

**Section 07 52 16.02
Modified Bituminous Roofing over LWC**

****** The Design Professional shall include the following PSFA requirements as noted and complete this section, edited as necessary with information for the specific project. Refer to the latest version of the "State of New Mexico Public School Facilities Authority Roofing Program Handbook" at www.nmpsfa.org. ******

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, general project requirements and Division 01 Specification Sections, apply to this Section.
- B. Documents specifically related to this section include:

****** Include additional sections as necessary. ******

- 1. Section [00 4113] [00 4166] - Bid Form: **Roofing production rates required by Contract.**
- 2. Section 01 3100 – Project Management and Coordination: Coordination of roofing work with Owner; roofing sequence inclusion in Project Schedule.
- 3. Section 01 4100 – Quality Requirements: **Roofing observation services** and reports; Contractor's responsibilities.
- 4. Section [] -

1.2 SCOPE OF WORK

****** Summarize scope of work involving existing system components to remain or be removed, if re-roofing project. ******

- A. Furnish and install a weather and watertight modified bitumen roof complete, in-place, per the Contract Documents.
- B. Major new system components include the following:
 - 1. 2-ply temporary roof including gypsum board substrate if required
 - 2. 1-ply fiberglass base sheet, mechanically attached
 - 3. 1-ply modified bitumen membrane, set in adhesive
 - 4. 1-ply modified bitumen cap sheet, set in adhesive
 - 5. 2-ply flashings, set in adhesive
- C. The latest Manufacturer specifications and installation techniques are to be followed. When the Contract Documents and Manufacturer's requirements are in variance with each other, the most stringent requirements of the two shall typically apply at no additional cost to Owner or resulting change in Contract.

1.3 CODE COMPLIANCE

****** Designer shall complete the following code compliance information for all projects. Wind uplift pressures shall be calculated per the Building Code and include a factor of safety of 2. ******

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- A. The completed roof system shall meet the following requirements:
 - 1. Building Code: _____
 - 2. Energy Code: _____
 - 3. External Fire Rating: UL Class A external fire rating.
- B. The completed roof system shall meet the following design wind load pressures calculated in accordance with the applicable building code:
 - 1. Field: _____ psf
 - 2. Perimeters: _____ psf
 - 3. Corners: _____ psf
- C. Perimeter and corner areas shall be calculated based upon the applicable building code requirements.

1.4 QUALIFICATIONS

- A. Manufacturer Qualifications
 - 1. The Manufacturer of the roofing system shall have not less than five (5) years of experience in the production of the specified system.
- B. Installer Qualifications
 - 1. The installer of the roofing shall have been engaged in the business of installing the specified roofing system for not less than five (5) years and shall be certified by the roofing system Manufacturer in the layout and application of this system. The installer shall have successfully installed the specified system as follows:
 - a. At least once, and;
 - b. At least five (5) years prior to Bid on this Project.
 - 2. The crew shall be composed of experienced and skilled workers in this work.

1.5 QUALITY ASSURANCE

- A. Standards: Comply with latest edition of standards specified in this section and as referenced below:
 - 1. *The NRCA Roofing and Waterproofing Manual* – National Roofing Contractors Association.
 - 2. Membrane Manufacturer's current published specifications, application instructions, and technical bulletins.
 - 3. *Annual Book of ASTM Standards*, Latest Revision – ASTM International.

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- B. Qualifications of Installers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section. In acceptance or rejection of the work, the Owner will make no allowance for lack of skill on the part of the workers.
- C. Roofing Inspections: Make all required notifications and secure all required inspections by the Manufacturer of the approved materials to facilitate issuance of the specified roof warranty.
- D. Roofing Consultant and Observer: The Owner shall provide the services of a Roofing Consultant Roofing Observer for the purposes of quality assurance in the design and installation of the roofing system. See Subparagraph 1.1-B and other portions of this section for related Contractor's requirements.
- E. U.L. Listing: Provide materials bearing Underwriters Laboratories (U.L.) marking on bundle, package, or container, indicating that materials have been produced under U.L.'s classification and follow-up service.
- F. The Roofing Contractor shall not subcontract the installation of the roof system covered under this specification to an individual or a firm that is not a full-time employee of the Roofing Contractor's company. Included shall be the following components:
 - 1. Temporary Roof
 - 2. Base Sheet
 - 3. Roof Membrane
 - 4. Membrane Flashings
 - 5. Roof Walkways
- G. Asphalt Labeling: Packaged asphalt shall be labeled showing type, EVT, FBT, and flash point temperature.

1.6 REFERENCES

- A. References: Materials used in this section shall be listed in the latest edition of the following:
 - 1. *Roofing materials and Systems Directory and Fire Resistance Directory* – Underwriters Laboratories Inc.

1.7 SUBMITTALS

- A. General: Comply with the provisions of the General Conditions of the Contract and Division 01 specification sections. Submittal schedule shall allow ample time for processing and approval prior to Pre-Roofing Coordination Meeting and start of roof system installation work.
- B. Product Data:

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1. Most recent copy of Manufacturer's literature applicable to products and specifications to be used.
2. Complete material list of all items proposed to be furnished and installed under this section.
3. Letter from Manufacturer stating that the roofing contractor is approved for installation of the specified roofing system.
4. Manufacturer's recommended methods of installation.
 - a. When approved by the Design Professional, the Manufacturer's recommended methods of installation, unless superseded by more stringent requirements in the Contract Documents, will become the basis for inspecting, and acceptance or rejection of the actual installation procedures used in this Work.
- C. Manufacturer's Certification, Bitumen: On bulk bituminous materials, submit bitumen Manufacturer's certification for type, EVT, FBT and flash point temperature for each shipment.
- D. Written confirmation from roofing Manufacturer approving the proposed asphalt for the specified warranty.
- E. Drawings showing the proposed temporary water cutoff detail.
- F. Fire Resistance Information: Provide documentation that roofing system, insulation, and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure over deck specified herein.
- G. Wind Uplift Information: Provide documentation that rigid insulation, modified bitumen roofing system, and component materials suitable for the structural deck, and that have been tested as a complete system for application and slopes indicated. Provide information on fastening for uplift resistance to meet the applicable Building Code.
- H. Temporary roof substrate fastening patterns for field, perimeter and corner areas and a roof plan clearly showing the perimeter and corner areas to receive increased fastener frequency.
- I. Base sheet fastening patterns for field, perimeter and corner areas and a roof plan clearly showing the perimeter and corner areas to receive increased fastener frequency.
- J. Manufacturer's tapered insulation fabrication drawings.
- K. Letter from membrane Manufacturer stating acceptance of proposed roof insulation assembly.
- L. Sheet metal and flashing shop drawings as required by Section 07 6200.

