

HCPS ROOFING SYSTEM 5 – SINGLE-PLY THERMOPLASTIC MEMBRANE ROOFING

DOCUMENT NUMBER: 07 54 16


APPLICATION: ELEMENTARY, MIDDLE AND HIGH SCHOOL



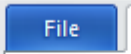
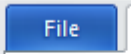
DATE OF ISSUE:

- 10-02-14 - **Revised Part 2.2 – Single-Ply Roofing Membrane Materials.**
- 10-01-14 - Added paragraph 3.1.A.2.f, concerning Work on Occupied Buildings
- 09-29-14 - First Issue

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. The use of hot-asphalt is specifically prohibited with the specified single-ply membrane roofing system unless written approval is provided by the Owner which will be decided on a case by case basis.
3. **Prior to publishing the specifications**, the Design Professional (A/E) who prepares the project manual shall **edit the information appearing in red brackets [...] , or as otherwise instructed, as appropriate to the project.** Delete brackets and change edited text to match the formatting of adjacent text. **All text in the final document shall be black.**
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.** If the sample editing instructions immediately following this paragraph are invisible, refer to *Microsoft Office Word (2007) Help* for guidance on displaying hidden text, and then show all formatting marks. **Do not print hidden text in the final document.**

Editing instructions appear as blue hidden text. Toggling the "Show/Hide formatting marks" command (using the  button) toggles the display of hidden text.

To display hidden text in Word documents		Click the Microsoft Office Button  , 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.
Word 2007		
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Word 2010/13		

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. Alternative testing may be performed for systems with adhered roof insulation and membrane providing testing meets the requirements of the appropriate FBC TAS

ATTACHMENTS: Specification Section 07 54 16 – HCPS Roofing System 5, dated 10-02-14

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A/E shall specify system type based on project requirements. It is the Owner's intent that the use of single-ply membrane roofing systems be generally limited to ancillary buildings (e.g., warehouses, machine shops, etc.) and covered walkways. The use of single-ply systems on any other building type (e.g., educational spaces, administrative offices, etc.) requires prior written approval by the Owner. Owner's approval is contingent upon receipt of a written justification from the design professional.

- A. This Section includes the following:

Retain only one of the following two paragraphs, unless both membrane types are required. Edit the information appearing in red brackets, as appropriate to the Project.

1. A single-ply **[mechanically fastened] [fully adhered]** elastic sheet Polyvinyl Chloride Copolymer Alloy (PVC) 60 MIL roofing system, including all flashings, etc., without exception, as indicated on the Drawings and specified herein.
2. A single-ply **[mechanically fastened] [fully adhered]** elastic sheet Ketone Ethylene Ester (KEE) 45 MIL roofing system, including all flashings, etc., without exception, as indicated on the Drawings and specified herein.

- B. Related Sections include the following:

Edit the information appearing in red brackets below, as appropriate to the Project Manual.

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.

DESIGN CONSIDERATION: Require pre-manufactured aluminum fixed access ladder(s), with or without fixed cages as required by OSHA, wherever elevation changes between roof areas exceed 30" in height. (Refer to FBC 1509.6.) Anchor ladder to wall with stainless steel hardware. Avoid anchoring through roofing systems whenever possible. Specify in Division 5, with the basis of design being Model 502, as manufactured by O'Keefe's Architectural Building Products, Inc. < <http://www.okeeffes.com/> >.

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”

DESIGN CONSIDERATION: New internal roof drains, when required, shall be cast iron units only, including cast iron vandal-resistant domes and deck clamps, with no-hub connections, located at least 36” from inside edge of parapet or gravel stop unless restricted by existing conditions for re-roofing projects. Drains shall be 4” minimum, or larger as required. The basis of design shall be Josam 22010 Series. For locations where required clearance for drain installation is limited, the Contractor may use the Zurn 103-90 roof drain with threaded connections. For steel roof decks, reinforce drain openings with steel angle frame fastened to adjacent structure. Refer to HCPS Standard Roof Details and coordinate with information shown on the Drawings. Roof insulation shall be tapered as required to achieve 4’ x 4’ sumps at primary roof drains.

The A/E shall stipulate unit pricing on the bid form for additional roof drains as required on re-roofing projects should additional drains beyond those shown on the renovation documents be required to alleviate ponding water.

Delete paragraph below, if internal drains are not part of the Work.

9. Refer to Division [22], Section ["Facility Storm Drainage"] for roof drains.

1.3 DEFINITIONS

- A. DESIGN UPLIFT PRESSURE – The uplift pressure, calculated according to procedures in the Single Ply Roofing Institute (SPRI) "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) *before* multiplication by a safety factor.
- B. 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.
- C. 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 system 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. Additionally, system shall exhibit resistance to ponding water for the specified warranty period.

