Paradiene 20 in cold adhesive and Paradiene 30 FR TG BW torch apply, with Veral Flashing; and provide ParaPro PMMA Flashing System at rigid penetrations, scuppers and drains, as manufactured by Siplast, Inc.
				3. Other acceptable manufacturer’s roofing and flashing system, acceptance pending roofing membranes and systems meeting all of the minimum installation requirements, physical/mechanical properties and specified fire safety rating listed in Section 07 52 00.

Firestone Building Products – SBS Premium Base, interply; SBS Premium FR Torch Improved UltraWhite, fire rated cap sheet; SBS Metal Flash-AL, aluminum clad flashings; AC Fast FR PMMA resin flashing for rigid penetrations and roof drain flashings.

Johns Manville - Dynaply T1, interply; DynaKap FR T1 CR G , fire rated cap sheet; Dynaclad, aluminum clad flashings; JM PMMA resin flashing for rigid penetrations and roof drain flashings.

Soprema - Elastophene Sanded 2.2, interply; Elastophene FLAM FR GR (SG), fire rated cap sheet; Sopralast 50 TV Alu, aluminum clad flashings; Alsan RS 230 PMMA resin flashing for rigid penetrations and roof drain flashings.

* + - 1. STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMEN ROOFING SYSTEM
				1. Furnish a combination of specified materials that comprise the Styrene-Butadiene-Styrene (SBS) modified bitumen manufacturer's standard system of the number and type of plies specified. SBS modified bitumen system shall consist of interply and cap sheet plus flashing materials. Materials provided must be suitable for the service and climatic conditions of the installation. Modified bitumen sheets must be watertight. Edges of sheet must be straight and flat. Polymer modifier must comply with ARMA PMBRG98 and be uniformly dispersed throughout the sheet. SBS modified bitumen sheets reinforcement mats shall be impregnated / saturated and coated each side with SBS modified bitumen blend. The cross section area of the sheet material shall contain no oxidated or non-SBS modified bitumen. Roofing manufacturer shall provide written certification that the interply sheet, cap sheet and flashings meet or exceeds the minimum physical and mechanical properties as listed herein.

SBS Interply Sheet, fully adhered in cold application, of the modified bitumen system shall meet or exceed all of the following minimum physical/mechanical properties and provide specified fire safety rating:

ASTM D6163 Type I or Type II, Grade S or ASTM D6162 Type I, Grade S; styrene-butadiene-styrene (SBS) modified, glass fiber reinforced or glass fiber / polyester composite reinforced.

Thickness: 90 mils, test method ASTM D5147.

High Temperature Stability (minimum): 250oF, test method ASTM D5147.

Low temperature flexibility at -15 oF: PASS, test method ASTM D5147.

Ultimate Elongation at 5% Peak Load at 73.4 oF: 40%, test method ASTM D5147.

Dimensional Stability (maximum): 0.2%, test method ASTM D5147.

Compound Stability (minimum): 250 oF, test method ASTM D5147.

UL Class listed, FM Approved; products shall bear seals of approval.

Reinforcement: fiberglass scrim/fiberglass mat or other meeting the performance and dimensional stability criteria.

Cyclic Fatigue: Interply and Cap sheets, when bonded together shall pass ASTM D5849 as manufactured and after heat conditioning according to ASTM D5147. The roof system Displacement (fatigue) at 14 oF. Passing results shall show no signs of membrane cracking or Interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D5849 after heat conditioning performed in accordance with ASTM D5147/D5147M.

Basis-of-Design: Siplast Paradiene 20, cold applied.

SBS Cap Sheet, fully adhered by torch application, of the modified bitumen system shall meet or exceed all of the following minimum physical/mechanical properties and provide specified fire safety rating:

ASTM D6163 Type I, Grade G or ASTM D6162 Type I, Grade G or ASTM D6164 Type II, Grade G (ceramic granules, specifically treated for cool roof application, manufacturer's standard white color); styrene-butadiene-styrene (SBS) modified, glass fiber reinforced.

Thickness: 138 mils, test method ASTM D5147.

Low Temperature Flexibility @ -15 oF: PASS, test method ASTM D5147.

Ultimate Elongation at 5% Peak Load at 73.4 oF: 40%, test method ASTM D5147.