1.8 QUALITY ASSURANCE BY ROOF SYSTEM MANUFACTURER

****** Design Professional shall edit, considering level of need, practicality and cost ******

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- A. Membrane Manufacturer's technical representative, who shall be a full time employee of the membrane Manufacturer's technical service, shall provide on-site training and quality assurance in conjunction with beginning of membrane installation. The Manufacturer's technical representative shall then visit the site to provide quality assurance and follow-up training a minimum of every two (2) weeks thereafter.
- B. During each visit, the Manufacturer's technical representative shall check all work installed since the last visit, mark all defects for repair, and provide a written site visitation report listing any deficient work requiring correction by the Contractor. All reports and other correspondence associated with the site visit shall be provided to the Contractor, Owner's Roofing Consultant and Design Professional within three (3) business days of the visit.
- C. The Manufacturer's technical representative shall coordinate all site visits with the Contractor, Owner's Roofing Consultant and Design Professional a minimum of three (3) business days in-advance.
- D. After the roof installation is Substantially Complete, the Manufacturer shall inspect the work and inform (by written report) the Design Professional, Contractor, Owner's Roofing Consultant and the Installer of defective/incomplete work to be remedied. Those areas indicated shall be corrected to the full satisfaction of the Design Professional, Owner, and Manufacturer. The Manufacturer shall submit written acceptance of the project to the Design Professional prior to Final Completion for issuance of the weathertightness warranty.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in their original unopened containers. Package labels shall indicate material name, production date, and/or product code. Slit Manufacturer-supplied plastic and cover with weatherproof tarps that are securely anchored so as to resist blow off.
- B. Store bulk bitumens in heated tanker not greater than 350° F. temperature. Avoid modification of asphalt's physical properties, resulting from long periods over heating.
- C. Store materials in dry, raised, protected areas in an upright position. Control temperature of storage areas in accordance with Manufacturer's instructions. Protect materials from exposed to the elements. Do not exceed allowable live load of storage area. Store all goods on end.
- D. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.
- E. In the event of damage to roofing and related work or building components, immediately make all necessary repairs and replacements subject to the approval of and at no additional cost to the Owner.
- F. Wet, damaged, or defective materials which are intended for incorporation into the new roofing system shall be marked to indicate rejection, and removed from the site the same day as discovered.

******* Include next item if re-roofing project. *******

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- G. Securely store and protect materials designated for removal and re-installation as part of the re-roofing work.

1.10 SCHEDULING

- A. Work is to be performed on a daily basis with each section completed before progressing to the next day's work, unless specifically directed otherwise by the Design Professional.
- B. Substantial Completion of roofing work will be defined as the contractually required and weathertight installation of all specified roof preparation, insulation, field membrane, flashings, counterflashings, sheet metal, fasteners and caulking.
- C. All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Design Professional. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, seams and or night seals, the affected area shall be removed and replaced at the Contractor's expense.
- D. Once roofing is started, the roofing application must be Substantially Complete within the time period required by the Contract. All punch list items must be complete prior to Final Completion.

1.11 WARRANTY

- A. The Roofing Contractor shall warrant all materials and workmanship for a period of two years from the date of acceptance of the completed work by the Owner. The Roofing Contractor shall make good any defects in materials or workmanship that may develop during the two-year period by repairing or replacing such defects at his own expense without cost to the Owner. Roofing Contractor shall use the form entitled "Roofing Contractor's Warranty" provided in this section.
- B. The Contractor shall make all necessary notices for warranty purpose to the primary roofing Manufacturer, to secure timely inspections and issuance of the warranty.
- C. Upon Final Completion and prior to final payment, Contractor shall pay all required fees, secure all required inspections, and complete all items necessary to secure and deliver to the Design Professional the following items:
 - 1. Copies of all Manufacturer's punch lists and documentation of completion.
 - 2. Primary Roofing Manufacturer's 20-year no dollar limit (NDL) labor and material, total systems warranty on the form provided in this section. The total system warranty shall include the following:
 - a. Roof membrane
 - b. Roof membrane adhesion and attachment
 - c. Roof membrane flashings
 - d. Roof insulation

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- e. Roof insulation adhesion
 - f. Roof system fasteners, termination bars, and other miscellaneous accessories supplied by the roofing Manufacturer
- D. Primary Roofing Manufacturer's Warranty shall cover building code required design wind speed.
- E. Primary Roofing Manufacturer's warranty shall cover defects in materials and workmanship and shall become effective at the completion of the work. This warranty shall not include any buy-out clauses and shall not be prorated.
- F. All warranties shall contain written provision(s) stating that they will be fully transferable at any time during the specified warranty period.
- G. Submit all items to the Design Professional within ten days of receipt from the Manufacturer or within ten days of the final inspection.

1.12 ROOFING DATA FORMS

- A. Roofing data forms shall be submitted at Project Closeout by Contractor. See Sections 01 7800 and 01 7801 for requirements.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All materials used on this project shall be compatible with the existing conditions and with each other.
- B. No product shall contain any asbestos or asbestos-related products.

2.2 ACCEPTABLE MANUFACTURERS

****** Include all manufacturers which have obtained final acceptance for listing on the project as required by the New Mexico Public School Facilities Authority Roofing Program Handbook. ******

- A. Products manufactured or accepted by:
- 1.
 - 2.
 - 3.