Edit the information appearing in red brackets below, as appropriate to the Project.

- 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]
 4. Wind Speed: [120] mph minimum.

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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 I 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.

Retain the next paragraph for reroofing projects where the existing structural framing and/or roof deck is combustible, or where the ceiling or roof/ceiling assembly is not fire rated, or where the slope of the roof deck exceeds that allowable for a Class A roof assembly

1. 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.

F. Solar Reflectance Index (SRI): Membrane shall exhibit not less than 78 SRI when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.5 ROOF SYSTEM DESIGN

DESIGN CONSIDERATION: A suitable gypsum sheathing cover board may be incorporated into the roofing system at the discretion of the A/E to achieve optimum roofing membrane substrates.

Edit the Roof Assembly described below, as appropriate to the Project. Delete any components not required for the Project. Coordinate with information shown on the Drawings.

A. Roof Assembly

1. Deck Type(s): **[Wood] [Structural Wood Fiber] [Gypsum] [Insulating Concrete] [Steel]**
2. Thermal Barrier: **[Polyisocyanurate] [and] [Perlite]** insulation above roof deck.
3. Cover Board: A roof cover board, 4' x 4' (max.) size.
4. Roof membrane system including all flashings.

B. Anchoring and Attachment

1. Attach insulation as follows:

Choose at least one of the following subparagraphs, based upon project conditions. Edit as required for insulation and mechanical attachment of single-ply roof membrane system. Coordinate fastener type with previously obtained pull-out resistance test results.

a. To Wood Deck:

- 1) Remail the existing deck to the framing in compliance with the requirements of the building code.
- 2) Mechanically fasten **[insulation] [roof cover board]** to wood deck, using **[(Insert type of fastener here)]**.

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- b. To Structural Wood Fiber Deck: Mechanically fasten insulation to structural wood fiber deck, using **[(Insert type of fastener here)]**.
 - c. To Gypsum Deck: Mechanically fasten using tubular fasteners with a dual barb, split shank fasteners or as recommended by manufacturer.
 - d. To **[Insulating Concrete over]** Steel Deck: Fully adhere or mechanically attach using **[(Insert type of fastener here)]** anchored **[through insulating concrete]** into the steel deck.
 - e. Adhering roof insulation shall be considered in situations where mechanical fastening is not a viable option providing the system has been tested and/or meets the requirements of the Florida Building Code.
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*, the *Single Ply Roofing Institute (SPRI): Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems*, *Wind Design Guide for Roof Edge Systems* and *ANSI/SPRI ES-1*.

1.6 SUBMITTALS

- A. Procedure: Submittals shall be 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.
 - 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 ten (10) calendar days for submittal review.

Require sufficient quantity of duplicate submittals to conduct the review and communicate the disposition to the Contractor. The Owner requires a single CD-ROM containing the final approved submittal in electronic format.

- a. 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

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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, cements, mastics, primer, and fasteners. Include data substantiating that materials comply with requirements. 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.
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.

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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.
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 membrane, plates/fasteners, adhesives, etc. 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." 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.
 2. 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, or damage resulting from the work of other trades. Inspections shall include but are not limited to the following periods:
 1. Within two (2) days following commencement, and
 2. During installation (at least once per 10,000 SF [100 squares] of installed roofing), and
 3. Immediately upon completion of roofing installation, including but not limited to the following:
 - a. At least one (1) inspection per week throughout the course of the roof system installation for each roof area.
 - b. Upon commencement of roof insulation installation.
 - c. Upon commencement of all roof membranes.

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- d. The roof system manufacturer shall be required to furnish a written report for each site visit which clearly indicates all areas of corrective action needed and/or all roof construction was observed to be installed with zero defects. The roof system manufacturer's reports shall be provided to the A/E and Owner within 5 working days of each visit.
 4. Within two (2) days prior to Substantial Completion.
- E. Reference Standards: In addition to applicable regulations of authorities having jurisdiction, comply with the following:
1. Florida Building Code (FBC) – Current Edition
 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. Single-Ply Roofing Institute (SPRI)
 6. ANSI/SPRI ES-1 – Standard Field Test procedure for determining the withdrawing resistance of roofing fasteners
 7. ASTM C 728 – Standard Specification for Perlite Thermal Insulation
 8. ASTM C 1013 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Roof Insulation
 9. ASTM D 146 – Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing

Retain only one of the following two paragraphs, unless both membrane types are required.

