

DOCUMENT NUMBER: 07 52 16.1A – ROOFING SYSTEM 1B


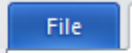
APPLICATION: ELEMENTARY, MIDDLE AND HIGH SCHOOL

DATE OF ISSUE:

- 01-13-16 - Miscellaneous revisions, weather station and photo requirements added, roof drain requirements clarified**
- 10-01-14 - Revised cover board products, fire barrier materials, and post-Installation Audit.
- 06-18-12 - Revised manufacturer's warranty; revised fire barrier paragraph and product list; miscellaneous revisions

NOTES:

1. Roofing systems shall be designed in accordance with the attached specification, which allows products from at least four different manufacturers. Requests for substitution will be considered only during an annual review and update of this specification by the Owner's roof committee.
2. Revisions to this specification, as may be required for adaptation to fit project-specific conditions, require Owner's written approval prior to bidding.
3. **Prior to publishing the specifications, the Design Professional shall edit the information appearing in bold font in brackets [...], or as otherwise instructed, as appropriate to the project. Delete brackets and change edited text to match the formatting of adjacent text.**
4. Editing instructions are included as blue hidden text within this specification. **Do not edit this specification unless you can see the hidden editing instructions in blue text.** If the sample editing instructions immediately following this paragraph are not visible, refer to *Microsoft Office Word Help* for guidance on displaying hidden text, and then show all formatting marks. **Do not print hidden text in the final document.**

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To display hidden text in Word documents Word 2010/13	Click the File tab  , and then click Word Options. In the Word Options dialog box, click Display, and then under Always show these formatting marks on the screen , select the Hidden text check box.

5. Roof Deck Testing – For new or replacement roofs on existing buildings, the Design Professional shall conduct fastener pullout resistance testing in compliance with **FBC Test Protocols: Test Application Standard (TAS) No. 105-98 – Test Procedure for Field Withdrawal Resistance Testing**. Design Professional shall then determine which type(s) of mechanical fastener(s), when used to attach any roofing component to a specific deck, will provide sufficient resistance to static uplift force to meet applicable wind-load requirements of the appropriate FBC TAS.

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PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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:

A two-ply SBS-modified bituminous roofing membrane (torch-applied applied cap sheet), over a hot-asphalt applied felt-ply sheet.

B. Related Sections include the following:

1. Refer to the Table of Contents for Sections related to roofing system.
2. Refer to Division **[1]** Section **["Unit Prices"]** for Work in this Section affected by unit prices.
3. Refer to Division **[5]**, Section **["Metal Fabrications"]** for fixed vertical ladders.
4. Refer to Division **[6]**, Section **["Rough Carpentry"]** for wood blocking and nailers.
5. Refer to Division **[7]**, Section **["Roof and Deck Insulation"]** for roof board insulation.
6. Refer to Division **[7]**, Section **["Sheet Metal Flashing and Trim"]** for sheet metal flashing and related work.
7. Refer to Division **[7]**, Section **["Building Sealants"]** for sealant related work.
8. Refer to Division 7, Section 07 50 00.1 "Roofing Installer's Five (5) Year Warranty."

1.3 DEFINITIONS

- A. ANCHOR SHEET – A fiberglass roofing felt, mechanically attached to a nailable deck with approved fasteners, on top of which either insulation or a multi-ply roofing membrane is then installed. *Not considered one of the plies in a multi-ply roof membrane.* Used over nailable decks only, to facilitate anchoring of roofing membrane to the deck.
- B. ASPHALT BARRIER – Red-rosin type building paper used as a protective layer directly over wood or structural wood fiber decks to prevent adhesion of asphalt to the deck or to prevent seepage of asphalt through the deck fibers and joints.
- C. DESIGN UPLIFT PRESSURE – The uplift pressure, calculated according to procedures in the Single Ply Roofing Institute (SPRI) "Wind Load Design Guide for

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- Fully Adhered and Mechanically Fastened Roofing Systems," "Wind Design Guide for Roof Edge Systems" and as required by the Florida Building Code (current edition) *before* multiplication by a safety factor.
- D. FACTORED DESIGN UPLIFT PRESSURE – The uplift pressure, calculated according to procedures in the SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," "Wind Design Guide for Roof Edge Systems" and as required by the Florida Building Code (current edition) *after* multiplication by a safety factor.
- E. FELT-PLY SHEET – A heavy fiberglass roofing felt which is mopped in with hot asphalt as the first ply in a multi-ply roof membrane.
- F. FIRE BARRIER – A roof cover board is **required** whenever roofing or flashing materials are to be torch-applied over combustible decks, wood parapet framing and blocking, or plastic foam insulation. The roof cover board shall be manufactured or approved in writing by the roof system manufacturer to ensure compatibility and warranty coverage. Cover board shall be a material type which provides a UL Class A combustible deck fire barrier without contributing toward blistering of any roof membrane. Owner's requirement for a fire barrier is independent from, but may be incorporated into, any code-required fire rating for a roof or roof-ceiling assembly.
- G. HOT 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.
- H. INTERPLY – An SBS modified smooth-faced asphalt sheet located below the cap sheet. Serves as one of the plies in a multi-ply roof membrane.
- I. OTHER ROOFING TERMINOLOGY: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed roofing membrane and base flashings shall remain watertight, shall not permit the passage of water, and shall resist specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Uniform Wind Uplift Load Capacity: Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria:
1. Design Code: **[ASCE/SEI 7-10]**.
 2. Building Category: **[3]**
 3. Importance Factor: **[1.15]**

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4. Wind Speed: **[120]** mph minimum.
 5. Exposure Category: **[C]** minimum.
 6. Topographic Factor: **[1.0]**.
- C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
- D. Florida Product Approvals Listing: Provide membrane roofing, base flashings, and component materials that are approved for use in Florida and which are listed in Florida's Product Approval System Website [<http://www.floridabuilding.org/pr/>].
- E. Fire Classification: UL Class A, complying with ASTM E 108.

Where the existing structure prohibits a Class A rating, provide the same materials and installation methods that would produce a Class "A" roof assembly, were it possible to achieve such a rating.

1.5 ROOF SYSTEM DESIGN

A. Roof Assembly

1. Deck Type(s): **[Wood] [Structural Wood Fiber] [Gypsum] [Insulating Concrete] [Concrete] [Steel]**
 2. Asphalt Barrier: Red-rosin sheathing paper, required over wood or structural wood fiber roof decks.
 3. Anchor Sheet: Asphalt saturated Type II fiberglass, mechanically fastened.
 4. Thermal Barrier: **[Polyisocyanurate] [and] [Perlite]** insulation above roof deck
 5. Fire Barrier: A roof cover board, ¼" (min.) thickness and 4' x 4' (max.) size, meeting Factory Mutual (FM) Class 1 and Underwriters Laboratories (UL) Class A fire ratings for unlimited slope in fire barrier applications, per UL 790.
 6. Felt-ply Sheet: Type IV fiberglass felt, fully adhered in a mopping of hot asphalt.
 7. Interply: SBS modified asphalt sheet, smooth surfaced, fully adhered in a mopping of hot asphalt.
 8. Cap Sheet: SBS modified asphalt sheet, granule surfaced, torch applied.
 9. Base Flashing: 2-ply SBS modified asphalt system, with torch-applied backer and flashing sheet.
- B. Anchoring and Attachment
1. Attach **[anchor sheet] [and] [insulation]** as follows:

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- a. To Wood Deck:
 - 1) Renail the existing deck to the framing in compliance with the requirements of the building code.
 - 2) Mechanically fasten anchor sheet over asphalt barrier to wood deck, using **[(Insert type of fastener here)]**.
 - 3) Fully adhere **[roof cover board] [insulation]** in a mopping of hot asphalt to prevent deck fasteners (which may back out) from penetrating the roof membrane.
 - b. To Structural Wood Fiber Deck: Mechanically fasten anchor sheet over asphalt barrier to wood deck, using **[(Insert type of fastener here)]**.
 - c. To Gypsum Deck: Mechanically fasten using only tubular fasteners with a dual barb or split shank fasteners.
 - d. To **[Insulating Concrete over]** Steel Deck: Mechanically attach using **[(Insert type of fastener here)]** anchored **[through insulating concrete]** into the steel deck.
 - e. To Concrete Deck: Fully adhere in a mopping of hot asphalt, on a clean, primed concrete deck.
2. Sheet Metal Flashing and Trim: All metal work, including new or existing wood blocking, shall be fastened in compliance with applicable requirements of *FBC Test Protocols: Roofing Application Standard (RAS) No. 111 – Standard Requirements for Attachment of Perimeter Woodblocking and Metal Flashing*.