Compound Stability (min): 250 oF, test method ASTM D5147.

Dimensional Stability (max): 0.2%, test method ASTM D5147.

Coating thickness, back surface: 40 mils minimum, test method ASTM D5147

Maximum 1.5 grams of granular loss (average result) and 2.0 grams loss per individual sample when tested in accordance to ASTM D5147.

UL Class listed, FM Approved (products shall bear seals of approval).

Reinforcement: fiberglass mat or other meeting the performance and Compound stability criteria.

Cyclic Fatigue: Interply and Cap sheets, when bonded together shall pass ASTM D5849 as manufactured and after heat conditioning according to ASTM D5147/D5147M. The roof system shall pass 500 cycles of ASTM D5849 Resistance to Cyclic Joint Displacement (fatigue) at 14 oF. Passing results shall show no signs of membrane cracking or Interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D5849 after heat conditioning performed in accordance with ASTM D5147/D5147M.

Solar Reflectance: · 0.70, test method ASTM C1549.

Solar Reflectance Index (avg): 86, test method ASTM E1980.

Thermal Emittance: 0.90, test method ASTM C1371.

Surfacing: White ceramic granules specially treated for cool roof applications.

Basis-of-Design: Siplast Paradiene 30 FR TG BW, torch applied

SBS flashing membrane, cant backing sheet, parapet flashing under coping, and flashing reinforcing ply to be use in torch application with aluminum clad flashings of the modified bitumen system shall meet or exceed all of the following minimum physical/mechanical properties and provide specified fire safety rating:

Thickness: 98 mils, test method ASTM D5147.

Weight (min per 100 ft² of coverage): 72 lb (3.5 kg/m²).

Low temperature flexibility @ -15 oF - PASS, test method ASTM D5147.

Ultimate Elongation at 5% Peak Load at 73.4 oF: 50%, test method ASTM D5147.

Dimensional Stability (max): 0.1%, test method ASTM D5147.

Compound Stability (min - sheet): 250 oF, test method ASTM D5147.

Compound Stability (min - adhesive coating): 212 oF, test method ASTM D5147.

UL Class listed, FM Approved (products shall bear seals of approval).

Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria.

Back Surfacing: polyolefin release film.

Basis-of-Design: Siplast Paradiene 20 SA, self-adhesive

SBS aluminum clad flashing sheet membrane, finish ply in torch application, of the modified bitumen system shall meet or exceed all of the following minimum physical/mechanical properties and provide specified fire safety rating.

* + 1. Thickness: 145 mils, test method ASTM D5147.
		2. Coating Thickness – back surface (min): 40 mils, test method ASTM D5147.
		3. Low temperature flexibility @ 0 oF PASS, test method ASTM D5147.
		4. Ultimate Elongation at Peak Load @ 0 oF: 3%, test method ASTM D5147.
		5. Tear-Strength: 100 lbf , test method ASTM D5147.
		6. Dimensional Stability (max): 0.2%, test method ASTM D5147.
		7. Compound Stability (min): 225 oF, test method ASTM D5147.
		8. Cyclic Thermal Shock Stability (max): 0.2%, test method ASTM D6298.
		9. UL Approved, FM Approved (products shall bear seals of approval).
		10. Reinforcement: fiberglass scrim mat or other meeting the performance and dimensional stability criteria.
		11. Surfacing: aluminum metal foil.
		12. Basis-of-Design: Siplast Paradiene Veral, torch applied
1. Catalyzed Resin Flashing System for Roof Flashing for liquid applied PMMA Roofing System, for use at all rigid roof penetrations, scuppers and all roof drain flashings. Fluid-applied reinforced membrane conforming to ASTM C 836. PMMA-based resin is to be color coating for use in combination with fleece fabric to form a monolithic, reinforced roofing membrane for field membrane construction. Flashing system shall meet all of the following minimum physical/mechanical properties and provide specified fire safety rating:
	1. Thickness (avg): 90 mils at minimum total application rate of 0.31 kg/ft² coverage rate, with base coat minimum total application rate of 0.19 kg/ft² and top coat minimum total application rate of 0.12 kg/ft² tested method ASTM D 5147.
	2. Provide summer grade flashing resin or winter grade flashing resin base on ambient or substrate temperature application per the manufacturer’s written instructions.
	3. Basis-of-Design: Siplast ParaPro PMMA Flashing System
		* 1. AUXILIARY MATERIALS
				1. General:

Furnish auxiliary materials recommended by roofing system manufacturer for compliance with warranty requirements and approved by roofing system manufacturer for intended use in accordance with warranty requirements

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

* + - * 1. Primer: ASTM D 41, asphalt type; as provided by the roof membrane manufacturer.
				2. Plastic Cement: ASTM D 4586, Type II; as provided by the roof membrane manufacturer.
				3. Cants: Perlite board, complying with ASTM C 728 and fire rated for application and approved by the roofing membrane manufacturer.
				4. PMMA Membrane and Flashing System Components as recommended by membrane manufacturer included but not limited to:

PMMA Primer

Preparation Paste

PMMA Cleaner/Solvents

PMMA Catalyst

Fleece reinforcement

Acrylic Resin

Color Finish Resin

* + - * 1. Walkways: Roof walkpads must be polyester reinforced, granule-surfaced modified bitumen membrane material, compatible with the modified bitumen sheet roofing and provided by the roofing manufacturer.

Size: 24 by 36 inches unless otherwise indicated.

* + - * 1. Sealants: As recommended by membrane manufacturer.
				2. Roofing Granules: Granite-like mineral, permanently coated with pigment using a ceramic coating process.
				3. Membrane Adhesive: Membrane manufacturer's recommended low volatile organic compound (VOC) cold process adhesive for application of the membrane plies.

In areas were PMMA Roof Flashing system is provided; provide a single component, solvent-free adhesive as approved by roofing manufacturer for application.

* + - * 1. Miscellaneous Accessories: As recommended by membrane manufacturer for application.
			1. 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.

Designer Note: Edit paragraph below to reflect required R-value

Provide insulation materials complying with a total minimum Long Term Thermal Resistance (LTTR) R-value of **<20>** minimum, per ASTM C 1289 and CAN/ULC.

The insulation shall provide a maximum board single board thickness not to exceed 2 inches and minimum single board thickness shall be sufficient to span metal deck flute in accordance with insulation manufacturer’s published documentation.

Designer Note: If a cool roof is not selected in climate zones 1 thru 3, meet one of the exception requirements listed in ASHRAE Standard 90.1 (2010) Chapter 5 or provide thermal insulation above deck with an R-value of 33 or greater.

* + - * 1. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 3, Faced with coated polymer-bonded glass fiber mat facer on major surfaces of core foam. Minimum compressive strength shall be 25 psi.

Manufacturer: As provided or approved by Roofing Membrane System Manufacturer.

UFC 3-110-03 notes a minimum 1/2 inch per foot main roof slope notes ans also notes that the slope for crickets and saddles shall be twice that of main roof slope. A 1 inch per foot slope seems more than necessary speed.

* + - * 1. Tapered Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 3, Faced with coated polymer-bonded glass fiber mat facer on major surfaces of core foam. Minimum compressive strength shall be 25 psi.

Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Provide factory-tapered insulation boards fabricated to slope twice that of the main roof slope, unless indicated.

Manufacturer: As provided or approved by Roofing Membrane System Manufacturer.

* + - * 1. Miscellaneous Insulation Shapes:

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

* + - 1. INSULATION ACCESSORIES
				1. General:

Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

* + - * 1. Fasteners:

Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation board to substrate, and acceptable to roofing system manufacturer.

Size and length as required for thickness of insulation board for attachment to substrate.

UFC 3-110-03 requires cover board membrane underlayment on roofing system regardless of design wind speed.

* + - * 1. Gypsum Sheathing Panel Cover Board:

A panel composed of a gypsum-based, non-structural water resistant core material integrally bonded with fiberglass mats on both sides having a nominal thickness of ½ inch. The panel surface shall be factory primed with a non-asphaltic primer. Acceptable types are as follows:

Base of Design: DensDeck Prime Gypsum Roof Board, by Georgia Pacific Corporation.

Minimum Qualities:

Mold Resistance of 10 per ASTM D3273.

ASTM Standard C 1177.

Uplift Standards and Testing as per ASCE 7, FM 4450, and FM 4470.

Fire Classification of UL 790 Class A and FM Class 1 as a cover board.