10. ASTM D 4434 – Standard Specification for Poly(Vinyl Chloride) Sheet Roofing
1. ASTM D 6754 – Standard Specification for Ketone Ethylene Ester (KEE) Based Sheet Roofing
11. ASTM E108 – Fire Tests of Roof Coverings
12. NFPA 241 – Standard for Safeguarding Construction, Alteration and Demolition Operations
13. NFPA 58 – Standard for the Storage and Handling of Liquefied Petroleum Gases
14. NRCA ML102 – The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual
15. NRCA ML214 – The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual
16. OSHA 2207 – Occupational Safety and Health Administration Construction Industry Standards
17. OSHA Regulation 29 CFR 1926 - Occupational Safety and Health Administration Construction Industry Regulation
18. SMACNA - Sheet Metal & Air-Conditioning Contractors' National Association, Inc., Architectural Sheet Metal Manual
19. UL FRD – Underwriters' Laboratory, Fire Resistance Directory
20. UL RMSD – Underwriters' Laboratory, Roofing Materials and Systems Directory
21. UL 580 – Standard Tests For Uplift Resistance Of Roof Assemblies
22. UL 790 – Tests For Fire Resistance Of Roof Covering Materials
23. UL 997 – Wind Resistance of Prepared Roof Covering Materials

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24. 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 designated Building 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 A/E.
2. Record discussions of conference, including decisions, agreements reached, and unresolved disagreements. Furnish a copy of record to 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 A/E 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.

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.
 1. 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 from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply

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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. Any roof insulation, cover board or membrane materials that are not properly protected and are exposed to moisture (rain, dew, condensation, etc.) during delivery, storage or handling shall be promptly removed from the project site and under no circumstances shall wet materials be installed within the roof system.

- 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

- 1. Prior to commencement of installation, Contractor shall verify condition of existing conditions, including:
 - a. Roof deck and/or substrate condition as being acceptable for Work specified in this Section
 - b. 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

The A/E shall include provision for a "120 mph Wind Rider" as provided by the Roof System Manufacturer on the bid form for all Enhanced Hurricane Protection Area (EHPA) buildings.

- 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 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. 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. Subject warranty shall also guaranty 100% watertight construction throughout the duration of the warranty. The warranty shall also cover the cost for all corrections and repairs associated with roof membrane blistering (regardless of whether or not blisters have ruptured) over cover boards. The roofing system manufacturer's warranty shall guaranty the roof shall perform in a watertight manner without damage resultant of wind speeds up to 73 mph as recorded by the nearest weather station.
 - 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

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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 following warranty period. The warranty shall also cover the cost for all corrections and repairs associated with roof membrane blistering (regardless of whether or not blisters have ruptured) over cover boards. 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.
2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. ROOF COVER BOARD MATERIALS

A/E shall specify a roof cover board material which is compatible not only with the specified roofing system, but also with the specified method of installation.

- A. Cover Board: A roof cover board (if required), 4' x 4' (max.) size, approved by the manufacturer for use in the specified roofing system.
 1. Products: Subject to compliance with requirements, provide the following:

Retain one of the following two paragraphs, a. or b..

- 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
 - 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)
 - a) 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

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d) Dimensional Stability (ASTM D 2126): < 0.6%

2.2. SINGLE-PLY ROOFING MEMBRANE MATERIALS

Retain only one of the following two paragraphs (B or C), unless both membrane types are required. A/E shall specify whether roof membrane is to be smooth or fleece-backed, as required to comply with project requirements. Edit the information appearing in red brackets below, as appropriate to the Project.

A. General:

1. All membranes must have certification, by letter from the roof system manufacturer, stating that the submitted project specific membrane formulation has a minimum of 20 years of successful performance history in the state of Florida. Roof system manufacturer must provide locations to be visited for performance inspection by the A/E and/or Owner.
2. All roof system manufacturers must provide documentation that the submitted membrane physical properties are comparable to the typical membrane properties specified (for 60 mil PVC and 45 mil KEE membranes respectively) as determined by the A/E.
3. Unless approved otherwise prior to project bid, all roofing components are to be supplied through the acceptable roof system manufacturer and be included in the warranty coverage.