1.6 SUBMITTALS

- A. Procedure: Provide submittals in accordance with Division 1 requirements, and as follows:
 1. Submittals specified herein shall be submitted at one time directly to the Design Professional for review and approval in electronic format on CD-ROM, and in printed format, in a 3-ring binder tabbed by Specification Section number.
 - a. All electronic format drawings shall be submitted as portable document format (PDF) files.
 - b. Product data, sample warranties, fastener pull testing reports or other information shall be submitted as portable document format (PDF) files.
 - c. All submittals shall be reviewed/approved in writing by the roof manufacturer and include a letter from the roof system manufacturer stating the roof design has been reviewed and approved by the manufacturer with zero exceptions.

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- d. Provide written evidence from the roofing manufacturer indicating the roofing installer is certified as receiving the manufacturer's highest level of certification status (e.g. Johns Manville "Peak Advantage Pinnacle Contractor").
2. Allow **fourteen (14)** calendar days for submittal review.

Submit **[insert quantity]** copies of the CD-ROM and **[insert quantity]** copies of the 3-ring binder, each labeled with all pertinent information needed to identify the submittal.

3. Where submission of samples, shop drawings, or other items are required from suppliers or subcontractors, it shall be the Contractor's responsibility to see that such submittal items are complete, properly submitted and, if required, corrected and resubmitted so as not to delay the progress of the Work. All submittals shall be made by the Contractor. Submittals received from sources other than through Contractor will be returned "without action," (not reviewed and not approved).
4. Contractor shall not submit for review the products of manufacturers not listed as approved in the Contract Documents, including any addenda. Submittals for products that are not approved shall be rejected and will delay the review process. The Contractor shall assume full responsibility for any delays caused by unapproved manufacturer submittals.
5. Maximum Review of the Same Submittal: The same submittal will only be reviewed a maximum of two (2) times. If the same submittal is not correct within the two (2) submittal limit for the same item, Contractor will be shall assume full responsibility for any delays caused by subsequent reviews.

B. Content: Submittals shall contain the following minimum information:

1. Product Data: Manufacturer's latest edition of technical product data for each type of insulation and roofing product specified, including but not limited to insulation, membrane, flashing, asphaltic cements and mastics, primer, and fasteners. Include data substantiating that materials comply with requirements, including certification of modified bitumen sheet minimum polymer content. Mark proposed products clearly by circling, underlining or highlighting with a highlighter color that will reproduce when copied.
2. Material Safety Data Sheets: MSDS for each product shall be included immediately following its specific product data.
3. Manufacturer's Instructions: Detailed application instructions for the roof system being installed, to include general and specific recommendations, product storage and handling, weather restrictions and parameters, and application requirements.

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4. Florida Product Approvals: Provide documentation substantiating that all products submitted are approved for use in Florida.
5. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work for the following:
 - a. Base flashings and membrane terminations.
 - b. Typical roof insulation layout, including slopes.
 - c. Crickets, saddles, and tapered edge strips, including slopes.
 - d. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Samples for Verification: For the following products:
 - a. Three of each fastener type.
 - b. Three 6" strips of full roll width samples of each sheet material.
 - c. Three 6" strips of full roll width samples of rigid and/or flexible flashing, including side/end-lap seam.
 - d. Three 6" X 6" or larger samples of each type of insulation board.
7. Roof Assembly and Anchorage Submittal: A form required and authored by the Owner, which follows PART 3 of this Specification Section. Provide supporting test results from approved testing facilities demonstrating that the proposed fastening pattern(s) will meet or exceed the required wind loads.
8. Qualification Data: Submit evidence satisfactory to Owner that the proposed installer is currently approved by the roofing materials manufacturer. Substantiation may include a "Certificate of License" issued to roofing installer by manufacturer.
9. Manufacturer's Certificates: Signed by roofing manufacturer, certifying that compliance with requirements specified in "Performance Requirements" Article has been achieved for:
 - a. Corrosion resistance of proposed mechanical fasteners.
 - b. Class A fire rating of proposed components.
10. Maintenance Data: For roofing system, to include in maintenance manuals.
11. Roofing System Manufacturer's Written Statement: From roofing manufacturer (on roof manufacturer's letterhead), acknowledging the manufacturer has reviewed and accepts the specified warranty requirements with no exceptions. The manufacturer's written statement shall clearly indicate their intent to provide the specified warranty upon the successful installation of the roofing system and upon their receipt of full payment for all roofing system materials.
12. Roofing Installer's Written Statement: From roofing installer (on roof installer's letterhead), acknowledging installer has reviewed and accepts the specified warranty requirements with no exceptions. Reference warranty form which appears in a separate Specification Section.

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13. Roofing System Manufacturer's Final Warranty: Manufacturer's standard twenty (20) year, no dollar limit warranty. Warrantor shall provide completed warranty form at project closeout, clearly indicating all aspects of specified warranty coverage.
14. Roofing Installer's Final Warranty: A form required and authored by the Owner, which appears in a separate Specification Section. Installer shall provide completed warranty form at project closeout.

1.7 QUALITY ASSURANCE

- A. Coordinated Installation: Except as otherwise indicated, perform roofing and flashing work as a single integrated unit of work, without division of responsibility between separate installers. Single installer responsibility required.
- B. Manufacturer Qualifications: Provide primary products, including insulation (where indicated), each type of roofing sheet (felt), bitumen, and composition flashings produced by a single manufacturer, which has produced that type product successfully for not less than 5 years. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.
- C. Installer Qualifications: A single installer ("roofer") must perform the work of this Section and have not less than 5 years of successful experience in installation of roofing systems similar to those specified for this project, and which be acceptable to and approved and/or licensed by manufacturer of primary roofing materials.
 1. Obtain written certification from manufacturer of roofing system certifying that installer is approved by manufacturer for installation of specified roofing system and approved at the manufacturer's highest level of certification status, e.g. Johns Manville "Peak Advantage Pinnacle Contractor."
 2. Installer shall maintain full-time, non-working supervisor/foreman on job site during times that roofing is in progress. Installer's supervisor/foreman shall have minimum of 5 years of experience in roofing work of similar nature and scope in specified roofing system.
 3. Installer shall have an office located within a 100 mile radius of the Owner's Maintenance Operations Center, located at 4805 E. Dr. Martin Luther King Jr. Blvd., Tampa, Florida 33605.
- D. Manufacturer's Inspections: Manufacturer's authorized representative shall conduct periodic inspections to identify deficiencies in workmanship or materials as described in PART 3 of this specification.
- E. Reference Standards: In addition to applicable regulations of authorities having jurisdiction, comply with the following:
 1. Florida Building Code (FBC) – Current Edition

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2. Factory Mutual Global (FM) – Insulation fastener type and spacing requirements
3. FM Global Data Sheet 1-30 – Repair of Wind Damaged Roof Areas
4. FM Global Data Sheet 1-33 – Safeguarding Torch-Applied Roof Installations
5. ANSI/SPRI ES-1 – Standard Field Test procedure for determining the withdrawing resistance of roofing fasteners
6. ASTM C 728 – Standard Specification for Perlite Thermal Insulation
7. ASTM C 1013 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Roof Insulation
8. ASTM D 41 – Asphalt Primer Used in Roofing and Waterproofing
9. ASTM D 146 – Standard Test Methods For Sampling And Testing Bitumen-Saturated Felts And Wove Fabrics For Roofing And Waterproofing
10. ASTM D 312 – Standard Specification For Asphalt Used In Roofing
11. ASTM D 1970 – Self Adhering Polymer-Modified Bituminous Sheet Material used as Underlayment
12. ASTM D 2178 – Standard Specification For Asphalt Glass Felt Used In Roofing And Waterproofing
13. ASTM D 3019 – Specification for lap cement used with asphalt roll roofing, non-fibered, asbestos fibered, asbestos free. **Asbestos containing materials are prohibited from use on this project.**
14. ASTM D 4601 – Standard Specification For Asphalt-Coated Glass Base Fiber Base Sheet Used In Roofing
15. ASTM D 4586 – Asphalt or Modified Bitumen Roof Cement, Asbestos-Free
16. ASTM D 5147 – Test Method for Sampling and Testing Modified Bituminous Sheet Materials
17. ASTM D 6163 – Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
18. ASTM D 6164 – Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements
19. ASTM D 6298 – Standard Specification For Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheets With An Applied Metal Face
20. ASTM E108 – Fire Tests of Roof Coverings
21. NFPA 241 – Standard for Safeguarding Construction, Alteration and Demolition Operations
22. NFPA 58 – Standard for the Storage and Handling of Liquefied Petroleum Gases
23. NRCA ML102 – The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual
24. NRCA ML214 – The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual
25. OSHA 2207 – Occupational Safety and Health Administration Construction Industry Standards
26. OSHA Regulation 29 CFR 1926 - Occupational Safety and Health Administration Construction Industry Regulation
27. SMACNA - Sheet Metal & Air-Conditioning Contractors' National Association, Inc., Architectural Sheet Metal Manual
28. UL FRD – Underwriters' Laboratory, Fire Resistance Directory
29. UL RMSD – Underwriters' Laboratory, Roofing Materials and Systems Directory
30. UL 580 –Standard Tests For Uplift Resistance Of Roof Assemblies