* + - * 1. Insulation/Cover Board Adhesive:

Manufacturer's recommended adhesive formulated to attach roof cover board to substrate.

* + - 1. PERIMETER METAL AND METAL FLASHING

Perimeter metal flashing must be compatible with the roofing system be provided by the roofing membrane manufacturer and included in the roof system warranty as specified herein. Metal flashing to meet all the requirements as specified in Section 07 60 00 Flashing and Sheet Metal and Section 07 71 00 Roof Specialties. Perimeter metal to meet wind uplift pressures and ANSI/SPRI ES-1 requirements.

1. EXECUTION
	* + 1. APPLICATION OF ROOFING – GENERAL
				1. Provide roof membrane and flashing system as standard with the manufacturer and complying with contract documents, installed in strict accordance with the manufacturer's written instructions.
				2. The entire roofing system, including top finish membrane, shall be finished in one operation up to the line of termination at end of day's work unless otherwise permitted in writing by the roofing system manufacturer and approved by Contracting Officer. Application of roofing membranes shall immediately follow application of cover board and insulation as a continuous operation. Phased construction will not be permitted. Roofing membrane shall be installed according to membrane manufacturer's requirements and specifications. Start installation of modified bituminous membrane roofing in presence of roofing system manufacturer's technical personnel.
				3. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."

Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."

* + - * 1. Construction of an aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules, and exercise care in ensuring that the finished application is acceptable to the Government.
			1. EXAMINATION
				1. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

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

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

Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place. Verify that curbs and perimeter substrates are at proper heights for warranty requirement.

Verify drains, and/or scuppers are set at proper heights for drainage.

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

Verify that wood nailers attachment meets the required uplift pressures and installation shall meets FM DS 1-29 and FM 1-49 requirements. Treated wood nailers are fastened in place at eaves, gable ends, openings, and intersections with vertical surfaces for securing of membrane, edging strips, attachment flanges of sheet metal, and roof fixtures. Embedded nailers are flush with deck surfaces. Surface-applied nailers are the same thickness as the roof insulation.

Verify deck surfaces are dry and free of moisture, snow or ice.

Exposed fastener heads in wood substrates are properly set. Warped and split boards have been replaced. There are no cracks or end joints 1/4 inch in width or greater. Knot holes are covered with sheet metal and nailed in place.

Cants are securely fastened in place in the angles formed by walls and other vertical surfaces. The angle of the cant is 45 degrees and the height of the vertical leg is not less than 3-1/2 inch.

Provide fastener pull test to verify deck fastener meets required uplift pressures. Pull test shall conform to ANSI/SPRI FX-1 Test procedure for determining the withdrawal resistance of roofing fasteners. Provide test and results prior to ordering fastener material.

* + - * 1. Roofing membrane manufacturer’s Technical Representative to exam and approve substrate prior to installation of roofing membrane systems.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			1. PREPARATION
				1. General:

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

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

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

Protect all combustible materials and surfaces which may contain concealed combustible or flammable materials. All fire extinguishing equipment has been placed as specified.

Verify all Fire Watch personnel assignments.

* + - 1. INSULATION INSTALLATION
				1. General:

Coordinate installing membrane roofing system components so cover board and polyisocyanurate insulation are not exposed to precipitation or left exposed at the end of the workday.

Comply with membrane roofing system, cover board and insulation manufacturers’ written instructions for installing cover board and insulation.

Install tapered insulation under area of roofing to conform to slopes indicated or if not indicated, to provide positive sloping to drains.

Install insulation so that all roof surfaces slope to drains, whether or not slope is explicitly indicated.

Install insulation so completed surface is flush with surface of contiguous wood nailers; adjust thickness of nailers to maintain surfaces flush.

Install insulation in two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction. Offset second layer from first so that joints between layers do not align vertically. Fill gaps exceeding 1/4 inch with insulation. Maximum single board thickness shall not to exceed 2 inches in depth, and minimum single board thickness shall be sufficient to span metal deck flute. Install insulation in multiple layers, no one layer of insulation to be greater than 2” in thickness.

Insulation shall have a solid bearing on deck and shall not cantilever over deck flutes. Insulation boards to have a minimum 1-1/2 inch bearing on the deck flanges; whenever the installation pattern reduces this dimension, trim insulation board for proper bearing.