2.3 TEMPORARY ROOF SUBSTRATE PRODUCTS

******Gypsum Board required if over a metal deck, base sheet required if over a nailable deck******

- A. Gypsum Board

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1. Non-structural, moisture resistant gypsum panel. Gypsum board shall conform to ASTM C 1177 or ASTM C 1278. Gypsum board shall be supplied in 4' x8' sheets. Gypsum board shall be flat stock ½" thick.
- B. Temporary Roof Base Sheet
1. Asphalt coated glass fiber base sheet complying with ASTM D-4601, Type II.

2.4 TEMPORARY ROOF SUBSTRATE FASTENERS

- A. Steel Deck
1. Corrosion-resistant, self-tapping, self-drilling #12 screw with #3 phillips head. ¼" hexhead fasteners are not approved. Fastener shall be carbon steel with fluorocarbon, corrosion-resistant coating. Fastener and plate shall meet FM 4470 requirements.
 2. Corrosion-resistant, factory-made metal plate.
 3. Steel Deck: Fasteners shall be the shortest length to penetrate the top flange of the deck by ¾".
 4. Fasteners must not penetrate bottom rib of steel deck. Fasteners shall not protrude below the bottom rib of steel deck.
- B. Nailable Decks
1. General
 - a. Provide industry standard types of mechanical fasteners for roofing system that have been tested by the fastener Manufacturer for the required pull-out strength and compatible with the deck type and roofing products used.
 - b. Fasteners shall be accepted by roofing membrane Manufacturer.
 - c. Fasteners shall incorporate 3" nominal diameter round, metal plates, unless otherwise specified.
 2. Wood Deck
 - a. Corrosion-resistant, self-tapping, self-drilling screw with #3 phillips head. ¼" hexhead fasteners are not approved. Fastener shall be carbon steel with fluorocarbon, corrosion-resistant coating. Fastener and plate shall meet FM 4470 requirements.
 - b. Fasteners shall be of sufficient length to provide minimum 1" embedment into wood decking.
 3. Structural Wood Fiber Deck
 - a. Twin-Loc Nail by ES Products
 - b. OlyLok Nail OMG

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4. Poured or Precast Gypsum (Aged) Deck
 - a. Twin-Loc Nail by ES Products
 - b. OlyLok by OMG

2.5 TEMPORARY ROOF SYSTEM

- A. Roofing Felts
 1. Ply Sheets: Two plies of asphalt-impregnated glass fiber mat complying with ASTM D 2178, Type IV.

- B. Roofing Bitumens

*******Specifier to verify asphalt types with use and slope.*******

1. Low fuming/low odor asphalt bitumen complying with ASTM D 312. Asphalt shall be domestically manufactured in the United States and as approved by the roofing system Manufacturer.
 - a. Approved Products
 - i. Trulo by Owens Corning Trumbull
 - ii. No Smell Asphalt by Continental Materials
 - iii. No Smell Asphalt by United Asphalt
 - b. Interply moppings – Type IV
 - c. Glaze coat – Type IV
 - d. Flashings – Type IV
 2. Asphalt Primer: To comply with ASTM D 41.
- C. Flashings
 1. Base Flashing Materials: Two plies of asphalt – impregnated glass fiber mat complying with ASTM D 2178, Type IV.
 - D. Asphalt Roof Cement
 1. To comply with ASTM D 4586, asphalt roof cement (asbestos free) or roofing membrane Manufacturer supplied SBS modified asphalt roof cement (asbestos free), as required.

2.6 ROOF SYSTEM

- A. Base Sheet
 1. Asphalt coated glass fiber venting base sheet complying with ASTM D 4897, Type II.
- B. Roofing Membrane

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1. Base plies shall consist of one-ply of SBS polymer modified bitumen material complying with ASTM D 6163 Type I, Grade S.
 2. Top ply shall consist of one-ply of SBS polymer modified bitumen material complying with ASTM D 6163, Type I, Grade G. Granular color shall be selected by the Design Professional from the Manufacturer's standard color offerings.
- C. Roofing Bitumens
- ****Specifier to verify asphalt/adhesive types with use and slope.******
1. Adhesive
 - a. Reinforced cold-process adhesive specifically formulated by the roof material Manufacturer for use with the modified bitumen membrane material, slope requirements, and application method.
 2. Asphalt Primer: To comply with ASTM D 41.
- D. Flashings
1. Base Flashing Materials: Two plies of material. Base ply shall be a SBS polymer modified bitumen reinforced with a polyester and/or glass fiber mat. Top ply shall be the fiberglass reinforced mineral cap sheet.
 - a. Base Ply – SBS polymer modified bitumen sheet complying with ASTM D 6164, Type I, Grade S.
 - b. Top Ply – SBS polymer modified bitumen sheet complying with ASTM D 6163, Type II, Grade G or ASTM D 6221, Type I, or ASTM D 6164, Type I, Grade G.
 2. Strip Flashing Materials: One ply of granule-surfaced SBS polymer modified bitumen sheet reinforced with a polyester and/or glass fiber mat complying with ASTM D 6164, Type I, Grade S or ASTM D 6163, Type I, Grade S.
- E. Walkways
1. Granule-surfaced modified asphalt material, with a minimum thickness of 5/16".
- F. Asphalt Roof Cement
1. To comply with ASTM D 4586, asphalt roof cement (asbestos free) or roofing membrane Manufacturer supplied SBS modified asphalt roof cement (asbestos free).
- G. Tapered Perlite Board Roof Insulation
1. Mineral aggregate insulation board composed of expanded perlite, blended with selected binders and fibers. Insulation shall conform to ASTM C 728.

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- H. Tapered Edge Strip
 - 1. Perlite or wood fiber insulation boards factory cut to provide slope. Insulation shall conform to ASTM C 728-91 or C 208-95.

- I. Cant Strip
 - 1. Perlite or wood fiber insulation boards factory cut to a 45° cant. Insulation shall conform to ASTM C 728-91 or C 208-95. Insulation shall be supplied in 4" face width.