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- 31. UL 790 – Tests For Fire Resistance Of Roof Covering Materials
- 32. UL 997 – Wind Resistance of Prepared Roof Covering Materials
- 33. UL 1256 – Fire Test of Roof Deck Constructions

F. Preinstallation Roofing Conference

1. Approximately two weeks prior to scheduled commencement of roofing installation and associated work, Contractor shall conduct a meeting at project site with the Owner's Building Code Inspector, the Design Professional, roofing system manufacturer's authorized representative, and subcontractors, including **[installers of deck or substrate to receive roofing work,]** installers of each component of work specified in this Section, installers of other work in the vicinity of the roof (i.e., mechanical, electrical, etc.) and any other representatives directly concerned with performance of the Work. The preinstallation roofing conference shall be conducted after all submittals have been provided and reviewed/approved by the Design Professional.
2. Record discussions of conference, including decisions, agreements reached, and unresolved disagreements. Furnish a copy of record to each all attendees.
3. Review methods and procedures related to roofing work, including, but not limited to, the following:
 - a. Tour representative areas of roofing substrates (decks) to inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
 - b. Review roofing system requirements (Drawings, Specifications, and other Contract Documents) for possible conflicts and resolutions.
 - c. Review required submittals, including those returned by the Design Professional as "Approved as Noted" or "Furnish as Corrected" as of the date of the conference.
 - d. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - e. Review required inspections, testing, certifying, and materials usage accounting procedures.
 - f. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
 - g. Review work safety requirements.
 - h. Review step-by-step installation methods of all components specified in this Section, and include a written description thereof in the discussion record.

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1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

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

- C. Protect roof insulation materials, roof cover board and roofing membranes including felt plies from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation. Roof insulation, cover board and membrane materials shall be covered and protected from moisture within a well ventilated storage area at all times without exception. Roof insulation, cover board and membrane materials protected by factory shrink wrapped plastic sheeting alone shall not be acceptable.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

- A. Existing Construction
 - Prior to commencement of installation, Contractor shall verify condition of existing conditions, including:
 - 1. Roof deck and/or substrate condition as being acceptable for Work specified in this Section
 - 2. Varying deck and wall thickness for length of required anchoring devices
- B. Environmental Limitations
 - 1. Do not install roofing during rain or start roofing if rain is probable during installation.
 - 2. Do not install roofing when there is ice, frost, surface moisture, or dampness visible on the surface to which roofing is to be applied.

1.10 WARRANTIES

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- A. Roofing System Manufacturer's Warranty: Manufacturer's customized form, without monetary limitation, in which manufacturer agrees to repair or replace all components of membrane roofing system that fail in materials or workmanship within specified warranty period.
1. Roofing System Manufacturer's warranty includes:
 - a. Membrane roofing, base flashings, wall flashing (over 12" high), roof insulation, fasteners, cover boards, roofing accessories, and other components of membrane roofing system including materials which are not produced by the roof system manufacturer.
 - b. Additionally, the roof system manufacturer's warranty shall include all cost associated with replacement of all defective roofing system materials resultant of manufacturing or the contractor's installation.
 - c. Subject warranty shall also guaranty 100% watertight construction throughout the duration of the warranty.
 - d. The roofing system manufacturer's warranty shall guaranty the roof shall perform in a watertight manner without damage resultant of wind speeds up to mph as recorded by the nearest weather station on non-EHPA buildings, and up to 120 mph on EHPA buildings. **The appropriate Wind Rider(s) shall be included with the manufacturer's warranty documents.**
 - e. "Leak", for the purpose of the warranty coverage, is hereby defined as the admission of water into the roof system, flashings, or building through an opening, separation, or other similar failure of the roof.
 2. Warranty Period: Twenty (20) years from date of Substantial Completion.
- B. Roofing Installer's Warranty: Submit roofing Installer's warranty, on warranty form which appears in a separate Specification Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, sheet metal, vapor retarders, sealants, pourable sealers and walkway products, for the defined warranty period. The roofing installer's warranty shall guaranty aspects of performance and watertightness for each of the aforementioned roof system components including sheet metal flashing, sealants and pourable sealers.
1. Roofing Installer's Warranty shall include a requirement for the roofing installer to conduct one (1) roof inspection per year on each roof section throughout the duration of the contractor's five (5) year warranty. The roofing installer shall be required to produce a roof inspection report for each inspection which identifies all items in need of attention, any repair work performed, etc., which shall be furnished to Owner within 5 working days of the inspection.

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2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

Subject to compliance with requirements, provide only those products specified herein. Refer to Schedule 1 – Recommended Roofing Materials (By Manufacturer), which follows PART 3 of this Section.

2.1 ASPHALT BARRIER MATERIALS

Sheathing Paper: Red-rosin type, used as an asphalt barrier over all wood and structural wood fiber roof decks. Rolls shall be 36" wide approximately 500 sf per roll and 9.0 to 11.5 mils thick.

2.2 ANCHOR SHEET MATERIALS

- A. Anchor Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and coated, heavy-weight glass-fiber sheet, 36" wide, with fine mineral surfacing on both sides.
- B. Anchor Sheet: ASTM D 4601, Type II, vented base sheet asphalt-impregnated and coated, heavy-weight glass-fiber sheet, 36" wide, with fine mineral surfacing on both sides.

2.3 FIRE BARRIER MATERIALS

Fire Barrier: A roof cover board, ¼" (min.) thickness and 4' x 4' (max.) size, meeting Factory Mutual (FM) Class 1 and Underwriters Laboratories (UL) Class A fire ratings for unlimited slope in fire barrier applications, per UL 790. A fire barrier is required whenever roofing or flashing materials are to be torch-applied over combustible decks, wood parapet framing and blocking, or plastic foam insulation.

The roof cover board shall be manufactured or approved in writing by the roof system manufacturer to ensure compatibility and warranty coverage. Cover board shall be a material type which does not contribute toward blistering of roof membrane. Owner's requirement for a fire barrier is independent from, but may be incorporated into, any code-required fire rating for a roof or roof-ceiling assembly.

Products: Subject to compliance with requirements, provide one of the following:

- A. Asphaltic Core Board: A mineral-fortified asphaltic core laminated between two asphalt-saturated fiberglass liners. Acceptable products include:
 - 1. Soprema, Inc.: Sopraboard,
 - 2. Siplast: Asphaltic Roof Board

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3. IKO Industries, Inc.: Protectoboard
 4. Other manufacturer's product, meeting the following performance criteria:
 - a. Moisture Content (DSM #9.90.60): 5 (max)
 - b. Moisture Absorption (ASTM D 146): 5 (max)
 - c. Dimensional Stability (ASTM D 1204): 1.0 (max)
- B. High Density Polyiso Board: A high-density, closed-cell polyisocyanurate foam core, with mineral coated fiber glass-reinforced facers. Acceptable products include:
1. Carlisle SynTec Systems: SecurShield HD Plus
 2. Firestone Building Products: ISOGARD HD Cover Board
 3. GAF: EnergyGuard HD Polyiso Cover Board
 4. Johns Manville: Invinsa Roof Board
 5. Other manufacturer's product, meeting the following performance criteria:
 - a. Moisture Vapor Permeance (ASTM E 96): < 1 perm
 - b. Water Absorption (ASTM C 209): 2% by vol (max)
 - c. Surface Water Absorption (ASTM C 473) < 1 gram
 - d. Dimensional Stability (ASTM D 2126): < 0.6%

2.4 FELT-PLY SHEET MATERIALS

Glass-Fiber Felt-ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt which meets thickness required by material manufacturer as specified within Schedule 1 – Recommended Roofing Materials (By Manufacturer), which follows PART 3 of this Section.

