CHAPTER 11 – APPENDICES

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Appendix 16: Modified Bituminous Membrane Roofing

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END OF SECTION 07551
SECTION 07551 – MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Two-ply, modified bituminous membrane roofing.
   2. Roofing insulation.

B. Related Sections include the following:
   1. Division 6 Section "Miscellaneous Carpentry" for wood blocking, curbs, cants, and nailers; and wood-based, structural-use roof deck panels.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
   3. Division 7 Section "Manufactured Roof Specialties."
   4. Division 7 Section "Roof Accessories."
   5. Division 7 Section "Roof Expansion Assemblies."
   6. Division 7 Section "Joint Sealants."
   7. Division 15 Section "Plumbing Specialties" for roof drains.
   8. Division 16 Section "Lightning Protection."

C. Unit Prices: Refer to Division 1 Section "Unit Prices" for description of Work in this Section that is affected by unit prices.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

B. 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 measured at the mop cart or mechanical spreader immediately before application.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure. Roofing system shall consist of tapered polyisocyanurate insulation attached in either cold adhesive or a hot mopping of asphalt, two (2) layers of modified bituminous membrane roofing membranes of either SBS or APP modifiers laid down in manufacturer recommended cold adhesive. Roofing membranes shall meet the minimum requirements as specified in sections 2.2 and 2.3.
B. FM Listing: Provide modified bituminous membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:
   a. Fire/Windstorm Classification: Class 1A-90.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified, include data substantiating that materials comply with requirements, including product specifications, installation instructions, and general recommendations for the following:

1. Roofing Specification
2. Insulation and Insulation Adhesives
3. Modified Bitumen Membranes and Base Sheet
4. Modified Bitumen Adhesives
5. Metal Flashing and Sealants

B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch square of modified bituminous, granule-surfaced cap sheets, of color specified.
2. 12-by-12-inch square of roofing insulation.
3. 6 insulation fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to receive the standard roofing manufacturer's warranty. The manufacturer's certification shall be submitted as part of the bid.

E. Manufacturer Certificates: Signed by roofing system manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of complying with requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.
H. Research/Evaluation Reports: Evidence of roofing system’s compliance with building code in effect for Project from a model code organization acceptable to authorities having jurisdiction.

I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

J. Warranty: Sample copy of standard roofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roof installation.

L. Current copy of the general specification recommendations and the recommended installation specifications of all systems of the proposed roofing system manufacturer. These publications will not be returned at the close of the project. The Roofing Contractor is to keep a copy of the same publications at the job site at all times for the duration of the contracted work.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project for not less than five (5) years; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty. Roof Installer to engage workers who are experienced with similar types of installations.

B. Superintendent Qualifications: Engage an experienced superintendent to manage installation of the Work of this Section who has specialized in installing roofing similar to that required for this Project for not less than five (5) years; who has received specific training by the roofing system manufacturer to install manufacturer's product; and who has functioned in a superintendent capacity on at least ten (10) roofing projects similar to that required for this Project.

C. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; complying with ASTM E 108, for application and slopes indicated.

D. Preinstallation Conference: Approximately two (2) weeks prior to the scheduled commencement of the roofing installation and associated work, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing installer and roofing installers construction foreman for this project; 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.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.

4. Review loading limitations of deck during and after roofing.

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

6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.

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

8. Review roof observation and repair procedures after roofing installation.

9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

10. Establish which areas on the site will be available for use as storage and work areas, and the Roofing Contractor's responsibility of protection and restoration of said storage and work areas to pre-construction conditions.

11. Review University parking requirements, regulations, and the procedure for the Roofing Contractor and his employees to obtain permits for parking during the course of the work. Any parking fees and/or fines are the responsibility of the Roofing Contractor.

### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location to ensure no significant moisture pickup and maintain at a temperature exceeding roofing system manufacturer's written instructions. Store rolls of felt and other sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.