- J. Related Materials
 - 1. Lead Flashing for roof drains shall be 27" x 27" and be minimum 4 pound lead.
 - 2. Pipe or vent jackets shall be minimum 3 pound lead with cap designed for use on flat roof construction.
 - 3. Flashing securement devices shall be of adequate design to achieve substantial and positive anchorage.
 - a. Anchor bars for flashing securement to concrete or masonry substrates shall be 1/8" x 1" flat aluminum bar with 8" hole spacing by OMG, or approved equal.
 - b. Fasteners for securing anchor bars to concrete or masonry substrates shall be zinc alloy with stainless steel pin; Masonry Anchor by OMG, or approved equal.
 - c. Nails for flashing securement to wood substrates shall be stainless steel with 1" metal caps.

2.7 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of the work in this section shall be as selected by the Contractor, approved by the Manufacturer, and subject to the approval of the Owner.

- B. Wood Nailers – Division 06

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Contractor shall be responsible for verifying existence of suitable substrate to accept the roofing system.

- B. Installer of roofing system shall examine substrate and conditions under which roofing work is to be performed and shall notify the Design Professional and Owner's representative immediately of unsatisfactory conditions. Do not proceed with roofing work until unsatisfactory conditions have been corrected in a manner acceptable to Design Professional, installer and Manufacturer.

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- C. Pre-roofing coordination meeting: Before roofing work may begin, the Design Professional shall conduct a pre-roofing coordination meeting with mandatory attendance required for the Owner's Representative, Owner's Roofing Consultant, primary roofing Manufacturer's technical representative, General Contractor, the Roofing Contractor, roofing foreman, and all other subcontractors who have any components of their work on or penetrating the roof. The participants shall:
1. As much as is possible by visual inspection and by the cutting of core samples, inspect surfaces and site conditions required to be ready to receive work. Contractor shall verify acceptability of substrate for application of new roofing system before commencement of installation.
 2. Examine roof openings, curbs, pipes, sleeves, ducts, and vents through roof, cant strips, wood nailing strips and reglets in place. Observe if curbs and penetrations have been laid out and installed with adequate vertical and horizontal clearance as required by the Manufacturer to provide the specified warranty.
 3. Observe if the condition of surface to receive roof insulation is firm, clean, smooth, and dry.
 4. Review the Contractor's schedule for roofing work so that all parties can coordinate essential tasks within the time restraints and as required by the roofing production rates of the contract.
 5. Review the responsibilities of all parties in regard to communication and coordination during the roofing portion of the Work, especially in that which pertains to the involvement of the Owner's Roofing Consultant and Observer. See Section 00 7200 - General Conditions of the Contract and Division 01.
 6. Review status of all submittals necessary to be approved prior to the start of the roofing work.
 7. Review plans for roofing equipment and materials staging and roofing schedule in coordination with school schedule and traffic patterns.

3.2 DESCRIPTION

- A. Preparation and Surface Conditions

*******Design Professional shall modify and supplement the following text to address conditions related to re-roofing projects, if applicable.*******

1. Before roof application is started, remove trash, debris, grease, oil, water, moisture, and contaminants that may affect bond of bitumen to substrate.
2. Prepare all surfaces according to applicable specification sections.
3. Protect adjacent areas from damage with tarps or other durable materials.
4. Surfaces scheduled to receive roofing are to be free of any standing water, frost, snow, or loose debris.

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5. Substrate is to be smooth, properly sloped, free of sharp projections, and free of obvious depressions.
 6. All roof openings, curbs, pipes, sleeves, ducts, and vents through roof shall be solidly set, and cant strips, wood nailing strips and reglets in place before roofing work begins. Verify that all nailers, curbs and penetrations have been laid out and securely installed with adequate vertical and horizontal clearance as required by the Manufacturer to provide the specified warranty.
 7. Do not start roof application until defects have been corrected.
- B. Installation – General
1. Perform all related work specified elsewhere necessary for the installation of the specified membrane system.
 2. Ensure that fasteners do not penetrate conduit or other miscellaneous items located on the underside of the roof deck.
 3. Do not apply roofing materials when water in any form (i.e. rain, dew, ice, frost, snow, etc.) is present.
 4. Do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application. Consult Manufacturer's technical specifications on cold weather application.
 5. Phased roofing system installation shall not be permitted.

3.3 WOOD NAILER INSTALLATION

- A. Nailers are to be installed as per detail drawings.
- B. Discard units of material with defects that might impair quality of work and units that are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- C. Set nailers to required levels and lines with members plumb and true.
- D. Top of perimeter nailers shall be uniformly flush with the top of insulation.
- E. Nailers shall be installed with 1/4" gap between ends of adjoining pieces.
- F. Nailers shall be fastened in accordance with the following schedule:
 1. Fasteners in 6" or wider (nominal) lumber shall be installed in two (2) rows, staggered one-third of nailer width. Listed spacings indicate distance between fasteners in adjacent rows.
 2. Two (2) fasteners shall be installed within 3" of each nailer end.
 3. Corner fastener spacing shall extend 8' maximum from all outside building corners.

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4. Where two or more nailers are installed, each nailer shall be fastened independently.
5. Over all deck types, the bottom nailer shall be fastened using the specified fasteners and 5/8" diameter washers. Countersink washers and fasteners level with top of wood using spade bit or similar method. Fasten subsequent nailers, where specified, using the specified screws without washers.
6. Nailer Attachment Schedule (unless noted otherwise on the drawings)

Attachment Substrate	Perimeter Fastener Spacing (maximum)	Corner Fastener Spacing (maximum)
Structural Concrete	12" o.c.	6" o.c.
CMU (fastener into solid material)	12" o.c.	6" o.c.
Steel Deck	12" o.c.	6" o.c.
Wood	12" o.c.	6" o.c.

3.4 TEMPORARY ROOF SUBSTRATE INSTALLATION

*******Gypsum board required if over a metal deck, base sheet required if over a nailable deck.*******

A. Gypsum Board

1. Install only as much board as can be covered with the temporary roof and completed before the end of the day's work or before the onset of inclement weather.
2. Neatly fit boards to all penetrations, projections, and nailers. Boards should be loosely fitted, with no gaps greater than 1/4". Under no circumstances should the temporary roof be left unsupported over a space greater than 1/4".
3. Areas of damage or broken corners shall be cut out and replaced with pieces 12" x 12" minimum.
4. Fastener spacings shall be as required to meet the design wind up-lift resistance, but not less than two fasteners per each piece of insulation.
5. Fasten the gypsum boards with screw and plate type fasteners. Minimum spacing shall be as required to achieve the specified wind up-lift resistance.
6. Any whole or partial insulation board that falls within the perimeter or corner areas shall have the increased fastening applied over the entire board. Gypsum boards shall be pre-primed or field primed as applicable.