2.5 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. Smooth-Surfaced Interply Sheet: ASTM D 6163, Grade S, Type I, SBS-modified asphalt sheet (reinforced with glass fibers), or ASTM D 6164, Grade S, Type I, SBS-modified asphalt sheet (reinforced with polyester fabric); smooth surfaced; **120 mil** (minimum) thickness, suitable for hot-asphalt application.
- B. Granule-Surfaced Cap Sheet: Subject to compliance with requirements of PART 3, provide the following:

Torch Applied: ASTM D 6163, Grade S, Type II, SBS-modified asphalt sheet (reinforced with glass fibers), or ASTM D 6164, Grade G, Type I, SBS-modified asphalt sheet (reinforced with polyester fabric); granule surfaced; **160 mil** (minimum) thickness, suitable for torch application.

Granule Color: White

2.6 TWO-PLY BASE FLASHING SHEET MATERIALS

2-PLY SBS MODIFIED BITUMINOUS MEMBRANE ROOFING TORCH APPLIED CAP WITH FELT-PLY SHEET

- A. Flashing Backer Sheet: ASTM D 6163, Grade S, Type I, SBS-modified asphalt sheet (reinforced with glass fibers), or ASTM D 6164, Grade S, Type I, SBS-modified asphalt sheet (reinforced with polyester fabric); smooth surfaced; **120 mil** (minimum) thickness; suitable for torch application.
- B. Flashing Cap Sheet: ASTM D 6163, Grade S, Type II, SBS-modified asphalt sheet (reinforced with glass fibers), or ASTM D 6164, Grade G, Type I, SBS-modified asphalt sheet (reinforced with polyester fabric); granular surfaced; **150 mil** (minimum) thickness, suitable for torch application.

Granule Color: White

- C. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668, Type I, suitable for use with roofing mastics in low slope roofing systems.

2.7 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials shall be compatible with roofing membrane and recommended or approved and warranted by the roofing system manufacturer for specified use.
- B. Asphalt Primer: ASTM D 41, used to prepare surfaces for hot asphalt.
- C. Roofing Asphalt: ASTM D312, Type IV Asphalt used for roofing ply application and adhesive for insulation.
- D. Modified Asphalt Roofing Cement: ASTM D 4586, reinforced with non-asbestos fibers and special mineral stabilizers, for use as a utility adhesive with SBS modified bitumen roofing systems. Product must be produced or sold by the roofing system manufacturer.
- E. Mechanical Fasteners
 - 1. General
 - a. Provide factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening specified roofing components to roof deck.
 - b. Provide mechanical fasteners specifically approved by Factory Mutual for use on roofs of specified class with specified wind uplift, and as appropriate for type of roof deck material.
 - 2. Anchor Sheet Fasteners

**2-PLY SBS MODIFIED BITUMINOUS MEMBRANE ROOFING
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- a. For asphalt-impregnated glass-fiber sheet over wood deck: Minimum requirements for anchor sheet fasteners shall be 1" long, with ring shanks and 1" heads.
- b. For asphalt-impregnated glass-fiber sheet over cementitious deck: Galvalume plated steel split-shank fasteners. Subject to compliance with requirements, provide one of the following:
 - 1) Insulation and membrane fastener, similar to Twin Loc-Nail
 - 2) Anchor sheet fastener/disk, similar to FM-90, 1.2" or 1.7", by ES Products
- c. For asphalt-impregnated glass-fiber sheet over structural wood fiber deck: Galvalume plated steel split-shank fasteners. Subject to compliance with requirements, provide the following:

Insulation and membrane fastener, similar to Twin Loc-Nail

3. Provide coated corrosion-resistant fasteners as recommended by the roofing material manufacturer's printed instructions and meeting the requirements of FM A/S4470 and FM P/7825c for Class I roof deck construction, and for the wind uplift resistance specified.

For fastening of membrane or felts to wood materials, provide fasteners driven through 1-inch (25mm) diameter metal discs, or one-piece composite fasteners with heads not less than 1-inch (25mm) in diameter or 1-inch (25mm) square with rounded or 45 degree tapered corners.
 4. For securing modified bitumen sheets, metal items, and accessories to masonry or concrete walls and vertical surfaces, provide hardened steel screws with flat heads, diamond shaped points, and mechanically deformed shanks not less than 1 1/4 inch long.
 5. Metal Plates: Round, flat, corrosion-resistant stress plates as recommended by the roofing material manufacturer's printed instructions, and meeting the requirements of FM A/S4470; not less than 2 inches in diameter for anchor sheet application and 3" in diameter for insulation attachment. Discs shall be formed to prevent dishing or cupping.
- F. Cant Strip: Provide preformed cant, 4", unless indicated otherwise, with 45 degree face. Cants shall be asphalt-impregnated perlite, 1-1/2 inch (min.) thick. Wood fiber cant strips are not acceptable.
- G. Pitch Pan: **Use of pitch pans or pitch pockets is not permitted** unless specifically indicated or approved in writing. When permitted, include the following:
1. Fill: Provide two- part polyurethane based flexible pourable sealer applied over 2" base of cured non-shrink grout.

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2. Cover: Provide stainless steel (24 ga.) sheet metal umbrella, as indicated on the Drawings which shall include hemmed edges and an approximate 30 degree bend along the top to form a sealant tray to receive elastomeric sealant.
3. Provide elastomeric sealant along top of sealant tray onto clean substrates 100% free of asphalt residue or other contaminants and tool sealant to shed water.

H. Walk Pads:

Roof walk pads shall be polyester reinforced, granule-surfaced, SBS modified bitumen membrane material, **200** mil (minimum) thickness.

The walk pad material shall be a contrasting color from the cap sheet. Avoid dark colors.

PART 3 - EXECUTION

3.1 MINIMUM CONSTRUCTION SAFETY PRECAUTIONS

A. The contractor shall take every precaution to maintain a safe campus for students, faculty, facility staff, workmen and visitors. It is the contractor's sole responsibility to maintain a safe work site. All materials and work required to create and maintain a safe work site shall be included in the cost of the Work. Any conditions deemed unsafe by the Owner shall be immediately corrected by the contractor. Minimum requirements include the following:

1. Barricades: Contractor shall restrict access to work site by placing rigid barricades around kettles, tank trucks, ladders and roof access points and other work areas, including, but not limited to, staging areas for hoisting, debris removal, and materials storage. Rigid barricades may include flexible safety fence (snow fence) or any other fence-like barricade that can be easily relocated but which cannot be easily crossed by pedestrians.
2. Work on Occupied Buildings
 - a. The following Work is strictly **prohibited** on occupied buildings:
 - 1) Demolition or removal of any existing roofing materials.
 - 2) Construction, repair, or replacement of structural framing, including roof deck, parapet walls or roof edges
 - 3) Installation or replacement of roofing insulation, fire barrier boards, anchor sheets (if required), or felt-ply roofing membrane
 - 4) Loading of roof deck with roofing materials or heavy equipment at any time prior to final completion

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TORCH APPLIED CAP WITH FELT-PLY SHEET

- 5) Use of hot asphalt for mopping in insulation or felt-ply sheets
- b. After the installation of the fire barrier and felt-ply sheet has been completed and the roof assembly is watertight, the following Work is **allowed** on occupied buildings:
 - 1) Torch application of SBS modified asphalt cap sheet
 - 2) Torch application of SBS modified asphalt base flashing
 - 3) Installation of sheet metal flashing and trim
3. Fire Extinguishers: Required on each roof where work is performed and at each location where a kettle is in service. A minimum of three (3) 20-lb fire extinguishers (20A-120BC) in proper working order shall be on the roof, located within 30 feet of the area where hot-asphalt or torching operations are being performed.
4. Hot Asphalt Safety Rules
 - a. The use of hot asphalt for mopping in *any roofing materials* is allowable only after *all* of the following conditions are met:
 - 1) Students and faculty are not present within the building(s) on which hot asphalt is being applied, and
 - 2) Administrative and custodial staff are not directly below the area(s) where hot asphalt is being applied, and
 - 3) Asphalt fume recovery units are installed and functioning properly
 - b. Locate kettle at least 10 feet away from any building and any egress path or exit, and at least 20 feet away from building air intakes, unless the intakes are turned off and sealed.
5. Torch Safety Rules:
 - a. Air conditioning units and ventilating fans shall be shut down before torch work is done in surrounding areas. When working close enough to an air conditioning unit that dust, dirt, fumes etc. may enter the building, damage the finish of the equipment, or damage the equipment, the units shall be covered.
 - b. The torch flame shall not be applied to a combustible substrate when installing any membrane. An approved fire barrier is required for separation of combustible decks, combustible parapet framing and plastic foam insulation from torch-application of roofing membranes or base flashing.
 - c. When foam plastic, kraft-faced glass fiber, or wood fiber insulation or cant strips, or plastic fastener plates are to be used, they shall be covered with a

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minimum 40 lb (18.2 kg) organic felt base sheet or a glass fiber felt base sheet adhered with hot asphalt before any torch applied membrane is installed. A full mop of hot asphalt should be used, unless the system is specifically listed in the Factory Mutual Research Approval Guide for base sheet installation, using a strip or spot mopping of asphalt or mechanical securement. Torch flames should not come in contact with exposed plastic roofing cement.