B. PVC Sheet: Polyvinyl chloride copolymer alloy complying with ASTM D 4434, Type **[II] **[III]**, Grade I.**

1. Basis of Design Manufacturer:

- a. Sika Sarnafil, Inc. – **[G410]** **[S327]** EnergySmart Roof Membrane.
- b. Thickness: 60 mils (+/-2 mils)
- c. Exposed Face Color: **[Specify Color from Manufacturer’s Standard Colors]**

2. Additional Acceptable Manufacturers:

- a. Johns Manville Corporation
- b. **Duro-Last Roofing, Incorporated**
- c. GAF Materials Corporation
- d. **Carlisle Syntec Systems**

3. Physical Properties:

<u>ASTM D 4434 Test Method(s)</u>	<u>ASTM D4434 Type III Min. Req.</u>	<u>60 mil Typ. Values</u>
Thickness, in. (mil) <i>ASTM D 751</i>	0.045 in. (45 mil)	.060 In. (60 mil)
Thickness over Scrim in. (mil) <i>ASTM D 7635</i>	0.016 (16 mil)	0.030 (30 mil)
Breaking Strength lbf/in (KN/m) <i>ASTM D 751 – Grab Method</i>	200 (35)	305
Elongation at Break (Cross Direction) % <i>ASTM D 751 – Grab Method</i>	15	29.5
Seam Strength, min.	75% of orig.	Pass

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<i>ASTM D 751 – Grab Method</i>		
Tear Strength (Cross Direction) lbf (N)	45 (200)	48.5
<i>ASTM D 751 proc. B.</i>		
Linear Dimensional Change (Cross Direction) %	.5% max.	-0.13%
<i>ASTM D 1204 max %</i>		
Low Temperature Bend	Pass	Pass
<i>ASTM D 2136 (°F)</i>		
Retention of Properties after Heat Aging	Pass	Pass
<i>ASTM D 3045 – 176°F/56 days</i>		
Change in Weight after Exposure in Water	<3.0%	2%
<i>ASTM D 570 158°F, 168h, one side only, max %</i>		
Static Puncture Resistance	Pass	Pass
<i>ASTM D 5602 (33lbf)</i>		
Dynamic Puncture Resistance	Pass	Pass
<i>ASTM D 5635 (14.7ft-lbf)</i>		
Accelerated Weathering (UV Exposure)	5,000 hr.	10,000 hr.
<i>ASTM G 15</i>		
Cracking or Cratering at 7x magnification	Pass	Pass
Discoloration		
Solar Reflective Index (SRI)	n/a	104

C. KEE Sheet: 45-mil ketone ethylene ester (KEE) membrane, reinforced with a 5-oz yd² knitted polyester fabric conforming to the typical physical properties as outlined below. The membrane should exceed the physical property requirements and the surface compound should meet polymer content definitions as outlined in ASTM D 6754 - 02 Standard Specification for Ketone Ethylene Ester (KEE) Sheet Roofing.

1. Basis of Design Manufacturer:
 - a. Seaman Corporation, Product 45 mil Fibertite-SM **[FB]**
 - b. Thickness: 45 mils nominal.
 - c. Exposed Face Color: **[Specify Color from Manufacturer’s Standard Colors]**

2. Physical Properties

<u>ASTM D 6754-02 Test Method(s)</u>	<u>ASTM D6754 Min. Req.</u>	<u>45 mil Typ. Values</u>
Thickness, mm (in.) <i>ASTM D 751</i>	0.79 (0.031)	1.14 (0.045) nom.
Thickness over Fiber mm (in) <i>Optical method (inches)</i>	0.15 (0.006)	0.37 (0.0145)
Breaking Strength N (lbf) <i>ASTM D 751 proc. B – strip</i>	1175 (265)	1557 (350)
Elongation at Break % <i>ASTM D 751 - strip</i>	15	18
Tear Strength N (lbf) <i>ASTM D 751 proc. B. tongue tear</i>	335 (75)	445 (100)
Linear Dimensional Change % <i>ASTM D 1204 max %</i>	1.3	0.63

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Fabric Adhesion N/m (lbf/in) <i>ASTM D 751</i>	225 (13)	No Peel
Low Temperature Bend <i>ASTM D 2136 (°F)</i>	-30	-40
Retention of Properties after Heat Aging <i>ASTM D 3045 – 176°F/156 days</i>		
Breaking Strength Strip % Original:	90	90
Elongation at Break Strip % Original:	90	90
Low Temperature Bend after Heat Aging	-30	-40
Change in Weight after Exposure in Water <i>ASTM D 471 158°F, 166h, one side only, max %</i>	0.0 +6.0	0.0, +3.7
Factory Seam Strength N (lbf) <i>ASTM D 751 Grab Method</i>	1780 (400)	> Fabric Strength
Hydrostatic Resistance Mpa (psi) <i>ASTM D 751</i>	3.5 (500)	5.2 (750)
Static Puncture Resistance <i>ASTM D 5602 (99lbf)</i>	Pass	Pass
Dynamic Puncture Resistance (J) <i>ASTM D 5635</i>	10	25
Accelerated Weathering <i>Practice G 155 / xenon</i>	5,000 hr.	10,000 hr.
Cracking or Crazing at 7x magnification Accelerated Weathering <i>Practice G 154 / UVA</i>	None 5,000 hr.	None 10,000 hr.
Cracking or Crazing at 7x magnification	None	None
Fungi Resistance: <i>Practice G 21, 28 days</i>		
Sustained Growth	None	None
Fungi Resistance: Discoloration	None	None
Abrasion Test Cycles <i>ASTM D 3389 H-18 wheel / 1,000 g load</i>	1,500	> 2,000
Solar Reflective Index (SRI)	n/a	98.54