B. Base Sheet Installation

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1. Any whole or partial base sheet roll width (when roll is parallel to the building edge), which falls within the perimeter or corner area shall have the increased fastening applied over the entire base sheet roll width.
2. Starting at the low points or drains, install base sheet with 3" side laps and 6" end laps. End laps shall be staggered 3' minimum.
3. Fastening patterns and perimeter/corner areas shall be as required to meet the required wind up lift resistance.
4. Roll all felts in a straight line so that no kinks or fish mouths result and felts are laid completely flat. Once felt direction is determined, do not change that direction over the entire roof area.
5. Install asphalt primer over fastener plates within corner fastening zones.

3.5 GENERAL BITUMEN REQUIREMENTS

- A. Contractor's kettles and tankers shall have thermostatic controls and an accurate, visible, and properly maintained thermometer. Crew foreman shall also have an accurate "stick" thermometer for use at the point of application.
- B. Contractor shall establish temperature control procedures to assure proper asphalt temperatures throughout the project.
- C. Do not heat asphalt over finished blowing temperature (FBT) for more than four hours.
- D. Do not heat asphalt above flash point or 525° F.
- E. Hot mops shall not be left unattended at any time. When mop usage is complete, hot mop heads shall be immediately spun-out on a fire resistant surface. All used mop heads shall be removed from the job site on a daily basis.
- F. When the kettle is heating material to the working application temperature, the kettle operator must be located on the same level as the kettle, be within eyesight and be within 25 feet of the kettle.
- G. Contractor shall provide and maintain a fume recovery system (after burner) and an asphalt safety loading system on all kettles for the duration of the project to control fumes/odors associated with bitumen heating.
- H. All kettle areas shall be barricaded from public access. Kettles shall not be located next to operable windows or fresh air intakes.

3.6 TEMPORARY ROOF INSTALLATION

- A. Install membrane materials in accordance with Manufacturer's current published application instructions for 2-ply built-up roof membrane.
- B. Starting at low points or drains, begin plying sequence with starter sheets as specified by the Manufacturer.
- C. Install membrane felts in shingle fashion, maintaining proper lap distance to result in a 2" headlap. Snap chalk lines for each ply to maintain consistent exposure for number of plies and headlap specified.

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- D. Roll all felts in a straight line so that no kinks, wrinkles or fish mouths result and felts are laid completely flat. Once felt direction is determined, do not change that direction over the entire roof area.
- E. Apply asphalt bitumen at EVT +/- 25° F. If temperature cannot be maintained at this application level, even with insulated hot carrying equipment and without heating asphalt to within 25° F. of flashing point, then operations shall cease until such conditions are met.
- F. Apply glass felts using felt laying machine, bitumen spreader or mop. At the discretion of Design Professional, the Contractor may be required to use hand mopping in lieu of mechanical equipment.
- G. Set roofing plies in hot asphalt bitumen at a solid nominal uniform rate of 25 lbs. per 100 square feet. The bitumen shall be sufficiently hot to ensure a complete bonding of plies. Certain weather and roof conditions may require brooming in all plies, using a moderately soft commercial broom or squeegee. The broom shall be pulled walking off the felts.
- H. Do not walk directly on felts for a minimum of 20 minutes to allow for proper adhesion of the felts.
- I. Flashing shall consist of two-ply of glass felts installed in uniform solid mopping of low fuming/low odor asphalt. Flashing shall extend a minimum of 6" above the roof deck. The top edge of all flashing shall be fastened at 6" o.c. with 1" cap nails or other appropriate/approved fasteners. The top edge of all flashing shall be three-coursed with roof cement and reinforcement fabric.
- J. Surfacing: All temporary roofing and flashing shall be glaze coated with 7-15 lbs/sq of asphalt at the end of each working day.

3.7 ROOF MEMBRANE BASE SHEET INSTALLATION

- A. Any whole or partial base sheet roll width (when roll is parallel to the building edge), which falls within the perimeter or corner areas shall have the increased fastening applied over the entire base sheet roll width.
- B. Starting at the low points or drains, install base sheet with 3" side laps and 6" end laps. End laps shall be staggered 3' minimum.
- C. Fastening patterns and perimeter/corner areas shall be as required to the required wind up-lift resistance.
- D. Roll all felts in a straight line so that no kinks or fish mouths result and felts are laid completely flat. Once felt direction is determined, do not change that direction over the entire roof area.
- E. Install asphalt primer over fastener plates within corner fastening zones.

3.8 TAPERED INSULATION CRITERIA

- A. Tapered insulation crickets and saddles shall be designed in accordance with the NRCA Roof Manual, Membrane Roofing Systems 2007 Edition, Fig. 48 Guide for Crickets and Saddles, and Fig. 49 Guide for Crickets.

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- B. Install tapered insulation with slope direction as indicated on the approved shop drawings. Miter cut all panels at valleys for tight fit and alignment throughout valley length.
- C. Install tapered saddles in valleys, where indicated on the approved drawings in the sizes shown. End of saddle shall provide for slope into the sump at the drainage device. End of saddle shall be of sufficient width at sump such that flat spots do not occur in valley. Saddle slope shall be twice the field slope, unless otherwise noted on the drawings.
- D. When a tapered insulation system is installed along a perimeter edge of uniform nailer height, utilize tapered edge strip along nailers as tapered insulation thickness decreases for smooth transition and for proper support for the membrane system.
- E. Utilize tapered insulation panels and tapered edge strips to construct sumps at roof drains, scuppers, and gutters where detailed. Size shall be as shown in approved shop drawings. Delete thermal insulation within sumps, as required, for installation of tapered panels, so as to provide continuous slope down to drainage device, without creating a sharp/steep sloped transition. At no time shall slope within drain sump exceed 1:12, unless otherwise noted in drawings.
- F. Install tapered crickets on the upslope sides of all rectangular penetrations with a dimension greater than 18" perpendicular to slope. Cricket slope shall be twice the field's slope, unless otherwise noted on drawings. Cricket slope less than twice the field slope shall create positive drainage.
- G. Utilize tapered edge strip at transitions in construction of more than ¼" to provide a smooth transition and proper support for the membrane system or subsequent insulation layer. Field cut and shape edge strip as required. Direct slope of edge strip so as to provide for proper drainage.
- H. Verify that tapered insulation is properly installed according to the approved shop drawings and that no irregularities exist that will result in ponding water in the finished roof system.