- d. Install targets or metal collars around penetrations in combustible deck to prevent flames from reaching the deck or under the decks.
- e. All torches shall be self igniting or pilot-only torches. No full-time torches are permitted on the project site.
- f. In the attics of roofs having combustible decks, install temporary smoke detectors prior to commencement of torching application and remove the smoke detectors one week after all torching operations on that building have been completed.
- g. The Contractor shall provide a competent individual "watchman" who will remain on site for a minimum of one hour after torching work is completed to monitor the areas where the torches were used, including at the end of each work shift. The individual shall have heat detection equipment such as infra-red cameras or digital thermometers. The individual shall also have a cell phone with the telephone number of the closest fire department programmed into the phone.
- h. Foremen and the "watchman" shall have successfully completed fire safety training provided by the local fire department, or other acceptable source for fire safety training, prior to commencement of the Work.
- i. Flammable liquids shall not be stored on the roof. 20lb liquid propane (LP) gas tanks and 5-gallon metal gas cans may be kept on the roof while the Work is in progress, provided they are removed and stored on the ground at the completion of each day's work shift.

B. Safety Equipment

The contractor shall provide equipment or verify workmen provide equipment or work-wear for the project that is approved for use by OSHA. This includes:

- 1. Work shoes
- 2. Hard hats
- 3. Gloves
- 4. Long sleeve shirts and long pants
- 5. Power tools
- 6. Scaffolding

C. Ladder Safety

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Comply with all OSHA requirements, and the following:

1. Place ladders on solid surfaces and at proper angles to the roof.
2. Tie ladders off at the roof and place barricades around ladders.
3. Do not place ladders in front of doors or entrances unless those are closed and blocked to use while the ladder is in place.
4. Use only ladders that are in good condition and not damaged.

D. Vehicle Safety

1. Park vehicles belonging to the contracting firm or workmen only in locations approved by Owner.
2. Contractor's parking area, if near a building, shall be clearly delineated with warning lines for pedestrians. Dump trucks parked on the work site shall be surrounded with barricades.
3. Provide observers on the ground any time vehicles near the school are backing up.
4. Maintain a safe speed when moving vehicles on school property.

E. Materials Hoisting Safety

1. Hoisting operations shall be performed only on unoccupied buildings and only in areas barricaded to entry.
2. All equipment shall be in good working order and designed for hoisting operation for which is being used.
3. Workmen shall be on the ground and the roof during hoisting and shall maintain a safe operation.

F. Securing of Site

Immediately following each day's work, the site shall be secured by the following minimum means:

1. Remove ladders from the site or lock ladders with chains and padlocks on the ground to prevent movement.
2. Remove tools from the site and roof unless locked in proper tool boxes such as "job boxes."
3. Remove flammable liquids from the roof and site.

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4. Lock kettle valve to prevent opening and draining of hot asphalt.

3.2 SCHEDULE

A. Weather Related Delays

The Contractor acknowledges that the specified construction duration is sufficient to accommodate normal weather conditions. Normal conditions are defined as those shown on the Summary of Monthly Normals from 1981 – 2010 as published by the National Oceanic and Atmospheric Administration (NOAA). The following link is provided for convenience: <http://www.ncdc.noaa.gov/cdo-web/datatools/normals>

1. During the construction period the Contractor may be entitled to a time extension for days when weather conditions are abnormal, defined as follows:
 - a. Daily rainfall exceeds .1”
 - b. Daily average wind speed exceeds 25 mph
 - c. Morning temperature is 50 degrees and falling.
2. The requested time extension will be granted provided that:
 - a. Weather conditions delay a critical path activity and
 - b. The project is on schedule when the delay is incurred
3. The Request for Time extension is to be accompanied by data obtained from a Contractor-provided wireless weather station.
 - a. The station is to be located at the job site field office or ballast-mounted on the roof of the building. Equipment is not to be fastened to the building, either temporarily or permanently.
 - b. The equipment is to be removed upon completion of the project or may be offered to the school for educational purposes.
 - c. The following equipment or similar is suggested:
Manufacturer: Scientific Sales, Inc., <http://www.scientificsales.com/>
Model 6152 - Wireless Vantage Pro 2
Model 7716 - Mounting Tripod
Model 7717 - Mounting Pole Kit
Model 6510USB - WeatherLink Software for Vantage Pro2
4. If the Contractor elects **not** to provide a weather station, he hereby acknowledges that NOAA weather data collected at Tampa International Airport will be used as the basis for evaluating weather related delay claims, regardless of the site location.

B. Delays related to Owner-Required Work Stoppages

1. Work may not result in undue noise, vibration or other hindrance to Owner's full use of building. Such work must be performed during non-school hours and 48 hour advance notice to the Owner is required.

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2. In the event that noise, vibration or other impacts of construction disturb Owner's educational activities, as determined solely by Owner, Contractor shall immediately cease the particular operation causing such disturbance upon request by the Owner. Operation shall resume only when the building, or affected portions thereof, are no longer occupied, or when the Contractor has taken steps to mitigate or eliminate the disturbance associated with the operation.
3. The Owner may, at its sole discretion, curtail or suspend roofing operations to avoid disruption. In the event of such a suspension of the Work, Contractor shall be entitled to an extension of Contract Time to the extent that such suspension actually delays project completion.

3.3 EXAMINATION

A. Asbestos in Existing Roofs

1. Prior to any work being performed on existing roofing assemblies, the Owner's environmental consultant will conduct testing on existing roofing materials in accordance with requirements of the Asbestos Hazard Emergency Response Act (AHERA), as outlined in the Code of Federal Regulations, Chapter 40, Part 763, Subpart E, in order to determine whether Asbestos-Containing Material (ACM) exists within the roof. All existing roofing materials shall be presumed to be ACM, unless test results published by the Owner's environmental consultant indicate otherwise.
2. For existing roofing materials either presumed or positively confirmed as ACM, removal and disposal shall comply with applicable EPA regulations, and the following minimum requirements:
 - a. 29 CFR 1926.1101: OSHA's Asbestos Standard for the Construction Industry
 - b. 40 CFR Part 61, Subpart M: National Emission Standards for Hazardous Air Pollutants – Asbestos
 - c. Where conflicts exist among applicable requirements, the most stringent shall apply.
3. Contractor's supervisory personnel overseeing roofing demolition activities shall be trained and certified in the removal of roofing material containing asbestos.
4. All presumed or positively confirmed ACM shall be deposited as soon as is practical at an EPA-approved waste disposal or conversion site. A copy of the waste shipment records shall be sent to the **Owners Representative for transmittal to the District Safety Office.**

