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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07513

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SECTION 07513

REROOFING - BUILT-UP REROOFING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced:

ASTM INTERNATIONAL (ASTM)

ASTM D 41	(1994; R 2000e1) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 312	(2000) Standard Specification for Asphalt Used in Roofing
ASTM D 1079	(2002) Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
ASTM D 2829	(2004) Standard Practice for Sampling and Analysis of Built-up Roofs
ASTM D 3617	(1983; R 1994el) Standard Practice for Sampling and Analysis of New Built-up Roof Membranes
ASTM D 4586	(2000) Standard Specification for Asphalt Roof Cement, Asbestos Free
ASTM D 4897	(2001) Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing
ASTM D 5147	(2002a) Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
ASTM D 6162	(2000) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
ASTM D 6163	(2000) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
ASTM D 6164	(2000) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using

Polyester Reinforcements

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists shall be submitted for the following in accordance with the paragraph entitled, "Material, Equipment, and Fixture Lists," of this section.

Membranes
Asphalt
Flashings
Fasteners

SD-02 Shop Drawings

Shop drawings shall be submitted for the following items in accordance with the paragraph entitled, "Shop Drawings," of this section.

Manufacturer reviewed and approved shop drawings to the Contracting Officer
Roofing membrane system
Modified bitumen flashing details
Membrane termination details
Roof projection and penetration flashing details
Roof drains
Walkway pad plan and detail

SD-03 Product Data

Manufacturer's product information, including manufacturer's Literature and Material Safety Data Sheets, for each of the following products indicated:

Asphalt Primer
Roofing Asphalt
Asphalt Roof Cement
Venting Base Sheet
Smooth Surfaced Modified Bitumen for Field and Flashings
Granulated Modified Bitumen for Field and Flashings
Fasteners
Roof Walkways
Cant Strips
Roof Expansion Joint
Termination Bar
Roofing Vent Caps

SD-04 Samples

Samples shall be submitted for each of the following items in accordance with the paragraph entitled, "Samples" of this section.

Venting Base Sheet

Smooth-surfaced roofing membrane for field and flashings
Granulated-surfaced roofing membrane for field and flashings
Walkway pad or walkway cap sheet
3 lb of granular surfacing material
Six venting base sheet fasteners
Sample copy of the contractor’s warranty
Sample copy of the manufacturer’s warranty

SD-06 Test Reports

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

Submit Test Reports for the following items:

Roof Cutout
Fastener Test-Pull test to Deck

SD-07 Certificates

Product Certificates shall be submitted for each of the following items in accordance with the paragraph entitled, "Certificates" of this section.

Venting Base Sheet
Smooth Surfaced Modified Bitumen
Granulated Modified Bitumen
Asphalt Bitumen
Roofing Contractor's Certificates
Manufacturer Certificates
Written approval of Roofing Assembly and Fasteners

SD-08 Manufacturer's Instructions

Manufacturer's Instructions shall be submitted for the following in accordance with the section entitled, "Manufacturer's Instructions," of this section.

Manufacturer's Installation Instructions for

Roofing
Flashings

Manufacturer's Maintenance Data for

Roofing System

SD-11 Closeout Submittals

Closeout Submittals shall be submitted for the following in accordance with the section entitled, "Closeout Submittals," of this section.

Warranty
Inspection Report
As-built drawings with MA Documentation

1.3 MATERIAL, EQUIPMENT, AND FIXTURE LIST

Material, Equipment, and Fixture List shall be submitted for each type of roof system specified including membranes, asphalt, flashings, fasteners, and other roof accessories required to achieve the performance criteria. Include the manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site for each type of material and assembly.

1.4 SHOP DRAWINGS

Submit shop drawings to the membrane manufacturer for review. Submit only manufacturer reviewed and approved shop drawings to the Contracting Officer. Minimum Scale for Roof Plan: 1/8 inch = 1 foot- 0 inches and Minimum Scale for Details: 1 inch = 1 foot - 0 inches

Submit Roofing membrane system (including relationship with non-roofing components that impact the installation). All modified bitumen flashing details. All membrane termination details, including but not limited to, termination bar. Roof projection and penetration flashing details, Roof drains, and Walkway pad plan and detail.

Interface with sheet metal components (per Section 07600), including but not limited to Counterflashing, Stack flashing assemblies, Edge and fascia sections, and Expansion joints assemblies.

Interface with roofing accessories, including but not limited to Equipment curbs, Roof hatches, and Prefabricated flashing boots.