- D. Sheet Flashing: Manufacturer’s standard sheet flashing of same material, type, reinforcement, thickness and color as roofing membrane. Include factory pre-formed inside and outside corners, pipe boot flashings, “T” lap patches and other factory fabricated sheet flashing accessories.

2.3. 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. Roof Membrane Primer: As required by the roof manufacturer for various substrates.
- C. Sheet Lap Seaming System: Manufacturer's standard methods for hot air welding all laps and joints.
- D. Tapered Edge Strips and Flashing Accessories: Types recommended by manufacturer of roofing system material, provided at locations indicated and at locations recommended by manufacturer, including adhesive tapes, flashing cements, and sealants.

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- E. Flashing Accessories: Types recommended by manufacturer of roofing membrane material, provided at locations indicated and at locations recommended by manufacturer, including adhesive, tapes, flashing cements, and sealants.
 - 1. Provide preformed cone sheet flashings at all vent pipe, conduit and other penetrations.
- F. Laminated Metal Flashing: Roofing membrane manufacturer's standard metal flashing sheet laminated with polyvinyl chloride alloy coating. Form to profiles shown on the drawings.
- G. Sealant: Roofing system manufacturer's standard single component, non-sag, rubber base elastomeric sealant
- H. Mechanical Fasteners: Roof system manufacturer's corrosion resistant plates, caps, fasteners and accessory components, fastening devices, and adhesives to suit substrate and as recommended by roofing membrane manufacturer and conforming to FM 4470 specifications.
- I. Insulation/Membrane Adhesive: As recommended by roofing membrane manufacturer for particular substrate and project conditions.
- J. Metal Termination Bar: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8" thick; with stainless steel fasteners.
- K. Pitch Pan: **Use of pitch pans or pitch pockets is not permitted** unless specifically indicated on Drawings or otherwise approved in writing by Design Professional or Owner. When permitted, include the following:
 - 1. Fill: Provide two- part polyurethane based flexible pourable sealer applied over 2" base of cured non-shrink grout.
 - 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 residue or other contaminants and tool sealant to shed water.

Retain paragraph below for roof walkway pads.

- L. Walk Pads:
 - 1. Roof walk pads shall be manufactured by the roof membrane manufacturer.
 - a. The walkway material shall be a contrasting color from the field cap sheet.

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's inspectors shall be immediately addressed by the contractor, at no additional cost to the Owner. 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

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- 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: **(NOTE: HCPS Roofing System 5 precludes the use of hot asphalt.)**
 - 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 or cover boards.
 - 4) Loading of roof deck with roofing materials or heavy equipment at any time prior to final completion
 - 5) Use of hot asphalt for mopping in insulation or membrane sheets
 - b. After the installation of the roof membrane system has been completed and the roof assembly is watertight, the following Work is **allowed** on occupied buildings:
 - 1) Installation of sheet metal flashing and trim
 - c. Contractor shall coordinate the use of cold-applied adhesives with on site personnel to ensure fumes/vapors do not permeate building interiors. At a minimum, contractor shall:
 - 1) Ensure all HVAC units with outside air louvers are shut down in the vicinity of roofing work.
 - 2) If HVAC units cannot be shut down, contractor shall install filter media along all exterior intake louvers in the vicinity of roofing work.
 - d. When operations are scheduled that may cause undue noise, vibration or other hindrance to Owner's full use of building, coordinate method and time of operations with the Owner a minimum of three (3) days in advance so as not to interfere with Owner's operations.
 - e. If 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. 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.
 - f. The Owner may, at its sole discretion, curtail or suspend roofing operations to avoid disrupting certain high-stakes testing. 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 causes a delay in the project completion.
 3. Fire Extinguishers: Required on each roof where work is performed and at each location where a kettle is in service or where hot air welding equipment is used. 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 hot air welding operations are being performed.
 4. Hot Asphalt Safety Rules: **(NOTE: HCPS Roofing System 5 precludes the use of hot asphalt.)**
 - a. The use of hot asphalt for mopping in *any roofing materials* is allowable only after *all* of the following conditions are met:

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- 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. General Safety Rules:
- a. Air conditioning units and ventilating fans should 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 Owner requires an approved protective barrier where hot asphalt is used.
 - c. 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.
 - d. The Contractor shall provide a competent individual “watchman” who will remain on site for a minimum of one hour after work is completed to monitor the areas where roofing materials have been applied in a manner in which combustible materials are susceptible to igniting, 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.
 - e. 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.
 - f. 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

1. 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:
 - a. Work shoes
 - b. Hard hats
 - c. Gloves
 - d. Long sleeve shirts and long pants
 - e. Power tools
 - f. Scaffolding

C. Ladder Safety

1. Comply with all OSHA requirements, and the following:
 - a. Place ladders on solid surfaces and at proper angles to the roof.