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5. Contractor may disregard the asbestos-related requirements outlined above only if test results published by the Owner's environmental consultant clearly indicate ACM is not present within existing roofing materials.
- B. Contractors Inspection
1. Examine substrates and conditions under which roofing work is to be performed and shall notify Design Professional in writing of unsatisfactory conditions.
 2. Do not proceed with roofing work until unsatisfactory conditions have been corrected in a manner acceptable to Design Professional.
 3. Examine surfaces over which roofing and flashing are to be applied. Do not install roofing over any surfaces until they are clean, dry, and free of all dirt and debris, and in an acceptable condition to receive new roofing materials. Voids greater than ¼ inch are not permitted in surfaces to receive roofing membrane and flashing.
- C. Code and Contract Inspections
1. The Contractor shall request code inspections in accordance with requirements published with the Building Permit. Minimum code inspections include the following:
 - a. Upon commencement of installation of new roofing materials
 - b. Prior to installation of the cap sheet
 2. See Owner's website, <http://www.sdhc.k12.fl.us/departments/21/building-code/>, for additional information regarding the code inspection request procedure.
 3. The Contractor shall request other specified inspections by submitting a request to the Design Professional a minimum of 24 hours in advance.
 4. Substantial and final completion inspections are to be requested in accordance with the terms of the Construction Contract.
- D. Manufacturer's Inspection
- The manufacturer's technical inspector, who has the authority to validate the acceptability of the Work for warranty, shall make regular site visits to examine and critique the Work. At a minimum, the inspector shall inspect at the following intervals:
1. Within two (2) days following commencement, and
 2. At least one (1) progress inspection per week throughout the course of the roof system installation for each roof area. The manufacturer shall furnish a written report for each site visit indicating any corrective action needed, or stating that

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zero defects were observed. The roof system manufacturer's reports shall be provided to the Design Professional weekly. Progress inspections are to include the following:

- a. Commencement of roof insulation installation.
- b. Commencement of all anchor sheets, felt-ply sheets, interply membrane(s) and cap sheet.

2. Within two (2) days prior to Substantial Completion.

3.4 PREPARATION

A. Protection

1. The work specified herein shall not preclude the use of procedures that will maintain a watertight building envelope. Therefore, while conforming to requirements of the Contract Documents, the Contractor shall also utilize skill and all necessary procedures to keep unwanted water out of the building while construction is in progress.
2. Surfaces not intended to receive roofing materials (i.e., adjacent paving, building walls, surfaces to receive sealants, paint, coatings, etc.) shall be protected from spillage, dripping, spotting and damage during application of the roofing, using the following minimum methods:
 - a. Lap protective materials at least 6 inches
 - b. Vent plastic sheets, if used, to keep moisture from condensing and collecting on covered surfaces.
 - c. Secure protective coverings against wind.
 - d. Leave protective coverings in place until roofing work has been completed.
3. Should protection be absent, inadequate, or otherwise ineffective, Contractor shall be responsible for restoring the respective surfaces to their original or like-new condition by cleaning, repairing, or replacing, as applicable for the circumstances and as directed by Design Professional, without additional cost to the Owner.
4. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
5. 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.

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B. Priming: Prime surface of concrete deck or metal surfaces with asphalt primer at a rate of $\frac{3}{4}$ gallon/100 sq. ft. and allow primer to dry.

C. Protrusions

1. Install and secure items which pass through roof prior to application of roofing. Extend all protrusions and penetrations as required to accommodate thickness of insulation.
2. Ensure that curbs and pipes extend no less than eight inches (8") above the finished surface of the roof. For Enhanced Hurricane Protected Area (EHPA) roofs, curbs and pipes shall extend no less than twelve inches (12") above the finished roof surface. (See FBC 423.25.4.5.2.)
3. Anchoring for curbs and curb extensions shall be designed and installed to meet applicable wind load criteria.

3.5 ASPHALT FUME RECOVERY SYSTEM

- A. Asphalt kettles shall have operative and effective fume recovery units in operation. Placement of the unit is subject to the approval of the Owner's District Safety Office (DSO). In no case shall the unit be located closer than 20 feet to building air intakes, unless the intake is turned off and sealed.
- B. Operation of the system shall limit emissions to one of the following:
 1. A maximum of 0.2mg/m³, which is the permissible exposure limit allowed by OSHA, or
 2. As allowed on the Material Safety Data Sheet (MSDS)
- C. The Owner's Safety Office will conduct periodic monitoring of roofing operations for compliance with these requirements. Roofing operations without effective fume recovery units shall be stopped and shall not resume until the fume recovery units are repaired or replaced, as acceptable to the Owner.

3.6 ASPHALT BARRIER INSTALLATION

Loosely lay one course of sheathing paper over wood or structural wood fiber deck, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.

3.7 ROOFING INSULATION INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation, and all other requirements specified herein.
- B. Install new insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

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- C. Install sumps, 4' x 4' in size, at each roof drain, with 1-1/2" in 12" slope (min.) to roof drain. The sump size may be increased up to 8' x 8' (max.), if required to prevent voids or buckles in the roof plies. Trim or taper surface of adjoining insulation so completed surface is flush and does not restrict flow of water.
- D. Where roofing membranes are to be torch-applied over combustible substrates or plastic foam insulation, install approved fire barrier boards with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches each direction from joints of insulation below. Multiple layers of roof insulation as well as fire barrier cover boards shall also have offset joints and gaps between abutting insulation board joints, fire barrier cover board joints or at roof penetrations shall not exceed 1/4" in width. Butt fire barrier board edges together and fasten to roof deck and vertical walls as required. Tape joints if required by roofing system manufacturer.

3.8 FIRE BARRIER INSTALLATION

Install fire barrier/ roof cover board in strict accordance with roof manufacturer's recommended instructions to prevent blistering which may result from latent moisture being released by hot asphalt mopping applications. Such preventive measures may include but are not limited to the use of a vented base sheet.

3.9 ROOF MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing," and as specified herein.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
- E. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four hour.

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

3.10 FELT-PLY SHEET INSTALLATION

Install glass-fiber felt-ply sheets according to roofing system manufacturer's written instructions starting at low point of the roofing system. Align glass-fiber felt-ply sheets without stretching. Extend felt-ply sheets and terminate 4" above cant strips, installing as follows:

Embed each glass-fiber felt-ply sheet in a continuous, void-free, 23-lb. mopping of hot roofing asphalt to form a uniform membrane.

3.11 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

Install modified bituminous roofing membrane interply and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets and terminate 2" above the edge of each previously installed roofing ply, installing as follows:

- A. Unroll modified bitumen membrane sheets and allow to relax minimum of 30 minutes prior to installing sheets. Ensure sheet is dry prior to installation.
- B. Provide minimum 3 inch side laps and minimum 6 inch end laps and as otherwise required by membrane manufacturer.
 - 1. Stagger end laps minimum 36 inches.
 - 2. Offset laps between felt-ply, interply and cap sheets a minimum of 12 inches.
- C. Fully adhere the modified asphalt interply sheet to the felt-ply sheet in a continuous, void-free, 23-lb. mopping of hot roofing asphalt to form a uniform membrane.
- D. Fully adhere the modified asphalt cap sheet to the interply sheet by torch application.
 - 1. Ensure substrate and membrane surfaces are warmed either naturally or by torch during the installation.
 - 2. Apply heat evenly to underside of roll membrane being installed, and exposed side of lap area of previously installed sheet. Provide for slight, uniform flow of bitumen in front of roll and full width of roll as the material is being unrolled or set into place. Heat sheets until hot asphalt flows out approximately ¼ inch along the side laps and is fully adhered to the sheet below without voids or air pockets. Avoid overheating the membrane or burning through to the membrane reinforcement.
 - 3. Apply uniform positive pressure to ensure membrane is fully adhered and all laps are sealed. Press laps and ends of rolls with a roller to assure proper adhesion. Ensure that a minimum of ¼ inch of asphalt is exposed at each lap.

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4. Prior to forming lap over granulated surfaces, embed granules of the receiving sheet by heating and troweling-in the granules to form a uniform black compound surface.
 5. Re-inspect and, if necessary, re-work until all laps are fully sealed.
- E. Provide tight smooth laminations of each membrane layer without wrinkles, ridges, buckles, kinks, fish mouths, or voids.
- F. Any delay in interply or cap sheet installation may result in thorough cleaning of the previously installed sheet surface and priming with asphalt primer prior to interply or cap sheet installation. Final decision shall be at the direction of the Design Professional or as required by the roofing manufacturer with the most stringent requirement prevailing.