1.5 SAMPLES

Submit three samples, 12-by-12-inch square, of each: Smooth-surfaced roofing membrane for field and flashings, Granulated-surfaced roofing membrane for field and flashings, Walkway pad or walkway cap sheet. Submit the designated sample amounts for 3 lb of granular surfacing material, six venting base sheet fasteners of each type, length, and finish, Sample copy of the contractor’s warranty, and Sample copy of the manufacturer’s warranty.

1.6 CERTIFICATES

Submit Product Certificates for Venting Base Sheet, Smooth Surfaced Modified Bitumen, Granulated Modified Bitumen, and Asphalt Bitumen.

Submit Roofing Contractor's Certificates, signed by roofing system manufacturer, certifying that Roofing Contractor is approved, authorized, or licensed by manufacturer to install roofing system.

Submit Manufacturer Certificates, signed by roofing manufacturer, certifying that roofing system complies with requirements specified within this Section.

Submit written approval by the membrane manufacturer for use and performance of the membrane system over the specified roof assembly including that all materials supplied for this job comply with the requirements of the ASTM standards cited and that materials are suitable for a UL Class A roof. Written approval is to indicate that the use of the material and components specified for this project meets the design intent and capabilities associated with a FM (Factory Mutual Laboratories) wind uplift rating for the roofing membrane system as specified.

Submit manufacturer's certification, signed by roofing manufacturer, certifying that pullout testing of the approved roofing system fasteners, as witnessed by the manufacturer's representative, complies with Project Specifications. Fastener Test - pull test to Deck. See Section 07590 "Re-Roofing Preparation and Procedures", paragraph entitled, "General" for fastener requirements of reroofing system.

1.7 MANUFACTURER'S INSTRUCTIONS

Submit the Manufacturer's Installation Instructions for Roofing and Flashings. Submit the Manufacturer's Maintenance Data for roofing system to include in maintenance manuals.

1.8 CLOSEOUT SUBMITTALS

Submit Warranty as required in the paragraph entitled, "Guarantee and Warranty" of this Section.

Submit Inspection Report: Copy of roofing system manufacturer’s inspection report of completed roofing installation, as required by manufacturer.

Submit As-built drawings reflecting modifications and variations to the specified roofing system from construction drawings to be used as record set.

1.9 DEFINITIONS

1.9.1 Roofing Systems Manufacturer

Any of the manufacturers whose systems are specified under "Acceptable Roofing System Manufacturers", and herein called "manufacturer".

1.9.2 Roofing Terminology

Refer to ASTM D 1079 and glossary of NRCA’s "National Roofing Contractors Association (NRCA) “Roofing and Waterproofing Manual”, 5th Edition, 2001 for definition of terms related to roofing work in this Section.

1.9.3 Hot Roofing Asphalt

Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F (14 deg C), measured at the mop cart or mechanical spreader immediately before application.

1.10 QUALITY ASSURANCE

1.10.1 Roofing Contractor’s Qualifications

A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer’s product and that is eligible to receive manufacturer’s warranty.

Firm must have successful roofing installations of similar size in the local area in use for a minimum period of five years.

Firm must employ only experienced and qualified workmen, skilled in the

installation for the specified roofing system.

1.10.2 Source Quality Control

Manufacturer’s Product: Obtain roofing materials from only one membrane manufacturer. Provide materials not available from the membrane manufacturer from sources that are recommended and approved by the membrane manufacturer.

General: Provide installed roofing membrane and base 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.

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

1.10.3 Manufacturer Qualifications

A qualified manufacturer that has UL listing and FMG approval for roofing system that meets the design intent and capabilities used for this Project. Materials shall be obtained only from manufacturers who will, send a qualified technical representative to the project site for the purpose of advising the contractor on the procedures and precautions for use of the materials specified in Part 2 "Products".

The quantity and timing of the site visits shall be as specified in the paragraph entitled, "Field Quality Control", of this section.

1.10.4 Underwriters Laboratories (UL) Listed Products

Provide materials that have been tested and listed by UL, and bear UL label on each package, or are shipped to the project with a UL Certification of Compliance.

1.10.5 Fire and Insurance Ratings

Provide roofing materials with the 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 shall be identified with appropriate markings of applicable testing and inspecting agency. Comply with the following:

Underwriters Laboratories requirements for “Roof Deck Constructions” which are rated “Fire-Acceptable,” Class “A” fire rating.

Factory Mutual: Must meet design intent for derived FM wind uplift rating based on basic wind speed for the specified roofing membrane system, as listed in Table 1.0, Section 01019 "Project Description" for each specific building's roof.

1.11 DELIVERY, HANDLING, AND STORAGE

Roofing materials are to be on the project site before work is begun.