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- b. Tie ladders off at the roof and place barricades around ladders.
- c. Do not place ladders in front of doors or entrances unless those are closed and blocked to use while the ladder is in place.
- d. 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

- 1. Immediately following each day's work, the site shall be secured by the following minimum means:
 - a. Remove ladders from the site or lock ladders with chains and padlocks on the ground to prevent movement.
 - b. Remove tools from the site and roof unless locked in proper tool boxes such as "job boxes."
 - c. Remove flammable liquids from the roof and site.
 - d. Lock kettle valve to prevent opening and draining of hot asphalt.

3.2 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

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- 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 Owner, at the following address:

Hillsborough County Public Schools
District Safety Office, ATTN: Mr. Glen Lathers
4224 West Crest Avenue
Tampa, FL 33614

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. Contractor’s 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 or projections over 1/8 inch are not permitted in surfaces to receive roofing membrane and flashing. In no instance shall roofing membrane be applied over sharp substrates which may cut or otherwise damage the roofing membrane.

C. Owner’s Inspection

1. The Contractor shall request an Owner’s inspection, in accordance with requirements published on the Owner’s website. Minimum inspections include the following:
 - a. Upon commencement of installation of new roofing materials
 - b. Prior to installation of the sheet metal flashings and terminations.
 - c. Substantial Completion and Final Completion
2. See Owner’s website, <http://www.sdhc.k12.fl.us/departments/21/building-code/>, for inspection request procedure.

D. Manufacturer’s Inspection

1. The manufacturer’s technical inspector, who has the authority to validate the acceptability of the warranty, shall make regular site visits to examine and critique the Work. At a minimum, the inspector shall inspect at the following intervals:
 - a. Within two (2) days following commencement, and
 - b. During installation (at least once per 10,000 SF [100 squares] of installed roofing), and
 - c. Immediately upon completion of roofing installation, including but not limited to the following:

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- 1) At least one (1) inspection per week throughout the course of the roof system installation for each roof area.
 - 2) Upon commencement of roof insulation installation.
 - 3) Upon commencement of all membrane(s).
 - 4) The roof system manufacturer shall be required to furnish a written report for each site visit which clearly indicates all areas of corrective action needed and/or all roof construction was observed to be installed with zero defects. The roof system manufacturer's reports shall be provided to the A/E and Owner within 5 working days of each visit.
- d. Within two (2) days prior to Substantial Completion.

Retain the next paragraph if the project requires replacement of existing roofing.

2. Once the existing roof has been removed and the roof deck exposed at each roof section, manufacturer's technical inspector, together with the design professional, shall examine the deck to determine suitability for compliance with roofing attachment requirements, prior to installing new roof assembly. Accordingly, the A/E shall provide revised attachment requirements as required which shall be approved by the roof manufacturer in a timely manner to ensure project delays are not encountered.

3.3 PREPARATION

Retain the next paragraph if the project requires replacement of existing roofing.

A. Total Installation Concept

1. A complete new roofing system has been specified. Partial replacement, patching, or splicing new roofing into existing are not acceptable under any circumstances.
2. If a section of existing roof warrants excessive reworking and/or patching, the entire area or section of roofing shall be replaced. This shall mean from edge and/or expansion joint to edge and/or expansion joint, in both directions. At the discretion of the A/E and the roof system manufacturer the roof area in question may be cleaned, primed and overlaid with an additional layer of cap sheet or repaired as deemed acceptable.

B. 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,

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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.
6. 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. Any roof insulation, cover board or membrane materials that are not properly protected and are exposed to moisture (rain, dew, condensation, etc.) at any time shall be promptly removed from the project site and under no circumstances shall wet materials be installed within the roof system.

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.

3.4 ROOFING INSULATION INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation and all other requirements specified herein. Roof insulation materials shall be covered and protected from moisture within a well ventilated storage area at all times without exception. Roof insulation materials protected by factory shrink wrapped plastic sheeting alone shall not be acceptable.