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

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

Attachment of Insulation at Metal Decks: Install and secure layers of insulation to deck in accordance to uplift and warranty requirements using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type. Insulation attachment shall be approved in writing by the membrane roofing system manufacturer. Attachment of insulation to resist uplift pressure at corners, perimeter, and field of roof in accordance with wind uplift requirements as well as Factory Mutual, manufacturer, performance and warranty requirements. Attachment to include corner and perimeter enhancements.

Install layers of insulation as indicated in accordance to the roofing manufacturer’s written instructions and according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification with corner and perimeter enhancements.

* + - * 1. Cover Boards:

Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 12 inches in each direction. Cover Board shall be adhesive applied using insulation cold adhesive, as manufactured by roof membrane manufacturer. Adhesive attachment to resist uplift pressure at corners, perimeter, and field of roof in accordance with wind uplift requirements as well as Factory Mutual, manufacturer, performance and warranty requirements.

Adhere cover board in cold adhesive in according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification with corner and perimeter enhancements. Install per manufacturer’s written instructions and to meet required warranties and wind uplift ratings.

Maintain a maximum panel size of 4 feet by 4 feet for adhesive application in accordance to manufacturer’s recommendations.

* + - 1. ROOFING MEMBRANE INSTALLATION
				1. General:

Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing. Install in accordance with manufacturer’s standard details which meet the project detail and specified requirements.

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

Ensure proper sheet alignment prior to installation. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger laps.

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

Phased application of membrane plies is prohibited unless otherwise approved by the Contracting Officer and supported by the membrane manufacturer's written application instructions. If cap sheet installation is delayed, thoroughly clean the applied membrane material surface and dry immediately prior to cap sheet installation. Priming of the applied membrane surface may be required at the discretion of the membrane manufacturer prior to cap sheet installation.

SBS Interply Sheet Modified Bitumen Membrane, Cold Adhesive Applied: Apply cold adhesive with airless sprayer or 1/4 inch saw-toothed rubber squeegee to prepared surfaces in accordance with membrane manufacturer's application instructions. Fully cover substrate with adhesive to fully bond interply. Roll or lay membrane in adhesive in accordance with manufacturer's recommendations and within the time limitations of adhesive application. Cut a dog ear angle at the end laps on overlapping selvage edges. seal laps immediately following sheet application. Stagger end laps a minimum of 3 feet. Broom the membrane to ensure full contact with adhesive. Ensure laps areas of base sheet are fully sealed; seal laps by heat fusing with torch as per membrane manufacturer written instructions. Minimize traffic on installed membrane during the adhesive cure and set time. Cold adhesive for roofing membrane shall be solvent free in areas where PMMA and/or aluminum clad membrane flashing system are provided, in accordance with the roofing manufacturer’s requirements.

SBS Cap Sheet Modified Bitumen Membrane, Torch Applied: Fully bond the cap sheet to the interply sheet, providing a minimum of 3 inch side and end laps in accordance with manufacturer's recommendations. Apply each sheet directly behind the torchapplicator. Stagger end laps of the cap sheet a minimum 3 feet. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying interply sheet. Cut a dog ear angle at the end laps on overlapping selvage edges. Apply top pressure to top seal laps immediately following sheet application. Apply matching synthetic chips in any areas of bitumen bleed out while still tacky. Minimize traffic on newly installed cap sheet membrane.

Apply membranes with lap and seal edges and ends permanently waterproof.

Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate.

At intersections with vertical surfaces:

Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.

Apply flexible flashing over membrane.

Secure flashing to nailing strips at 4 inches on center.

Coordinate installation of related flashings as work progresses.

* + - 1. BASE FLASHING INSTALLATION
				1. General:

Install sheet flashings and preformed flashing accessories to substrates according to membrane roofing system manufacturer's written instructions. Install in accordance with manufacturer's standard details which meet the project detail and specified requirements.

Apply two-ply modified bitumen strip flashing and sheet flashing in the angles formed where the roof deck abuts walls, curbs, ventilators, pipes, and other vertical surfaces, and where necessary to make the work watertight. Apply membrane flashing in accordance with the roof membrane manufacturers printed instructions and as specified.