3.12 BASE FLASHING AND STRIPPING INSTALLATION

- A. Install a 2-ply base flashing system over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
1. Backer Sheet Application:
 - a. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - b. Adhere backer sheet to substrate using torch application.
 2. Flashing Sheet Application:
 - a. Torch apply flashing sheet to backer sheet. Heat cap sheet granules and press them down to bring the asphalt to the surface. Avoid overheating the membrane or burning through to membrane reinforcement.
 - b. Apply uniform positive pressure to ensure membrane is fully adhered and all laps are sealed. Press laps and ends with a roller to assure proper adhesion.
 - c. At locations where bitumen bleed-out occurs, apply granules while bitumen is still hot.
- B. After the cap sheet is installed, install the base flashing system to a minimum height of 8 inches above the finished surface of the roofing system. (Exception: On EHPA facilities, base flashing shall extend 12 inches above finished roof surface.) Use a chalk line to maintain a straight bottom edge of the base flashing.
- C. Where the flashing is applied on a parapet wall, the flashing shall extend up and over the top of the wall and down the face so that all wood blocking is covered by the

2-PLY SBS MODIFIED BITUMINOUS MEMBRANE ROOFING TORCH APPLIED CAP WITH FELT-PLY SHEET

- base flashing a minimum of 1 inch. Secure the membrane to the wood blocking with fasteners spaced no greater than 12 inches apart.
- D. Mechanically fasten top edge of modified bituminous flashing maximum 6 inches on center through 1 inch (min.) diameter tin caps with fasteners of sufficient length to embed 1 inch (min.) into substrate.
 - E. Apply membrane liner over top of exposed nailers and blocking and to overlap top edge of base flashing installation at curbs, and as indicated elsewhere, to serve as a waterproof lining under sheet metal flashing components. At perimeter, liner shall extend 1 inch below the bottom edge of the lowest nailer. Cover all exposed wood and protect from rain during construction.

3.13 AUXILIARY MATERIALS INSTALLATION

- A. General: Coordinate installation of auxiliary materials so as to be integral with the roofing assembly.
- B. Conform to NRCA Roofing and Waterproofing Manual unless otherwise specified or recommended by the roofing material manufacturer.
- C. Do not use any type of cutback asphalt mastic (petroleum asphalt blended with mineral solvents) under any modified bitumen products.
- D. Roof Drains:
 - 1. **New roof drains:** Prime and set 30-inch-by-30-inch square 4lb. lead flashing in bed of modified asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring. Install stripping according to roofing system manufacturer's written instructions.
 - 2. **Existing roof drains to remain:** Install new roofing interply sheet up to drain bowl. Install roof cement and fiberglass fabric at the junction of the base ply and drain bowl. Install lead in a bed of roof cement and press into place. Prime lead and apply one ply of base sheet in asphalt or adhesive over the sheet. Apply modified asphalt cap sheet over base sheet, lap onto lead sheet and under clamping ring. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring. Install stripping according to roofing system manufacturer's written instructions.
- E. Set-On Accessories: Where pipe or conduit blocking and similar roof accessories, including lightning protection supports, are set on the membrane, adhere an additional layer of cap sheet material or walk pad material to bottom of pre-manufactured pipe/conduit stands or other set-on accessories prior to setting on roofing membrane. Specific method of installing set-on accessories must permit

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normal movement due to expansion, contraction, vibration, and similar occurrences without damaging roofing membrane. Do not mechanically secure set-on accessories through roofing membrane into roof deck substrate.

F. Penetration Flashing:

1. For small, single element penetrations, install metal flashings and metal counterflashings, as applicable. Clean and prime both sides of metal to be embedded in roof membrane system.
2. Set metal base flashings in a full, thick, uniform and continuous bed of **modified** asphalt roofing cement and secure to roof deck or wood nailers as applicable.
3. At lead vent pipe flashings, fold/roll lead flashing down into pipe a minimum of 1 inch.
4. Strip-in multiple plies of flexible base flashing sheets as recommended by roofing materials manufacturer, consistent with warranty requirements.
5. At juncture of metal base flashings and flexible base flashing sheets, apply a continuous bead of flashing cement.
6. Prime with asphalt primer all metal surfaces to which roofing membrane will be applied.
7. Secure metal counterflashing to penetrating element and seal with non-bituminous sealant over clean substrates 100% free of asphalt bitumen or other contaminant which would adversely affect sealant adhesion.
8. **Use of pitch pans or pitch pockets is not permitted** unless specifically indicated on Drawings or approved in writing. When permitted, include a 24-gauge stainless steel sheet metal umbrella wrapped around the penetrating conduit, pipe, etc., extended up and flared out at the top, filled with sealant and held in place with a stainless steel draw band. Provide hemmed edges on all exposed edges of sheet metal.

G. Walk Pads:

1. Roof walkway materials are to be applied as shown on the drawings or around each roof hatch and air conditioning unit. Any mechanical equipment on the roof that requires annual maintenance shall have walk pad material applied around the unit.
2. Walk pad material shall be minimum 36" wide and sheets no more than 6 feet long before a break. Provide a nominal 2" gap between walkway pads to promote roof surface drainage.

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3. Adhere the membrane to the surface of the cap sheet by torch application. Prepare cap sheet first by heating the surface and pressing the granules into the asphalt to achieve an asphalt-to-asphalt bond between the cap sheet and walk pad material.

H. Sheet Metal Flashing

1. Contractor shall coordinate installation of sheet metal flashing with the Work of other trades and requirements of the Contract Documents.
2. Install metal flashing in accordance with Division 7 Specifications, and as follows:
 - a. Set primed metal flashings in a full bed of compatible modified asphalt roofing cement and securely fasten to roof deck or wood nailers. Prime flanges of metal flashing on the roof surface and strip-in with trowelings of cement and flexible flashing strips so that strip extends not less than 8 inches beyond outer edge of flange.
 - b. For all metalwork to be stripped in to the roofing system, primer shall be applied by brush and not roller or spray, unless followed by brushing. Primer shall be applied to both sides of horizontal metal flanges.

3.14 TEMPORARY ROOFING

- A. At the end of each day's roofing installation and prior to the onset of inclement weather, provide temporary roofing and flashing as necessary to maintain building in a watertight condition at all times during course of work. Temporarily seal projections through the roof, and surrounding intersections so that no moisture enters roofing membrane or building structure before work resumes.
- B. Water Cut-Offs: Roofing insulation line shall be straightened using loose-laid cut insulation sheets and the terminated edge of the roofing system shall be sealed watertight.
- C. Provide temporary flashing at drains, curbs, walls and other penetrations and terminations of roofing membrane until the roofing system installation is complete and the permanent flashings are applied.
- D. Close drains with permanent or temporary strainers at the end of each work day.
- E. Temporary work shall be removed before continuing with application of the permanent roof system.

3.15 PROTECTING AND CLEANING

- A. Immediately protect completed portions of roofing from damage by subsequent construction activities, in accordance with contract requirements. Do not permit

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- storage, unnecessary walking, wheeling and trucking directly on applied roofing materials.
- B. Provide temporary walkways, runways and platforms of smooth clean insulation boards or planks as necessary to avoid damage to the installed roofing materials and to distribute weight uniformly in order to avoid overloading the roof structure.
 - C. Use clean rubber-tired equipment for roofing work.
 - D. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing the nature and extent of any such damage in a written report, with copies to Design Professional and Owner. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
 - E. For the entire duration of construction, Contractor shall repair, replace, or otherwise remedy any roofing material damaged as a result of subsequent construction activities or moisture intrusion, without additional cost to Owner.

3.16 FIELD QUALITY CONTROL

- A. During the work of this Section, Contractor shall make visual inspections as necessary, verifying that:
 - 1. All materials of this Section comply with the specified requirements.
 - 2. All materials are properly stored and handled.
 - 3. Asphalt is heated in kettles with operating thermometers to temperatures in compliance with the equiviscous temperatures method (EVT) as recommended by the NRCA. At no time shall the asphalt be heated and held to a temperature within 25 degrees of the flash point of the asphalt.
 - 4. Asphalt that has been held at a temperature exceeding the finished blowing temperature for more than 4 hours is discarded and not used in the Work.
 - 5. The asphalt manufacturer shall provide the flash point, finished blowing temperature and EVT on each container of asphalt.
 - 6. Membrane heating is provided uniformly for full melt and even flow of bitumen on underside of roll.
 - 7. The proper number and types of plies are installed, with the specified overlaps.
 - 8. The proper number, type, and spacing of fasteners are installed.

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9. Associated flashings and sheet metal are installed in a timely manner, in accordance with specified requirements.
10. All laps in felt-ply, interply and cap sheet are fully adhered without voids, skips, fishmouths, or open "T" joints.
11. Insulation is properly secured to the substrate and nailers are provided where and as needed.
12. Nightly tie-offs are properly made and effective.