Retain paragraph below if insulation strips shaped to fit into topside ribs of acoustical roof deck are installed in this Section.

- B. Install new insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.
- C. Install sumps, 4' x 4' in size, at each roof drain. Trim or taper surface of adjoining insulation so completed surface is flush and does not restrict flow of water.
- D. Install approved insulation with long joints in continuous straight lines with end joints staggered between rows. Multiple layers of roof insulation shall have offset joints a minimum of 6" and gaps between abutting insulation board joints or at roof penetrations shall not exceed 1/4" in width. Tape joints if required by roofing system manufacturer.

A/E shall specify insulation to be adhered or mechanically fastened. Delete paragraphs that are not applicable to system selected. If insulation is to be adhered, specify method.

- E. Mechanically fasten insulation over substrate as per manufacturer's installation instructions. OR
- E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

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1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place. OR
1. Set each layer of insulation in a uniform coverage of full-spread adhesive, firmly pressing maintaining insulation in place. OR

3.5 COVER BOARD INSTALLATION

- A. Cover board materials shall be covered and protected from moisture within a well ventilated storage area at all times without exception. Cover board materials protected by factory shrink wrapped plastic sheeting alone shall not be acceptable.
- B. Install approved cover 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. Gaps between abutting cover board joints or at roof penetrations shall not exceed ¼” in width. Butt cover board edges together and fasten to roof deck and/or vertical walls as required. Tape joints if required by roofing system manufacturer.

3.6 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions 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, cover board 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. The entire roof system including all penetrations should be left in a watertight manner at the end of each workday. Any installed roof insulation or cover board materials that are not properly protected and are exposed to moisture (rain, dew, condensation, etc.) during roof membrane installation shall be promptly removed and replaced. The contractor shall be responsible for removal of all wet materials and under no circumstances shall wet insulation or cover board materials from the project site be left in place and allowed to “dry out”.
- F. Substrate-Joint Penetrations: Prevent adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.7 SINGLE-PLY ROOFING MEMBRANE INSTALLATION

A/E shall specify membrane to be adhered or mechanically fastened. Delete paragraphs that are not applicable to system selected.

- A. Mechanically fasten membrane roofing over substrate as per manufacturer’s installation instructions. OR
- A. Adhere membrane roofing over substrate as per manufacturer’s installation instructions.
 1. Apply bonding adhesive to substrate at rate required by manufacturer and allow to partially dry before installing membrane roofing.
 2. Do not apply bonding adhesive to splice area of membrane roofing.

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3. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations and perimeter of roofing.
- B. Factory Fabricated Rolls: Install roofing membrane manufacturer's standard width rolls snug, but not taut, utilizing chalk lines and maintaining good (lay flat) characteristics.
1. Stagger end laps unless published installation instructions indicate differently.
 2. Stagger factory welds to prevent alignment upon each other.
 3. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- C. Seams: Clean seam areas, overlap membrane roofing and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
1. Perform all welding by qualified personnel.
 2. Prior to welding, power blow dust and contaminants, remove foreign material from seams using roof membrane manufacturer approved cleaning solvent and clean cotton wiping cloths.
 3. Test hot air welding equipment on separate strips of membrane prior to beginning work each day or at the start of each work shift to ensure hot air welding guns are properly set and calibrated.
 4. All finished seams shall exhibit a homogeneous bond minimum of 1-1/2" wide.
 5. Test lap edges with probe to verify seam weld continuity throughout the course of each work shift.
 6. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 7. Repair tears, voids and lapped seams in roofing that does not comply with requirements.
- D. Install sheet flashings and preformed flashing accessories on to substrates according to manufacturer's installation instructions.
1. Apply bonding adhesive to substrate at rate required by manufacturer and allow to partially dry before installing sheet flashings.
 2. Do not apply bonding adhesive to splice area of sheet flashings.
 3. Terminate and seal top of sheet flashings and mechanically anchor to substrate through metal termination bars.
 4. Apply sealant as recommended by the roof system manufacturer along terminating edges of the roof membrane.
- 3.8 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 and the Single-Ply Roofing Institute (SPRI) recommendations unless otherwise specified or recommended by the roofing material manufacturer.
- C. Roof Drains: Install roof drains per manufacturer recommended instructions.
- D. Set-On Accessories: Where pipe or conduit blocking and similar roof accessories, including lightning protection supports and cable clamps, are set on the membrane, adhere or hot air weld an additional layer of membrane or walk pad material to bottom of premanufactured pipe/conduit stands or other set-on accessories prior to setting on roofing membrane. Specific method of installing set-on accessories must permit normal movement due to expansion, contraction, vibration, and similar occurrences

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without damaging roofing membrane. Do not mechanically secure set-on accessories through roofing membrane into roof deck substrate.