1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

2. No more material should be stored at the job site than will be used within two weeks. For expected storage periods greater than two weeks, the material should be properly warehoused.

B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F. Shipping wrappers are not acceptable field storage covers. All waterproof tarps shall be opaque. The Roofing Contractor shall visit the site on a daily basis to inspect the storage conditions of the materials.

C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

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

E. All materials may be checked by use of moisture meter for acceptance prior to application and while being installed, at the option of the Architect.

F. No materials containing asbestos are to be used, in any form, on any project. No products containing asbestos will be allowed to be stored on site. Any materials containing asbestos will be removed promptly.
1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements. Do not apply roofing membrane during inclement weather or when ambient temperature is below forty (40) degrees Fahrenheit including wind chill factor. Do not apply roofing membrane to damp or frozen surface.

B. After rains or dew, no material will be applied until all moisture has dissipated from roof surface.

C. The existing roof deck is assumed to be sloped, and it is the responsibility of the Roofing Contractor to verify any variations. If a variation should be discovered, the Roofing Contractor shall notify the Architect immediately and receive instruction before any further work can proceed.

D. If found necessary and requested by the Roofing Contractor, The Kansas State University Facilities Planning Office will survey the roof deck at no cost to the Roofing Contractor to assist in identifying variations in the deck that may produce unacceptable water ponding.

E. Kansas State University personnel will disconnect all electrical work and mechanical piping on the roof as required for the reroofing of the building and will do other work as required by plans and specifications. On completion of the work, Kansas State University personnel will reconnect all electrical and mechanical services.

F. The Roofing Contractor shall verify the location of all sources of power and insure that such sources are compatible with the requirements of the tools for installation of the new roofing system. If the sources of appropriate power do not exist or are not available, the Roofing Contractor shall supply an appropriate source at the Roofing Contractor's expense.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks in the roof membrane and base flashings resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 10 years base bid.
2. Warranty Period: 20 years alternate no. 1.

C. Special Project Warranty: Submit roofing Installer's warranty on warranty form at end of this Section, signed by Installer, covering Work of this Section, including membrane roofing, base flashing, roofing insulation, fasteners, and vapor retarders, if any, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.
2. Such repair or replacement of defects shall include, but not be limited to: splits, blisters, bare spots, fishmouths, wrinkles, slippage and metal work. Repair or
replacement may be required due to visual defects and not necessarily limited to defects with resulting roof leaks.

3. Upon notice of roofing leaks or defects, the roofing Contractor shall promptly inspect the defective areas and make all necessary repairs, including labor and materials, at no expense to Kansas State University, with no dollar limit.

4. The Roofing Contractor is to meet and administer the minimum requirements of the roofing system manufacturer and the requirements of these specifications for inspection of the roof system.

5. The Roofing Contractor shall maintain a copy of the drawings, specifications, and the roofing manufacturer's specifications at the job site at all times.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. 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:

1. Modified Bituminous Sheet:
   a. Garland Co., Inc. (The).
   b. Johns-Manville Roofing Systems
   c. Performance Roof Systems, Inc.
   d. Siplast
   e. Tremco, Inc.
   f. Derbigum

2. Polyisocyanurate Board Insulation:
   a. Apache Products Co.
   b. Atlas Roofing Corporation
   c. NRG Barriers, Inc.
   d. Celotex Corp. (The).

B. Should a bidder wish to incorporate, in the base proposal, brands or products other than those named in the Specifications, he shall submit written request for substitution approval to the Project Architect/Engineer ten (10) calendar days prior to date proposals are due. Approved substitutions will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

C. Products submitted for request for substitution shall meet the minimum requirements as shown in sections 2.2 and 2.3 below within +/- 7%. Any products not meeting the above criteria will not be approved for substitution.