3.17 POST INSTALLATION AUDIT

- A. Upon Substantial Completion, Design Professional shall conduct an infrared scan to identify whether thermal anomalies indicate potential moisture is present within the roofing system. Should thermal anomalies identify areas of suspect entrapped moisture, the contractor shall be required to provide roof cores at suspect conditions which shall be evaluated by an independent test laboratory utilizing gravimetric analysis test procedures with test results submitted to the Design Professional of record and the roof system manufacturer for mandatory review and recommendations. Should the laboratory testing indicate there is no detrimental presence of entrapped moisture within the system, the contractor shall be compensated for the removal/repair of each roof core based on a pre-established unit cost. Conversely, percentages of entrapped moisture deemed detrimental to the roofing system shall result in cost associated with roof core sampling and repairs solely at contractor's expense
- B. When practicable, infrared scanning of the roof membrane should be conducted prior to the installation of the roof membrane cap sheet rather than upon Substantial Completion, so as to avoid patching the finished roof surface.
- C. The Post Installation Audit Report is to include photographs of each roof area. At a minimum, provide the following photographs of each roof area:
 1. One overall photo taken from one corner, angled so as to capture the largest area.
 2. A second overall photo from the opposite corner.
 3. Individual photos of each special condition, including but not limited to curbs, flashing, scuppers, roof drains, expansion joints, changes in elevation and the like.
 4. Each photograph is to be labeled with the date, building number, direction of photograph and other descriptive information as needed for clarity.

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3.18 PROJECT CLOSEOUT

A. As soon as possible following Substantial Completion, Contractor shall submit the following documents to Design Professional:

1. Manufacturer's certification that the finished roofing system complies with the Contract Documents.
2. Warranties and bonds: Submit all warranties specified herein, and include a graphical image depicting roof area(s) covered by Manufacturer's Warranty; identified using Owner's building numbers.
3. Other close out documents as specified.

B. Roof Warranty Inspections

1. Within 1 year of the warranty commencement, **each year thereafter**, and again within two months of the expiration of the Installer's 5-year warranty, the Contractor shall schedule a visual examination of the warranted roofing system with the manufacturer and the Owner. This shall include one (1) roof inspection per year on each roof section.
2. The Contractor shall correct and restore to a warrantable condition any deficiencies discovered in warranted work or materials, at no additional cost the Owner.
3. A Warranty Inspection Report shall be submitted to the Owner, listing the date of the visit, warranty number, participants, facility name, and a description of any deficiencies found and corrections made. The report shall also include any deficiencies found that were not a part of the original project, but which require the Owner's attention.

SCHEDULE OF RECOMMENDED ROOFING MATERIALS FOLLOWS...

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SCHEDULE 1 - RECOMMENDED ROOFING MATERIALS (BY MANUFACTURER)

The materials and products listed below establish a standard of required function, dimension, appearance and quality. Requests for substitution may be considered at the discretion of the Architect and the Owner. Each such request shall include the name of the material for which it is to be substituted with evidence the proposed substitution material meets or exceeds all specified requirements and satisfies all aspects of the stipulated warranties. Additionally, a complete description of the proposed substitution including drawings, cuts, performance and test data and any other information necessary for an evaluation shall be provided to the Architect for review. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitution is on the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

A. CERTAINTEED®

1. Asphalt: **As approved by roofing membrane manufacturer.**
2. Anchor Sheet (when required for nailable decks): **Glasbase Base Sheet**
3. Felt-Ply Sheet: **Flintglas Premium Ply Sheet Type IV**
4. Roofing Membrane
 - a. Interply: **Flintlastic Ultra Poly SMS Base Sheet**
 - b. Cap Sheet: **Flintlastic GTS (White)**
5. Base Flashing
 - a. Backer Sheet: **Flintlastic Base 20 T**
 - b. Cap Sheet: **Flintlastic GTS (White)**

B. FIRESTONE®

1. Asphalt: **As approved by membrane manufacturer.**
2. Anchor Sheet (when required for nailable decks): **MB Base M**
3. Felt-Ply Sheet: **Ply IV**
4. Roofing Membrane
 - a. Interply: **SBS Smooth**
 - b. Cap Sheet: **SBS Premium FR Torch (White)**
5. Base Flashing
 - a. Backer Sheet: **SBS Glass Torch Base**
 - b. Cap Sheet: **SBS Torch (White)**

C. GAF®

1. Asphalt: **As approved by roofing membrane manufacturer.**
2. Anchor Sheet (when required for nailable decks): **GAFGLAS #75**
3. Felt-Ply Sheet: **GAFGLAS Ply 4**
4. Roofing Membrane
 - a. Interply: **Ruberoid Mop Plus Smooth**
 - b. Cap Sheet: **Ruberoid Heat-Weld Plus FR (White)**
5. Base Flashing
 - a. Backer Sheet: **Ruberoid SBS Heat-Weld Smooth**

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- b. Cap Sheet: **Ruberoid SBS Heat-Weld Plus (White)**

- D. **JOHNS MANVILLE®**
 - 1. Asphalt: **As approved by roofing membrane manufacturer.**
 - 2. Anchor Sheet (when required for nailable decks): **PermaPly 28**
 - 3. Felt-Ply Sheet: **GlasPly IV**
 - 4. Roofing Membrane
 - a. Interply: **Dynalastic 180 S**
 - b. Cap Sheet: **DynaWeld Cap 250 FR (White)**
 - 5. Base Flashing
 - a. Backer Sheet: **DynaWeld Base**
 - b. Cap Sheet: **DynaWeld Cap (White)**

- E. **SOPREMA®**
 - 1. Asphalt: **As approved by roofing membrane manufacturer.**
 - 2. Anchor Sheet (when required for nailable decks): **ASTM D4601, Type II**
 - 3. Felt-Ply Sheet: **ASTM D2178, Type IV**
 - 4. Roofing Membrane
 - a. Interply: **Sopralene 180 PS**
 - b. Cap Sheet: **Sopralene Flam 250 FR Granules (White)**
 - 5. Base Flashing
 - a. Backer Sheet: **Sopralene Flam 180**
 - b. Cap Sheet: **Sopralene Flam 180 Granules (White)**

END OF SCHEDULE

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Roof Assembly and Anchorage Submittal

(To be completed by contractor and manufacturer)

Project Name: _____
 Project Address: _____
 Applicable roof area(s): _____
 (Use separate forms for different roof/deck assemblies and roofing systems.)

Contractor Name, contact person, address, phone, email:
 Name of Person Preparing Form:

Parapet Height: _____ Roof Height: _____
 Exposure Category: _____ Basic Wind Speed: _____
 (Insert component and cladding wind loads (PSF) from Drawings: Effective wind area= 10sq. ft)

Zone 1 Field:	Zone 2 Perimeter:	Zone 3 Corner:

Roofing System Manufacturer: _____
 Authority for determining compliance: (check one below)
 Florida Product Approval No.: _____
 Dade County Notice of Acceptance No.: _____
 FM Global No.: _____
 Underwriters Laboratories No.: _____
 Independent Laboratory No.: _____

Deck Information:

Deck: Type: _____ Gauge/Thickness: _____ Existing Slope: _____ in 12" (Deck or structure only, not insulation)

Fiberglass Anchor sheet: (Where Applicable for Nailable Decks)
 Anchor Sheet fastener Type: _____

Insulation:

Top cover board layer type: _____ Size and thickness: _____
 Top insulation fastener/bonding material: _____
 Bottom and intermediate layer(s) of insulation _____ Size and thickness: _____
 Bottom and intermediate layer(s) of insulation fastener/bonding material: _____

Number of fasteners per insulation board, per RAS 117:

Zone 1 Field:	Zone 2 Perimeter:	Zone 3 Corner:

Roof Membrane:
 Top Ply or Cap Sheet type: _____
 Interply Sheet type: _____
 Felt-ply Sheet type: (where applicable) _____

Anchor/Interply Sheet:

Fastener spacing for anchor/interply sheet attachment, per RAS 117:
 Zone 1 Field: _____" o.c. @Lap, # Rows: _____@ _____" o.c.
 Zone 2 Perimeter: _____" o.c. @Lap, # Rows: _____@ _____" o.c.
 Zone 3 Corner: _____" o.c. @Lap, # Rows: _____@ _____" o.c.

Form Prepared by: _____ Date: _____
 Testing Firm: _____

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[Design Professional: INSERT SUPPLEMENTAL INFORMATION HERE]
[System Test Data, Fastener Pullout Test Report, etc.]