- E. Roof Edge Flashing: Fabricate roof edge flashing to profiles shown on drawings and per requirements of Division [7], Section ["**Sheet Metal Flashing and Trim**"].
 - 1. All flashings shall be fully adhered to properly prepared, approved substrate(s), with manufacturer's approved adhesives or mastic applied in sufficient quantity to insure total adhesion.
 - 2. Provide and install as per manufacturer's instructions.
- F. Coping, Coping Accessories and Counterflashings: Utilize wall counterflashings and copings as shown on drawings and per the requirements of Division [7], Section ["**Sheet Metal Flashing and Trim**"].
 - 1. Fill joint between flashing and wall with sealant as specified within Division [7], Section ["**Building Sealants**"].
- G. Laminated Metal Flashings: Install laminated metal flashings where indicated. Comply with roofing membrane manufacturer's instructions.
- H. Roof Penetration Flashing: Install preformed flashing accessories and clean all pipes, conduits, stacks and other penetrations to bare metal.
 - 1. Flash all penetrations in strict accordance with roofing membrane manufacturer's details and methods.
- I. **Use of pitch pans or pitch pockets is not permitted** unless specifically indicated on Drawings or otherwise approved in writing by Design Professional or Owner. 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.

Retain paragraph below for roof walkway pad installation.

- J. 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.
 - 3. Adhere the walk pad to the surface of the membrane utilizing hot air welding.

3.9 TEMPORARY ROOFING

- A. At the end of each working day, or at the sign of rain, install temporary watertight seal where the exposed edge of the completed new roofing terminates at the uncovered deck as well as along all penetrations. Use a sufficient size strip of roofing membrane or approved tape to bridge the new membrane and the roof deck. If using roofing membrane, the strip must be welded to the new roofing membrane and adhered fully to the cleaned roof deck or existing membrane. Provide and install as per manufacturer's instructions.
- 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.

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- 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.
- F. If water is allowed to enter beneath the newly completed roofing, the affected area(s) shall be removed and replaced at no additional expense to the Owner.
- G. The use of asphalt based roofing cement as night seals or for any other purpose will not be permitted for the project.

3.10 CORRECTION/REPAIRS

- A. Patching shall be kept to a minimum. Architect/Owner shall require severely patched areas to be replaced entirely at no additional expense to the Owner.
- B. Surface Splice:
 - 1. Correction of splices, tears, etc., shall be accomplished by splicing a membrane section over the affected area.
 - 2. Select repair membrane which is of the same material as that to be repaired.
 - 3. Extend the repair membrane section minimum 3” in every direction from the splice, tear, etc., to be corrected.
 - 4. Remove field dirt by scrubbing the splice area with warm soapy water; rinse with clean water, and dry.
 - 5. Surface splices at drains shall extend 6” onto the horizontal surface of the roof membrane.
 - 6. Membrane bridging (membrane unsupported by substrate) shall be repaired per the manufacturer’s published requirements.

3.11 PROTECTING AND CLEANING

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

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- F. If roofing is unusually soiled at time of completion, the Contractor shall be required to clean entire roof surface to satisfaction of Architect at no additional expense to the Owner.

3.12 FIELD QUALITY CONTROL

- A. During the course of the work of this Section, Contractor shall make daily inspections of all welds. Should inconsistencies in quality of welds be found, cease all work until corrective actions are taken to assure continuity of welds and to correct defective welds.
- B. Additionally, 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. The proper number, type, and spacing of fasteners are installed.
 4. Associated flashings and sheet metal are installed in a timely manner, in accordance with specified requirements.
 5. Insulation is properly secured to the substrate and nailers are provided where and as needed.
 6. Nightly tie-offs are properly made and effective.
 7. Insulation, cover board and membrane materials are properly protected and have not been exposed to moisture.

3.13 POST-INSTALLATION AUDIT

The A/E shall include provisions for unit cost associated with roof core sampling and repair.

- 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 A/E 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 for the work. 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.
1. When practicable, infrared scanning of the roof membrane should be conducted prior to the installation of the roof membrane cap sheet, so as to avoid patching the finished roof surface.

3.14 PROJECT CLOSEOUT

- A. Immediately upon achieving Final Completion, Contractor shall submit the following documents to Design Professional:
1. Statement of Compliance: Submit a formal letter to the Owner, stating that the finished roofing system installation complies with the Contract Documents.
 2. Warranties: 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.

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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.

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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: _____

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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[A/E: INSERT SUPPLEMENTAL INFORMATION HERE]
[System Test Data, Fastener Pullout Test Report, etc.]