3.9 INSULATION INSTALLATION

- A. Install only as much insulation as can be covered with roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
- B. Prior to installing insulation, seal around all penetrations and roof perimeters with non-asbestos roof cement and fiberglass mesh to ensure no asphalt drippage below the deck level.
- C. Insulation shall be installed with all joints tightly butted and end joints staggered 12" minimum. Insulation shall fit tightly around penetrations.
- D. Place insulation boards in a solid application of hot asphalt at a nominal rate of 25 lbs. per 100 square feet. Do not slide boards through asphalt moppings during placement.
- E. Asphalt shall be at 450° F maximum at point of application.

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- F. While asphalt is still hot, thoroughly "walk-in" each board until maximum adhesion is achieved. If boards can be lifted or moved by hand, they are not sufficiently attached.
- G. Areas of damage or broken corners shall be cut out and replaced with pieces 12" x 12" minimum, secured in hot asphalt.

3.10 TAPERED INSULATION INSTALLATION

- A. Prior to installing insulation, seal around all penetrations and roof perimeters with non-asbestos roof cement and fiberglass mesh to ensure no asphalt drippage below the deck level.
- B. Insulation shall be installed with all joints tightly butted and end joints staggered 12" minimum. Insulation shall fit tightly around penetrations.
- C. Place insulation boards in a solid application of hot asphalt at a nominal rate of 25 lbs. per 100 square feet. Do not slide boards through asphalt moppings during placement.
- D. Asphalt shall be at 450° F maximum at point of application.
- E. While asphalt is still hot, thoroughly "walk-in" each board until maximum adhesion is achieved. If boards can be lifted or moved by hand, they are not sufficiently attached.
- F. Areas of damage or broken corners shall be cut out and replaced with pieces 12" x 12" minimum, secured in hot asphalt.

3.11 ROOF MEMBRANE / FLASHING

******Design Professional shall modify and supplement the following text to address conditions related to re-roofing projects, if applicable.******

- A. Adhesive Application
 - 1. Temperature of adhesive, membrane and ambient conditions shall be within the Manufacturer's recommended ranges during roof membrane application.
 - 2. Adhesive application methods shall conform with Manufacturer's accepted practices. Notched squeegees, adhesive spreaders, and spray equipment are acceptable, subject to Manufacturer approval.
 - 3. Adhesive shall be applied at the minimum rate of 1-1/2 gallons per 100 square feet. Where porous substrates exist, the application rate for the base ply may need to be increased to ensure full adhesion. Application rates shall be determined by the Contractor and Manufacturer for bidding and installation purposes.
- B. Approved Lap Adhesion Methods
 - 1. The following methods of lap adhesion shall be used for each listed component:
 - a. Field Membrane Base Ply: Membrane Adhesive

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- b. Field Membrane Top Ply: Membrane Adhesive or Hot Air Welding
 - c. Flashing Base Ply: Flashing Adhesive
 - d. Flashing Top Ply: Flashing Adhesive or Hot Air Welding
 - e. Flashing Strip-In Ply: Flashing Adhesive
- 2. Contractor shall prevent adhesive contamination of laps requiring hot air welding.
 - 3. Where hot air welding of flashing laps is specified, all edges, including the flashing-to-field membrane lap, shall be prepared and hot air welded.
- C. Roofing Membrane
- 1. When recommended by the Manufacturer, prior to installing modified bitumen materials, unroll membrane and allow it to relax.
 - 2. Beginning at low point or drain, apply first layer of modified membrane maintaining minimum 3" side laps and 6" end laps. Roll membrane into full width, uniform, and solid application of adhesive. End laps shall be offset 3' minimum.
 - 3. Starting at low point or drain, apply second layer of modified membrane maintaining minimum 3" side laps and 6" end laps. Roll membrane into full width, uniform, and solid application of adhesive. Offset end laps 3' minimum, and stagger laps between layers.
 - 4. Roll all sheets in a straight line so that no kinks, wrinkles or fish mouths result and sheets are laid completely flat. Once sheet direction is determined, do not change direction over the entire roof area for either bottom or top ply.
 - 5. Full adhesion of both plies shall be achieved and all edges shall be well sealed. Leading and trailing edges of T-laps in both plies shall be hand rolled to prevent formation of voids.
 - 6. All side and end laps of both modified bitumen layers shall be rolled with a minimum 20 lb. roller. Granular surfacing at end laps shall be embedded into the modified bitumen membrane using a hot air gun and trowel prior to constructing the laps.
 - 7. Prior to constructing end laps, remove a triangular piece of material (dog ear) from the overlapping selvedge edge using a 45° angle cut. This requirement applies to the bottom layer and top layer of the two-ply membrane.
 - 8. Apply uniform pressure to all plies after installation using a stiff broom or similar tool to ensure full adhesion of the membrane to the substrate.
 - 9. Care is to be taken not to track, spill, or apply adhesive over onto the finished exposed membrane. All exposed adhesive shall have #11

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granules broadcast and pressed into the adhesive while still wet, so that the finished appearance is uniform and neat.

10. Follow Manufacturer's recommendations regarding length of time first layer of modified bitumen membrane may be exposed to the weather, prior to installation of the second layer. Maximum time allowed shall be 60 calendar days.
11. Note: No phased construction is allowed. The roof section is to be fully completed at the end of each working day. If it becomes necessary to employ a phased application due to a sudden rainstorm, the temporarily installed roofing shall be removed prior to proceeding with the installation.