2.2 APP-MODIFIED BITUMINOUS SHEET

A. APP-Modified Bituminous Sheet, Smooth Surfaced: Atactic-polypropylene-modified asphalt sheet, smooth surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type as follows:

1. Use: Base ply of 2-ply, modified bituminous membrane roofing.
2. Reinforcing: Woven or nonwoven polyester.

B. APP-Modified Bituminous Sheet, Mineral-Granule Surfaced: Atactic-polypropylene-modified asphalt sheet, reinforced, with continuous layer of mineral granules factory applied to top exposed surface and a plastic film on bottom surface; suitable for
application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type and granule color as follows:

1. **Use:** Finish ply of 2-ply, modified bituminous membrane roofing and base flashing.
2. **Reinforcing:** Woven or nonwoven polyester.
3. **Granule Color:** White.

**C. Physical Properties:** Provide APP-modified bituminous membrane materials with the following properties when tested according to ASTM D 5147:

1. **Thickness:** 157 mils base ply, 177 mils finish ply.
2. **Tensile Strength:** 150 lbf/in base ply, 203 lbf/in finish ply at 0 deg F in each direction.
3. **Elongation at Maximum Load:** 4.0 percent at 0 deg F.
4. **Tear Strength:** 158 lbf base ply, 170 lbf finish ply.
5. **Low-Temperature Flexibility:** Pass at -13 deg F.

### 2.3 SBS-MODIFIED BITUMINOUS SHEET

**A. SBS-Modified Bituminous Sheet, Smooth Surfaced:** SBS-modified asphalt sheet, smooth surfaced, dusted with fine parting agent on both sides; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type as follows:

1. **Use:** Base ply of 2-ply, modified bituminous membrane roofing.
2. **Reinforcing:** Glass-fiber mesh or nonwoven glass-fiber mat.

**B. SBS-Modified Bituminous Sheet, Mineral-Granule Surfaced:** SBS-modified asphalt sheet, with continuous layer of mineral granules factory applied to top exposed surface; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type and granule color as follows:

1. **Use:** Finish ply of 2-ply, modified bituminous membrane roofing and base flashing.
2. **Reinforcing:** Woven or nonwoven polyester.
3. **Granule Color:** White.

**C. Physical Properties:** Provide SBS-modified bituminous membrane materials with the following properties when tested according to ASTM D 5147:

1. **Thickness:** 138 mils base ply, 135 mils finish ply.
2. **Tensile Strength:** 125 lbf/in base ply, 150 lbf/in finish ply at 0 deg F.
3. **Elongation at Maximum Load:** 4% at 0 deg F.
4. **Tear Strength:** 120 lbf base ply, 150 lbf finish ply.
5. **Low-Temperature Flexibility:** Pass at -13 deg F.

### 2.4 AUXILIARY MEMBRANE MATERIALS

**A. General:** Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with APP-modified bituminous roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

**B. Asphalt Primer:** ASTM D 41.
C. Roofing Asphalt: ASTM D 312, Type III, as recommended by modified bituminous membrane manufacturer.

1. Label each container or provide certification with each load of bulk asphalt identifying type of roofing asphalt and indicating softening point, minimum flash point, equiviscous temperature, and finished blowing temperature.

D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, 1- or 2-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with modified bituminous membrane roofing and flashings.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application. Asphaltic roofing cement is considered a waterproofing agent but is not a weatherproofing agent. In no instance will roofing cement be allowed as part of the exposed final roof system. The contractor will make every effort to limit the use of roofing cement except as allowed in the details. If roofing cement is used as a temporary method of waterproofing, all roofing cement shall be removed prior to the application of the final roof system.

F. Mastic Sealant: Polyisobutylene, plain or modified bituminous, nonhardening, nonmigrating, nonskinning, and nondrying.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470; designed for fastening base sheets, base-ply felts, and base flashings and for backnailing modified bituminous membrane to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.

H. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."

I. Wood Nailer Strips: Furnish wood nailer strips complying with requirements of Division 6 Section "Miscellaneous Carpentry."

J. Cants: Wood cants are specified in Division 6 Section "Miscellaneous Carpentry."

K. Cants: Fiberglass board, complying with ASTM C 728.

L. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100% passing No. 8 sieve and 98% of mass retained on No. 40 sieve.