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 storage.

Label roll goods to indicate grade, weight, and type of saturant.

Original packaging must not be disturbed until materials are to be applied.

Only approved roofing materials may be brought to or stored at the site.

Keep all materials dry while they are transported, stored, and installed. Protect materials from exposure to moisture during transportation, storage, handling and installation. Reject and remove from the site any new materials, which exhibit evidence of moisture during application, or have been exposed to moisture. Reject and remove from the site any material, which has moisture content more than 10-percent greater than the Equilibrium Moisture Content (EMC) at 90-percent relative humidity.

Store and protect roofing materials from contact with soil, rain, or snow. Permanently remove materials that have not been adequately protected from the site.

Stack roll goods on end and stored in an area maintained at no lower temperature than 50 degrees F for at least 24 hours before laying.

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.

Not more than a 1-day supply of insulation or roll goods is to be stored on the roof at any time. Stack this 1-day supply on pallets and completely covered with plastic sheet whenever work is interrupted or when there is precipitation of any kind. Securely fasten plastic sheeting to the pallets so as to be completely weather tight.

Handle and store roofing materials and place equipment in a manner to eliminate permanent deflection of deck. Materials temporarily stored on the roof are to be distributed to stay within the indicated live-load limits of the roof construction (20 psf). Ample bases are to be provided under equipment to distribute the weight to conform to these live-load limits.

1.12 PROJECT CONDITIONS

1.12.1 Field Verification

Field verify all dimension and existing details prior to bidding and acquisition or installation of materials.

Notify the Contracting Officer of any existing condition found to be different than that indicated in the contract documents. The conditions will be reviewed by the Contracting Officer and required modifications will be made, if any.

1.12.2 Project Safety

Comply with safety requirements as specified in Section 01410 "Contractor Safety and Health Program".

1.13 SAMPLES AND TESTING

Upon notification by the Contractor that the materials are on site, randomly select three 1-quart samples of each material from the sealed packaging or containers. For liquid components, mix the contents of each sampled container to render the sample truly representative of the material in that container. For membrane components, provide cutout sampling of the membrane when specified or required by the Contracting Officer.

Clearly identify the samples by designated name, batch number, date of manufacture, project contract number, intended use, and quantity involved.

Test the samples for conformance to the specified requirements and provide test results to the Contracting Officer. If the sample fails to meet specification requirements, replace the material represented by the sample, and test new material.

All costs for testing are paid by the Contractor.

1.14 QUALIFICATIONS FOR ROOFING WORK

Perform roofing work by a contracting organization experienced in and completely equipped for applying roofing of the nature and size of this project. Equipment is to be in an operable condition, functionally as good as new equipment, and conforming to the requirements of this specification.

Provide backups for important equipment available in standby mode, to be set up within 2 hours at the project if the primary equipment experiences mechanical difficulty.

Submit certified evidence of projects where work of a similar kind and scope has been performed by this organization within the past five years.

The installing contractor must be authorized and previously trained by the roofing system manufacturer to install the specified membrane system.

Substitution of a different superintendent or foreman during the roofing application is not permitted unless approved previously in writing by the Contracting Officer. Individual crew members are to have each worked on at least 3 similar projects within the previous year and one half. Submit written evidence for all crew members.

1.15 PROTECTION OF PROPERTY

Seal and weatherproof all roofing and flashing terminations and maintain in a watertight state until permanent roofing and flashing is installed.

Appoint an approved fire watch if sprinkler systems are to be taken down for more than 4 hours in a 24 hour period.

At no time will personnel working inside a facility be exposed to hazards as a result of work being performed on the exterior of the facility. Means of egress shall not be compromised by equipment or processes.

See additional requirements in Section 07590 "Preparation and Procedures for Reroofing".

1.16 GUARANTEE AND WARRANTY

1.16.1 Manufacturer’s Warranty

Manufacturer’s non-prorated system warranty, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

Warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, substrate board, walkway products and other components of roofing system.

Warranty Period: 20 years from date of Substantial Completion.

1.16.2 Roofing Contractor’s Project Warranty

Submit Roofing Contractor’s warranty, signed by Roofing Contractor, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

Warranty Period: Two years from date of Substantial Completion.

Upon notice by the Government, immediately make good any defects in material or workmanship, or both, within the same 2 year period covered by the guarantee, at no additional cost to the Government.

1.17 COORDINATION MEETINGS

Attend and participate in technical coordination meetings as indicated in Section 07590 "Preparation and Procedures for Reroofing".