D. Flashings

1. Prime all masonry, concrete, wood, and metal substrates, and granular membrane surfaces with asphalt primer at the rate of 3/4 gallons per 100 square feet. Allow primer to dry prior to adhesive application. As an alternative to priming on granular surfaces, granules may be embedded into the sheet using a hot air gun and trowel.
2. Bridge all junctures of vertical and horizontal surfaces with 45° cant strips, except where an existing wood cant is specified to remain or a prefabricated metal curb cant already exists. Wood cants, where shown, shall be properly fastened; fiber/perlite cants shall be fully adhered with Manufacturer recommended adhesive.
3. Install two-ply modified bitumen base flashings in adhesive according to the Manufacturer's current published application instructions, unless superceded by the requirements of this section. Stagger laps between flashing plies.
4. All base flashings shall be installed in 39" long pieces cut from the end of the roll. Flashing lap shall be bonded to the selvedge edge of the preceding flashing.
5. Uniform coat(s) of adhesive shall be applied using a notched trowel. Flashings shall be thoroughly rubbed in. Loose or poorly bonded flashings will not be accepted. Fasten top edge of base flashing using the specified securement devices immediately after flashing installation. Masonry anchor spacing shall be 8" o.c. maximum. Nail spacing shall be 6" o.c. maximum.
6. Unless top edges of base flashings are covered by single-ply curb/wall coverings, top edges shall be thoroughly sealed with one-ply of reinforcing fabric fully embedded in asphalt roof cement immediately after layup.
7. All inside and outside corners shall be three-coursed with asphalt roof cement and reinforcing fabric, with #11 granules broadcast and pressed into the asphalt roof cement while wet.
8. Flashing height shall be minimum 8" above finished roof height.

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9. Avoid applying bituminous materials over locations to receive caulking during subsequent sheet metal work. All such materials shall be thoroughly removed to the substrate prior to caulk application.
- E. Set-on Metal Accessories
1. Install first layer of membrane under location to receive metal flange.
 2. Install metal flange embedded in asphalt roofing cement.
 3. Metal flanges that are required to be fastened shall be fastened with annular or ring shank nails 3" o.c. staggered.
 4. Prime top of metal flanges, then install one strip-in ply of first layer modified roof membrane in adhesive.
 5. Where flashing strip-in ply must be cut for installation around a roof penetration, the flashing shall be installed in two pieces. Pieces shall have 3" minimum side laps.
 6. Install top ply of field membrane over strip-in ply.
 7. Inspect edges of membrane plies and repair any loose or poorly bonded areas.
 8. Seal edge of membrane to sheet metal surface with a tooled bead of approved sealant.
9. Pitch Pans
- a. Install pitch pans only at locations where shown on the drawings. Prior approval from the Owner's Representative is required for pitch pan use at any other location.
 - b. Pitch pans shall have a minimum depth of 4" and have a minimum clearance of 2" from penetration on all sides.
 - c. Prime interior of pitch pan and penetration with polyurethane primer.
 - d. Fill lower portion of pitch pan with grout and allow to dry. Fill top 2" with an acceptable pourable sealer.
- F. Roof Drain Detailing
1. Install tapered insulation to ensure positive drainage into drain.
 2. Install first layer of modified membrane into drain under location to receive clamping ring.
 3. Install 27" x 27" lead set in asphalt roof cement under location to receive clamping ring. Prime lead flashing and allow primer to dry.
 4. Install strip-in ply of first layer membrane extending 6" past outer edge of lead flashing and under location to receive clamping ring.

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5. Install second layer modified membrane over strip-in ply and under location to receive clamping ring. Laps in the top ply shall be held a minimum of 12" away from edges of clamping rings.
 6. Set clamping ring and drain strainer.
- G. Roof Walkways
1. Verify walkway locations with the Design Professional prior to installation.
 2. Chalk line walkway locations prior to installation to ensure a neat appearance.
 3. Neatly prime area to receive walkway and allow primer to dry. Confine priming to areas being covered by walkways.
 4. Space panels with 2" gaps for drainage, granule side up.
 5. Protect roof surface prior to cutting walkways. Ensure straight, square cuts.
 6. Install walkway using Manufacturer approved materials and methods.

3.12 TEMPORARY WATER CUTOFFS

- A. Temporary water cutoffs are to be constructed at the end of each working day to protect the insulation, roofing, building, and building interior from damage due to wind, snow, and rain.
- B. Temporary water cutoffs are to be constructed with hot asphalt unless otherwise specifically approved by the Design Professional.
- C. Temporary water cutoffs are to be detailed by the Contractor and approved by the Manufacturer and the Design Professional.
- D. All temporary water cutoffs shall be removed at the commencement of work the next working day.

3.13 FIELD QUALITY CONTROL

- A. Water Test
 1. After completion of the two-ply membrane and prior to the installation of the cap sheet, a water test, shall be coordinated with the Owner and conducted by the Contractor in the presence of Design Professional, Owner's Roofing Observer, and Owner's Representative. The water test shall include the following procedures:
 - a. At the direction of the Design Professional, apply simulated rain over all roof areas for at least 15 minutes per area, or as otherwise directed.

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- b. In addition to the simulated rain, direct water to all walls, windows, units, penetrations, etc. that occur adjacent to, or within each roof area, using a continuous, unforced hose stream.
- c. Plug all roof drains and scuppers in each drainage area and allow each drain/scupper sump to be filled to a depth of 3-4 inches. Allow to stand for a minimum of 2 hours.
- d. Perform any necessary corrections to defects noted (including the ensuring of positive drainage around all curbs, roof openings and crickets to roof drains or scuppers) during or after the water test procedures. Perform additional testing as necessary to further define sources of any noted leakage.
- e. Contractor shall provide and/or arrange for necessary equipment, supplies, water, etc. as needed to perform these tests. Provide a water truck with an appropriate hose, if necessary.

3.14 PROTECTION

- A. Protect building surfaces, rooftop mounted equipment, piping, conduit, etc., against damage from roofing work. Where traffic must continue over finished roof membrane, protect surfaces.