1. Color: To match color of cap sheet.

M. Glass-Fiber Fabric: Woven glass cloth, treated with asphalt; complying with ASTM D 1668, Type 1.

N. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.

2.5 INSULATION MATERIALS

A. General: Provide preformed roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.
1. Provide preformed tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:
   a. ¼ inch per 12 inches, unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated and as required for sloping to drain.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents, complying with ASTM C 1289, facer type as follows:
   1. Facer Type: As recommended by manufacturer.

2.6 INSULATION ACCESSORIES

A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470, designed for fastening roofing insulation to substrate, and acceptable to roofing system manufacturer.

C. Tapered Edge Strips: Rigid, perlite insulation board, complying with ASTM C 728.

D. Cover Board: Rigid, glass-fiber insulation board, complying with ASTM C 726, ¾ inch thick.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood blocking, curbs and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
   1. Verify that wood nailer strips are located perpendicular to roof slope and are spaced according to requirements of roofing system manufacturer.

D. Verify that flatness and fastening of metal roof decks comply with installation tolerances specified in Division 5 Section "Steel Deck."

E. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane.

F. Do not proceed with installation until unsatisfactory conditions have been corrected.

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

B. 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.

C. The Roofing Contractor shall seal all fresh air intakes on the roof and in the areas of the disposal chute during construction. The Roofing Contractor shall notify the Architect prior to sealing fresh air intakes.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. 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."

B. Demolition and construction shall take place in areas only large enough to be rendered watertight on the day they are started. Phased application of roofing materials is not permitted. Each component and detail must be installed promptly on each section.

C. The Owner may require the start of the project at a location of special sensitivity. The Roofing Contractor shall make every effort to accommodate the Owner.

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

E. Shingling Plies: Install modified bituminous membrane roofing system with ply sheets shingled uniformly to achieve required number of membrane plies throughout. Shingle in direction to shed water.

1. Where roof slope exceeds ½ inch per 12 inches, run sheets of modified bituminous membrane roofing parallel with slope. Backnail top ends of sheets to nailer strips.

F. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of modified bituminous membrane roofing system with vertical surfaces or angle changes greater than 45 degrees.

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

H. Coordinate installing roofing system components so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

1. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

I. Asphalt Heating: Heat roofing asphalt and apply within plus or minus 25 deg F of equiviscous temperature, unless otherwise required by roofing system manufacturer. Do
not raise roofing asphalt temperature above the 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. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding 500 deg F for more than 4 hours. Keep kettle lid closed, unless adding roofing asphalt.

1. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. If mopping is applied directly to substrate, tape substrate joints.

J. Safety is of major importance when heat welding or torching modified bitumens. It is the sole responsibility of the Roofing Contractor to enforce fire safety precautions at all times. Torches should be extinguished when not in use and should not be left unattended. There should be a sufficient number of fire extinguishers on the roof at all times to handle any contingency which might develop. The roofing applicators shall be trained in the proper use of fire extinguishers. The Roofing Contractor shall notify the Architect when torch work is to be done. No torch work shall be conducted one (1) hour prior to the end of the day's work.

K. The Roofing Contractor shall maintain a copy of the drawings, specifications, and the roofing manufacturer's specifications at the job site at all times.

3.4 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roofing insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.

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

E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

G. Nailer Strips: Where roof slopes are greater than \( \frac{1}{2} \) inch per 12 inches, mechanically fasten to deck 4-inch nominal-wide, wood nailer strips of same thickness as insulation, spaced not more than 20 to 21 feet apart. Run nailers perpendicular to slope of roof.

H. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding \( \frac{3}{4} \) inch with insulation.

1. Cut and fit insulation within \( \frac{1}{4} \) inch of nailers, projections and penetrations.
I. Attached Insulation, Concrete Deck: Prime surface of concrete deck with asphalt primer at a rate of ¾ gal./100 sq. ft., unless a greater weight is required by roofing system manufacturer, and allow primer to dry. Set each layer of insulation in a solid mopping of hot roofing asphalt.