PART 2 PRODUCTS

2.1 MANUFACTURER’S AND SYSTEMS

2.1.1 General Description

The roofing system is to be a two-ply modified bitumen membrane system having a smooth surfaced and granulated surfaced modified bitumen membrane. Various roof deck types are in scope of this project.

For lightweight insulating concrete deck install a venting base sheet per roofing manufacturers specifications with vent caps to attain the required wind uplift classification.

Color of cap sheet and flashing shall be white or light grey.

Exception Loggia projects and Building 46 reroof. See Table 1.0, Section 01019 "Project Description".

2.2 ACCEPTABLE MANUFACTURERS

All products required for built-up roofing shall be the product of one manufacturer or shall be approved for use by that manufacturer.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

The Garland Company, Inc.
Johns Manville International Company
Siplast/Icopal
Tremco Incorporated
W. P. Hickman Systems, Inc.

All roof membrane systems shall meet or exceed the following minimum standards as determined by ASTM D 5147 Standard Test Methods:

Tensile Tear Strength: (ASTM D 5147 Section 7)

Granulated cap sheet: Minimum of 700 lbf (pounds-force)
Smooth surfaced secondary membrane: Minimum of 100 lbf (pounds-force)

In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2.3 SBS-MODIFIED ASPHALT-SHEET MATERIALS

2.3.1 Roof Membrane Assemblies

Bottom ply of membrane shall be a smooth surface, SBS modified asphalt sheet with polyester or composite polyester/glass-fiber or fiberglass reinforcement. Product must meet or exceed ASTM D 6162 Type III, Grade S or ASTM D 6163, Type II, Grade S or ASTM D 6164, Type II, Grade S and standards specified in the paragraph entitled, ACCEPTABLE MANUFACTURERS, of this section.

Top ply of membrane shall be a fire resistant, granulated surface, SBS modified asphalt sheet with polyester or fiberglass or composite polyester/glass-fiber reinforcement. Product must meet or exceed ASTM D 6162 Type III, Grade G or ASTM D 6163 Type III, Grade G or ASTM D 6164, Type II, Grade G and standards specified in the paragraph entitled, ACCEPTABLE MANUFACTURERS, of this section.

The Garland company:

1. Bottom Ply: HPR Tribase Plus
2. Top Ply: Stressply "E" FR Mineral

Johns Manville International Company

1. Bottom Ply: DynaLastic 180S
2. Top Ply: DynaMax FR Plus Granulated

Siplast/Icopal

1. Bottom Ply: Paradiene 20 EG
2. Top Ply: Paradiene 30 MW FR

Tremco Incorporated:

1. Bottom Ply: Powerply HD Base Sheet
2. Top Ply: Powerply Supreme FR Granulated

W. P. Hickman Systems Incorporated:

1. Bottom Ply: Pika Ply SS-3P
2. Top Ply: Pika Ply Supreme FR

2.4 VENTING BASE SHEET MATERIALS

Venting base sheet materials applies to reroofing systems with LIC or Concrete Decks.

Base Sheet: ASTM D 4897, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface.

2.4.1 Venting Base Sheet Materials

Use manufacturers vented base sheet over new or existing lightweight insulating concrete.

2.4.2 Vent Caps

Vent caps are to be installed per manufacturers recommendations shown in shop drawings locations, and provide roofing vent caps. Use vent caps over LIC.

2.5 FLASHING SHEET MATERIALS

2.5.1 Flashing Sheet

Bottom ply of membrane shall be a smooth surface, SBS modified asphalt sheet with polyester or composite polyester/glass-fiber or fiberglass reinforcement. Product must meet or exceed ASTM D 6162 Type III , Grade S or ASTM D 6163, Type II, Grade S or ASTM D 6164, Type II, Grade S, and standards specified in the paragraph entitled, ACCEPTABLE MANUFACTURERS, of this section suitable for application method specified.

Top ply of membrane shall be a fire resistant, granulated surface, SBS modified asphalt sheet with polyester or fiberglass or composite polyester/glass-fiber reinforcement. Product must meet or exceed ASTM D6162 Type III, Grade G or ASTM D 6163 Type III, Grade G or ASTM D 6164, Type III, Grade G, and standards specified in the paragraph entitled, ACCEPTABLE MANUFACTURERS, of this section suitable for application method specified.