3.15 CLEANUP

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this Section, consult Manufacturer of surfaces for cleaning advice and conform to their instructions.
- C. Remove excess materials, trash, debris, equipment, and parts from the work.
- D. Repair or replace defaced or disfigured finishes caused by work of this section.

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ROOFING CONTRACTOR'S WARRANTY

Trade: _____

Manufacturer and System Installed: _____

Contractor: _____

Contract Number and Date: _____

Project and Location: _____

Area of Roof Installation: _____

Date of Acceptance
(Effective Warranty Date): _____

1. Contractor warrants to Owner that the roofing system identified above have been installed in accordance with the specifications of the contract referenced above, and the specifications of the Manufacturers of all materials used in performance of the work.
2. Contractor warrants to Owner that Contractor for a period of two (2) years commencing with the date of Owner's acceptance of the installation, will make good any deficiencies that develop as a direct result of workmanship defects, by repairing or replacing such defects. All corrective work shall utilize materials and installation procedures in strict accordance with the specifications. The Contractor will respond within 24 hours and repair within 5 business days, any leaks or defects in the roofing assembly.
3. Contractor warrants to Owner that Contractor for a period of two (2) years commencing with the date of Owner's acceptance of the installation, will maintain all sheet metal flashing in a watertight condition without cost to the Owner.
4. Contractor's liability hereunder shall be limited to the repair or necessary replacement of any defective component of the work without cost to Owner and shall not include incidental or consequential damages.

CONTRACTOR

By: _____
(Officer)

Title: _____

Company: _____

Date Executed: _____

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Roofing System Manufacturer's 20 Year Warranty

Manufacturer's Warranty Number:

Effective Date:

Expiration Date:

Manufacturer Name:

Telephone #:

Fax #:

E-Mail:

Address:

School District:

School:

Project:

Project Address:

Total Warranty - Square Footage:

Roof Specification-System Name:

Insulation Type(s):

Roofing Contractor:

Address:

Designer of Record:

Telephone #:

Fax#:

E-Mail:

Address:

Telephone No.:

Fax #:

Other Information:

WARRANTY

- 1 The Manufacturer warrants to the School District named above, that, subject to the provisions of this document, the Manufacturer will, within 3 business days, at its own expense, make or cause to be made all repairs necessary to maintain the roofing system in a watertight condition during the warranty period stated above which commences on the date of Substantial Completion. System warranty includes:
 - A. Roof membrane
 - B. Roof membrane adhesion
 - C. Roof membrane flashings (except metal or components not furnished by the Manufacturer as part of its advertised system)
 - D. Roof insulation
 - E. Roof insulation attachment / adhesion
 - F. Roof system fasteners, termination bars, and other miscellaneous accessories supplied by the roofing Manufacturer
 - G. Roof related sheet metal (edge metal, copings, counterflashing) supplied by the Manufacturer.
 - H. Metal component strip-in-plies.
 - I. Roof system attachment / adhesion to the building code defined design wind speed.
- 2 OWNER'S RESPONSIBILITY: The Owner will notify the Manufacturer if repairs covered by the Warranty are required. The notice will be by, Telephone, Fax, E-mail, or Mail, to the Manufacturer's office listed above within 30 days of discovery of leaks or other defects in the roofing system. The Owner will provide the Manufacturer free access to the building during regular business hours over the life of the Warranty. The Owner acknowledges that the Manufacturer has provided its Roofing Maintenance Manual, including instructions necessary for the Owner to inspect and maintain the roofing system during the warranty period.
- 3 EXCLUSIONS: The following are excluded from this Warranty:
 - A. Roof maintenance for corrections of conditions other than leaks.
 - B. Damage to any part of the building (other than the roofing system) or to its contents (consequential damages).
 - C. Damage resulting from repairs made to the roofing system without the Manufacturer's prior authorization.
 - D. Damage resulting from any one of the following:
 1. Settlement, expansion, contraction, cracking, warping, deflection or movement of roof deck, walls, coping structural members or building foundation.
 2. Natural disasters (i.e., windstorm (in excess of wind speed defined in 1. I. above), hail, flood, hurricane, cyclone, lightning, tornado or earthquake).
 3. Changes in building usage; new installations on, through or adjacent to the roofing system made after the effective date of this Warranty, unless the Manufacturer has given prior written approval of such changes in building usage or new installations.
 4. Accidents, vandalism or other uncontrollable events.
 5. Lack of positive drainage (standing water) for asphalt built-up systems.
 6. Chemical attacks on the membrane from sources unknown or not present at time of roofing installation.
 7. Falling objects, misuse or abuse of the roofing system, traffic, recreational activities or storage of material on the roofing system.
 8. Infiltration or condensation of moisture in, through or around walls, copings, building structure or underlying or surrounding areas.
 9. Movement or deterioration of metal components adjacent to the roof (except where such components are a part of the Manufacturer's advertised roofing system).
 10. Failure of materials supplied by others (except where such materials are a part of the specified roofing system certified by the Manufacturer prior to bidding the roofing work).
 11. Tests or test cuts not authorized by the Manufacturer.
 12. Failure of the Owner to provide maintenance in accord with the Roofing Maintenance Manual.
 13. Failure of the Owner to notify the Manufacturer of leaks or other defects within 30 days of discovery.

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4. The Parties agree that any controversy or claims relating to this Warranty shall be first submitted to mediation under the Construction Industry Arbitration and Mediation Rules of the American Arbitration Association (Regular Track Procedures) or to such other mediation arrangement as the parties mutually agree. Participation in mediation as set forth above shall be a condition precedent to institution of any legal, equitable or arbitration proceedings regarding a controversy or claim relation to this warranty.
 5. This is the sole roof system Manufacturer's 20-year warranty, any implied warranty of merchantability and fitness for a particular purpose are excluded.
-

In Witness Whereof: Manufacturer and Owner have caused this Warranty to be duly executed on the dates below.

MANUFACTURER:
a State of Corporation with principle office at:

OWNER:

BY: _____

BY: _____

TITLE: _____

TITLE: _____

DATE: _____

DATE: _____

- End of Section -