SBS Aluminum Clad Modified Bitumen Flashing Sheet, Torch-applied: Cut the cant backing sheet into 12 inch widths and peel the release film from the back of the sheet. Set the sheet into place over the primed substrate extending 6 inches onto the field of the roof area and 6 inches up the vertical surface utilizing minimum 3 inch laps. Set the non-combustible cant into place dry prior to installation of the SBS flashing membrane base ply. Flash parapets, walls and curbs using the SBS flashing membrane base ply and the SBS aluminum clad flashing membrane. After the interply base sheet has been applied to the top of the cant, prime the base ply surfaces to receive the SBS flashing membrane base ply. Fully adhere the SBS flashing membrane base ply, utilizing minimum 3 inch side laps onto the primed base ply surface and up the primed wall or curb to the desired flashing height. After the cap sheet ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the SBS aluminum clad flashing membrane into place using 3 ft widths lapping the factory selvage edge. Avoid overheating the membrane or burning through to membrane reinforcement. Stagger the laps of the SBS aluminum clad flashing membrane layer from lap seams in the SBS flashing membrane base ply. Extend the flashing sheets a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the cap sheet membrane and up the wall or curb to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the vertical and horizontal surfaces, preventing air pockets. Inspect all laps and edges to ensure all lap areas are fully sealed. Apply flashing membranes with lap and seal edges and ends which are permanently waterproof. Nail the top edge of the flashing on 9 inch centers, minimum. Reference roofing manufacturer’s written instructions for specific application. Vertical flashings to have a minimum of two layers over substrate; overlapping base flashing, SBS aluminum clad flashing and other vertical surfaces, and secure to substrates according to roofing system manufacturer's written instructions. Extend over flashings over top of parapet and fasten along outer edge.

PMMA Membrane System for Rigid Penetration, Scupper and Roof Drain Flashings:

Clean and prepare surfaces to receive PMMA flashing in accordance to the manufacturer’s written instructions. Install in accordance with manufacturer's standard details which meet the project detail and specified requirements.

Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.

Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.

Apply an even, generous base coat of flashing resin using a roller to prepared surfaces requiring flashing coverage. Work the fleece into the wet, catalyzed resin using a brush or roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 inch and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin immediately following embedment of the fleece, ensuring full saturation of the fleece. Ensure that the flashing resin is applied to extend a 1/4 inch beyond the fleece. Remove the tape before the catalyzed resin sets. Make allowances for saturation of roller covers and application equipment.

Roof Drains – Clean and prep roof drain bowl. Extend membrane sheets to edge of drain bowl opening at the roof drain deck flange in accordance with membrane manufacturer's printed application instructions. Securely clamp membrane sheets and metal roof drain flashing and strip flashing in the flashing clamping ring. Secure clamps so that sheets and metal flashing are free from wrinkles and folds. Trim stripping must be flush with inside of clamping ring. Following membrane manufacturer’s written instructions for application into roof drain bowls.

* + - 1. WALKWAY INSTALLATION
				1. Install walkway products in locations indicated or, if not indicated, from roof access indicated to and around roof-mounted mechanical equipment. Adhere walkway products to substrate according to roofing system manufacturer's written instructions. Space walkway pads one-inch apart to permit drainage. Discontinue walkways over all field splices to provide a minimum one-inch gap over the seam edge.
			2. FIELD QUALITY CONTROL
				1. Final Roof Inspection:

Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Contracting Officer within 7 days.

Notify Contracting Officer 48 hours in advance of date and time of inspection.

Manufacturer's technical representative must visit the site a minimum of four times, at ¼ points, of the installation for purposes of reviewing materials installation practices and adequacy of work in place.

Inspections must occur within the first 20 squares of membrane installation, midpoint, three quarter point of completion, and at substantial completion, at a minimum. Additional inspections that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Contracting Officer. After each inspection, submit a written report, signed by the manufacturer's technical representative then submit to the Government within 5 calendar days.

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

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

Roof Information and Warranty Signage:

Furnish a typewritten information card for facility records.

Provide aluminum warranty signage as stated herein.

* + - 1. PROTECTING AND CLEANING
				1. Protection:

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

* + - * 1. Correction:

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

* + - * 1. Cleaning:

Remove debris, scraps, containers and other rubbish and trash resulting from installation of the roofing system from job site each day.

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

END OF SECTION