The Garland company:

1. Bottom Ply: HPR Tribase Plus
2. Top Ply: Stressply "E" FR Mineral

Johns Manville International Company

1. Bottom Ply: DynaLastic 180S
2. Top Ply: DynaMax FR Plus Granulated

Siplast/Icopal

1. Bottom Ply: Paradiene 20 EG
2. Top Ply: Paradiene 30 MW FR

Tremco Incorporated:

1. Bottom Ply: Powerply HD Base Sheet
2. Top Ply: Powerply Supreme FR Granulated

W. P. Hickman Systems Incorported:

1. Bottom Ply: Pika Ply SS-3P
2. Top Ply: Pika Ply Supreme FR

2.6 AUXILIARY ROOFING MEMBRANE MATERIALS

2.6.1 General

Auxiliary materials recommended by roofing system manufacturer, FM, and UL for intended use and compatible with roofing membrane for the type and condition of existing roof deck. Auxiliary materials as submitted and approved by Government that are part of a manufacturers recommended roofing system is provided for in these specifications. If hot asphalt is recommended the following paragraphs entitled, Asphalt Primer and Roofing Asphalt apply.

2.6.2 Asphalt Primer

ASTM D 41.

Product and manufacturer as recommended by roof membrane manufacturer

2.6.3 Roofing Asphalt

ASTM D 312, Type IV.

Product and manufacturer as recommended by roof membrane manufacturer and insulation manufacturer.

2.6.4 Asphalt Roof Cement

ASTM D 4586.

Asbestos free, of consistency required by roofing system manufacturer for application.

2.6.5 Fasteners

See Section 07590, "Re-Roofing Preparation and Procedures", paragraph entitled, "General" for additional requirements.

Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required

pullout strength, and acceptable to roofing system manufacturer. Provide fasteners for the following systems.

Vented Base Sheet Fasteners

Constructed from corrosion resistant materials having a minimum of a G-90 coating and as specified by the manufacturer for use with their system.

Wood Nailer Fasteners

Reference Section 06100 "Rough Carpentry".

Other Fasteners

Constructed of the same metal as metals being fastened, or nonmagnetic stainless steel or other non-corrosive metal as recommended by manufacturer.

Match finish of exposed fasteners with finish of material being fastened.

2.6.6 Metal Flashing Sheet

Metal flashing sheet is specified in Division 7 Section “Flashing and Sheet Metal”.

2.6.7 Roofing Granules

As recommended by Roofing Manufacturer.

2.6.8 Miscellaneous Accessories

Provide miscellaneous accessories recommended by roofing system manufacturer.

2.7 WOODEN NAILERS AND PERLITE CANT STRIPS

Wood nailers: Refer to Division 6 “Rough Carpentry”.

Perlite cant strips must be not less than 4 inches and set where indicated at projections through the roof deck, at expansion joints, at roof perimeter, and elsewhere as indicated.

2.8 ROOF INSULATION

Provide roofing insulation, if required, in accordance with Division 7, "Reroofing Insulation".

2.9 ROOF WALKWAYS

Walkway Pads: Granule-surfaced, asphaltic composition, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer.

Pad Size: Shall be a minimum of 32 inches by 32 inches.

Granule Color: White or grey to match roofing cap sheet granule.

2.10 ROOF EXPANSION JOINT

Provide roof expansion joints at existing locations at the various buildings per the roof membrane manufacturer and Project requirements.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions 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 cant strips, blocking, curbs, and nailers that are not designated for replacement are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 “Metal Deck.”

Examine deck surfaces for inadequate anchorage, foreign material, moisture, and unevenness that would prevent the execution and quality of application of built-up roofing system as specified. Notify Contracting Officer in writing of unsatisfactory conditions.

Verify that work of other trades that penetrates the roof deck or that requires men and equipment to traverse the roof deck has been completed.

Verify that areas to have new insulation meet the slope requirements. Notify the Contracting Officer in writing if unsatisfactory conditions are encountered.

Conduct a base ply fastener pull test 3 or more days following the application of new lightweight insulating concrete to ensure a minimum withdrawal resistance of 40 pounds (18 kg) per fastener. See also Section 07590 "Re-roofing Preparation and Procedures" for additional pull test and roof system fastening requirements.

Do not proceed with the roofing application until defects have been corrected to the satisfaction of the Contracting Officer and insulation/ membrane manufacturers. Starting work designates acceptance of the surfaces.

3.2 PREPARATION

Coordinate with removal of existing roofing specified in Division 2 “Demolition”.

Conduct necessary field measurements to determine material quantities and sizes. The accuracy of all field measurements and estimates of material quantity and sizes is the responsibility of the Contractor.

Coordinate with work specified in Division 7 - Flashing and Sheet Metal, Division 7 Roof Insulation (if required), and sections within Division 6 that impact roof membrane installation.

Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections. Fill voids, cracks, and holes with an approved material and strike flush with adjoining surfaces.

Prime surface of concrete decks, lead flashings, cants, nailers, curbs, penetrations, concrete, masonry, and other surfaces that will receive roofing with asphalt primer at a rate of 3/4 gal./100 sq. ft. and allow primer to dry.

3.3 APPLICATION

3.3.1 General

Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing." Use NRCA guidelines in addition to the requirements of this section. In conflicting guidelines are observed, the more stringent guideline shall apply.

Install roofing insulation and its components in accordance with approved descriptive data and as specified in Division 7, "Reroofing Insulation".

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

Provide an aesthetically pleasing overall appearance of the finished roof application. Make necessary preparations, utilize recommended application techniques, apply the specified materials, and exercise care in ensuring that the finished application is acceptable to the Owner.

Bitumen quantities specified for laminating insulation, for attaching base sheets, for laminating successive plies of roof membrane are to be regarded as square-foot by square-foot minimums, not as averages for areas.

Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

Coordinate installing roofing system so components of the system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when work is suspended due to rainfall or other causes. See Section 07590 for specific weatherproofing requirements.

Roofing installation must be continuous, with all operations proceeding together. The base sheet and specified plies of roof membrane must follow shingle-fashion as a single composite operation. Do not exceed 48 hour intervals between the base sheet application and succeeding plies.

Do not apply roofing when ambient temperature is below 50 degrees F.

Traffic over partially or completely finished roofing must be over planks or on plywood not less than 5/8-inch thick and 2-feet wide.

Remove debris from the roof at the end of each work day.

Place planks, plywood, or other approved protection over the roof insulation or the roofing membrane when mechanical roofing-application equipment is used. Confine traffic to the protected area. Felt machines are to contain a sufficient quantity of bitumen at the proper temperature to ensure no holidays in the bitumen.

Do not dilute or alter primers, roofing cements, sealants, or coatings. Keep containers closed except when removing materials from them. Do not allow mixing of various bitumen classes through mixing of kettle remains or dual use of transporting or application equipment. Do not use equipment with remains of bitumens other than asphalt.

Do not allow wrappers and packaging materials to be included in the re-roofing system.

Do not use oil, or other lubricants that are incompatible with roofing materials on wheels of roofing equipment. Remove and replace any roofing that contacts such lubricants.

Asphalt Heating: (applies if asphalt used)

Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application.

Do not exceed roofing asphalt manufacturer’s recommended temperature limits during roofing asphalt heating. Discard bitumen heated above the specified maximum limits provided below.

Maximum temperature in kettle:

Asphalt, Type IV: 475 degrees F or as recommended by membrane manufacturer.

Minimum temperature at the time and point of application:

Asphalt, Type IV: 425 degrees F or as recommended by membrane manufacturer.

Do not heat roofing asphalt within 25 deg F of flash point.

Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.

Provide thermostatic controls and a visible thermometer on the kettle, maintain them in working order, and keep them calibrated.

The foreman is to frequently check bitumen temperatures with an immersion thermometer, accurate within plus or minus 2 degrees F, that is to be carried on his person at all times. If the temperature of the bitumens in the applicators is below specified amounts, removal and replacement of the affected roofing may be required.

Tend heating kettles continuously at all times. Upon request of the Government, maintain a record of the kettle temperature at intervals of 15 minutes and given to the Contracting Officer at the end of roofing operations each day.

Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.3.2 Venting Base Sheet Installation

For installation over LIC and Concrete Decks See also Section 07590 "Re-roofing Preparation and Procedures" paragraph entitled "General" for approved reroofing and fastening requirements.

Install lapped base sheet course, extending sheet over and terminating beyond cants and nailers. Fasteners must maintain a minimum pull-out values as set by roofing manufacturer to meet wind uplift requirements. Lightweight insulating concrete substrates must be cured, dry and smooth prior to installation of the roofing system. Fasteners should be installed perpendicular to the substrate using the appropriate tool as required by the manufacturer. Fastening pattern shall be determined by FM and manufacturer to meet project requirements.

Attach base sheet as follows:

Starting at low point, mechanically attach vented base sheet to substrate.

Lap seams so that water flows over laps toward the drainage points and not into lapped seams.

3.3.3 SBS-Modified Bituminous Membrane Installation

Install modified bituminous roofing membrane smooth and granulated sheet according to roofing manufacturer’s written instructions, starting at low point of roofing system and installing as follows:

Apply all layers of roofing free of wrinkles, creases, or fishmouths. Exert enough pressure on the roll during application to ensure prevention of air pockets.