J. Attached Insulation, Metal Deck: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roofing insulation to deck type indicated.

1. Fasten insulation according to the insulation and roofing system manufacturers' written instructions to meet specified wind-uplift requirements, but not less than 1 fastener for each 4 sq. ft. and at least 2 fasteners per board.

K. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing systems manufacturer's written instructions.

L. The roof deck is designed to provide a positive slope to the drains. If during the course of the work the Roofing Contractor discovers that the deck will not provide positive drainage, a method of correction shall be submitted by the Roofing Contractor and approved by the Architect. The corrections shall be made by the Roofing Contractor at a cost to the University by change order.

M. If, after completion of the work, it is discovered that the deck will not provide positive drainage, a method of correction shall be submitted by the Roofing Contractor and approved by the Architect. The corrections shall be made by the Roofing Contractor at no cost to the University.

3.5 ROOF MEMBRANE INSTALLATION

A. General: Install modified bituminous membrane over area to receive roofing, according to manufacturer's written instructions. Extend modified bituminous membrane over and terminate beyond cants.

1. Unroll sheet and allow it to relax for the minimum time period required by manufacturer.

B. Two-ply, Modified Bituminous Membrane: Install 2 plies of modified bituminous membrane, consisting of a base ply and a finish ply, starting at low point of roofing system.

1. Base- and Finish-Ply Application: Adhere each ply to substrate in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer.

2. Base- and Finish-Ply Application: Adhere each ply to substrate in cold adhesive, applied within temperature range and at rate required by roofing system manufacturer.

C. Laps: Accurately align sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Heat-weld side and end laps and completely seal by rolling, leaving no voids.

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

2. Apply granules, while asphalt is hot, to cover asphalt bead extruded at laps.
D. Install modified bituminous membranes with side laps shingled with slope of roof deck where possible.

1. Install modified bituminous membranes with side laps shingled in direction to shed water on each large area of roofing, where slope exceeds 1/2 inch per 12 inches.

E. Care should be taken not to overheat membrane causing damage. Repair of damaged areas shall follow manufacturer's recommendations.

3.6 FLASHING AND STRIPPING INSTALLATION

A. Install modified bituminous membrane 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:

1. All metal components to be primed and allowed to completely dry with primer as required by roofing system manufacturer prior to installation of flashing and/or roofing membrane.
2. Prime substrates with asphalt primer if required by roofing system manufacturer.
4. Backer Sheet Application: Install base-sheet backer and adhere to substrate in cold adhesive, applied within temperature range and at rate required by roofing system manufacturer.
6. Base Flashing shall be installed by heat welding. Install in pieces full width of roll by the height required from the top to eight (8") inches out onto the surface.

B. Extend base flashing up the wall a minimum of 8 inches above roof membrane and 4 inches onto field of roof membrane.

C. Mechanically fasten top of modified bituminous membrane base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing.

D. Install modified bituminous stripping where metal flanges and edgings are set on membrane roofing, according to roofing system manufacturer's written instructions.


3.7 FIELD QUALITY CONTROL

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

1. Notify Architect and Owner 48 hours in advance of the date and time of inspection.

3.8 PROTECTING AND CLEANING
A. Protect modified bituminous membrane roofing from damage and wear during remainder of construction period. Storage of roofing materials, tools, equipment, and debris and construction traffic will not be allowed on completed sections of roof. 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 Architect and Owner.

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

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

3.9 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work:
6. Acceptance Date:
7. Warranty Period:
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leads and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. lightning;
   b. peak gust wind speed exceeding 70 mph;
   c. fire;
   d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and
g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.

4. During Warranty Period, if work has been damaged by any of the foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner’s General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <DAY> day of <MONTH>, 12<YEAR>.

1. Authorized Signature:
2. Name:
3. Title:

END OF SECTION 07551