Apply all layers of roofing perpendicular to the slope of the deck.

Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F.

Extend all field plies to top edge of cants and cut off evenly.

Use a stiff broom to obtain full and uniform contact of membrane with asphalt mopping.

Install the bottom ply and cap sheet in shingle fashion lapped so that water flows over laps toward drainage points.

Install the bottom ply and cap sheet all in the same day. Phasing is not permitted, unless prior approval is given by Contracting Officer to allow a later installation of cap sheet only.

Avoid walking on plies until membrane has sufficiently cooled to prevent displacement of asphalt.

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.

Install with 4 inches minimum side and end laps. Stagger end laps 12 inches minimum.

Align the cap sheets so that the side laps do not coincide with the side laps of the base sheets. Place the side laps of the base ply sheet under the middle of the succeeding layer of membrane. At a minimum, stagger seams in the base plies 12 inches from top ply.

Apply mineral-surfaced cap sheet asphalt so that a small amount is visible the full length of each lap.

As the mineral-surfaced cap sheet is installed, and while the exposed asphalt at each lap in the cap sheet is still hot, cover with loose granules to ensure a monolithic surface color.

Install roofing membrane sheets so side and end laps shed water.

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

3.3.4 Flashing Installation

Provide flashings in the angles formed at walls and other vertical surfaces and where required to make the work watertight. Bituminous-plastic flashings specified are to be used, except where metal flashings are indicated or specified in Division 7, "Flashing and Sheet Metal."

Provide and install flashings immediately after the top ply of the roofing is placed and returned and seal or cap and seal to waterproof edges and ends.

Step flashing where vertical surfaces abut sloped roof surfaces.

Prior to installing sheet flashing, prime all vertical surfaces at a rate recommended by the membrane manufacturer and allow surface to dry completely.

Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer’s written instructions and as follows:

Flashing Sheet Application: Adhere base and cap flashing sheets to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C). Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.

Flashings may also be fully adhered with Manufacturer's approved flashing cement.

Extend base ply and top membrane layers out past toe of cant onto flat roof surface a minimum of 4 inches and 8 inches respectively, and provide side laps of 4 inches minimum. Stagger joints in base ply and top layer 12 inches minimum.

Base flashing height must not be less than 8 inches nor more than 24 inches above finish roof surface unless otherwise indicated on

drawings or approved in writing by membrane manufacturer and Contracting Officer.

Mechanically fasten top of base flashing securely at terminations and perimeter of roofing. For parapet wall flashing where wall height is greater than 24 inches above the finished roof surface, use the two piece flashing method and mid-wall termination as approved by the membrane manufacturer.

Avoid excessive asphalt seepage at seams. At exposed portions of mineral surfaced top layer system, cover exposed hot asphalt seepage with a full sprinkling of loose granules.

3.3.5 Cant Strip Application

Install cant strips in the angles formed at wall and other vertical surfaces as backing for base flashings.

Lay cant strips in a solid coat of bituminous cement just prior to laying the roofing plies or as specified by the roofing system manufacturer.

Cants are to be continuous and installed in as long lengths as practical.

Cant strips are not be required at locations where cast-in-place cants specified under other sections are integrally formed with the structural deck or roof fill.

3.3.6 Roof Drain Flashing

Install roof drain flashing according to roofing system manufacturer’s written instructions and as follows:

Prime all metal surfaces.

Using a trowel, set a 6-inch wide layer of mastic around the drain bowl edge as water cut-off.

Install base ply membranes with lap centered on bowl and as noted in the Flashing Application section above to provide a tight seal at drain.

Install a full-primed 30-by-30-inch sheet of 4 lb. lead flashing set in mastic on completed roofing membrane.

Install a 3-by-3-foot reinforcing sheet of base ply material, centered on drain and extending a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Extend membranes 1 inch beyond the inside edge of the drain bowl and temporarily secure with clamping ring. Neatly trim lead and base ply within drain rim and remove excess.

Install roof membrane cap sheet as noted in the Flashing Application section above. Extend membrane 1 inch beyond inside edge of drain bowl. Position membrane to avoid occurrence of any seams at drains. Install stripping according to roofing system manufacturer’s written instructions. Extend stripping plies 8 inches beyond edge of lead flashing.

Seal off drain by running a hot trowel along the edge and firmly pressing against the rim.

Install clamping ring and drain covers supplied with drain. Clamp collar to drain in bed of specified elastomeric mastic or water cut-off. Install bolts and clamps.

Test all drains for proper flow and water tightness. Correct defects.

3.3.7 Walkway Installation

Furnish and install walkway systems for the protection of the roofing membrane as indicated on the project drawings.

Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

Set walkway pads in a full embedment of hot roofing asphalt applied at not less than 425 deg F at designated walkway areas and directly on the roof membrane.

Set pads in asphalt while the asphalt is still hot.

Space pads a minimum of three inches and a maximum of six inches apart.

Maintain a minimum 1/2 inch space between adjacent roof projections for drainage.

3.3.8 Vent Stacks, Stanchions And Lightning Protection

Vent Stacks: Install new vent stack flashing at designated locations in accordance with the following.

Install roofing base plies at base of vent stack and set flange in mastic. Base flange should extend 6 inches minimum.

Turn lead down into vent opening a minimum of 2 inches or install a metal cap sized to fit around the rim.

Install cap sheet ply as noted in this section. Extend stripping plies 8 inches beyond edge of lead flashing. Install a uniform bead of mastic/roofing cement at edge of top ply at the base of the stack.

Stanchions: Install stanchion flashing at designated locations in accordance with the following.

Install roofing base plies at base of all stanchions, tiebacks, pipe stanchion supports, tube steel members and similar penetrations.

Seal around base of penetration with mastic.

Install metal flashing and set flanges in mastic. Base flange should extend 6 inches minimum.

Install top ply as noted above. Extend stripping plies 8 inches beyond edge of flashing assemblies. Install a uniform bead of mastic/roofing cement at the edge of top ply of the base of the penetration.

Lightning Protection: Install new lightning protection flashing at designated locations in accordance with the following.

Install roofing base plies at base of lightning protection stanchions.

Seal around base of stanchion with mastic.

Install metal flashing and set flange in mastic. Base flange is to extend 6 inch minimum.

Install top ply as noted above. Extend stripping plies 8 inches beyond edge of metal flashing. Install a uniform bead of mastic/roofing cement at edge of top ply at the base of the stanchion.

3.3.9 Equipment And Expansion Joint Curbs

Refer to Flashing Application above for general base flashing installation requirements and the following additional procedures.

Wood curbs for equipment and expansion joint assemblies:

Extend base ply of flashing membrane up and over top of curb, and secure with nails to blocking.

Extend cap flashing membrane sheet up vertical surface of curb and terminate at top edge.

For expansion joint locations, seal top edge of cap sheet with mastic. Secure with fasteners that attach expansion joint assembly to curbs.

For curbs where integral sheet metal flashing is used but not attached to face of curb:

Install termination bar at top of cap sheet with fasteners at 8 inches on center.

3.4 FIELD QUALITY CONTROL

Test Cuts: If the Contracting Officer feels that roof test cuts are needed, the Contractor is to provide an independent testing laboratory to conduct the test cut sampling.

Perform initial test cuts in accordance with ASTM D 3617 to evaluate the Work.

Testing will be performed on approximate quantities of components within roofing membrane as determined by ASTM D 3617 with a minimum of four total test cuts

Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

If the ASTM D 3617 testing is not conclusive, the testing laboratory is to use ASTM D 2829.

Provide test analysis immediately following testing to the Government.

If test cuts show a deficient roof, the Contractor is to pay for the tests and correct the deficiencies at no cost to the Government.

The Contracting Officer will provide periodic onsite observation during installation.

Roofing manufacturer must provide qualified technical personnel for onsite observation and instruction full time at beginning of membrane installation to establish project standards and thereafter as the manufacturer deems necessary, but not less than 1 time every 2 weeks when roofing system components and related work is being performed.

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

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

Repair or remove and replace components of 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.

3.5 PROTECTING AND CLEANING

Protect roofing system from damage and wear during remainder of construction period. Prevent storage of materials and equipment on the completed roof areas.

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.

Accompany the manufacturer's technical inspector, and assist with equipment and workmen if necessary to provide access to the roof. Correct all defects noted during the inspection.

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

Clean up bitumen and mastic spills and spattering. Repair damage and remove stains caused by the Work.

At completion of the Work, remove all surplus equipment, tools and supplies.

Remove from the job site and legally dispose of all debris.

3.6 ACCEPTANCE

Provide all close-out documents to the Contracting Officer upon completion of the Work.

Provide construction (as-built) details to the Contracting Officer. Construction as-built details are to include the following.

By building area, the material type, amount, and installation method.

An illustration or map of the building may serve this purpose.

Provide a cover letter for the as-built information that is clearly marked with the system name, date, and the words "As built insulation/material - Forward to the Contracting Officer".

Provide final submittal showing that the facility master drawings have been updated per the marked as build drawings.

-- End of Section --