SECTION 075419

Hybrid Fully Adhered Single Ply Roofing Systems

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including, General and Supplementary Conditions and Division 01 Specification Sections, apply to this
Section.

B. RELATED SECTIONS

1. Division 06 10 53 Miscellaneous Rough Carpentry: Wood nailers, curbs and cant strips
2. Division 07 71 00 Roof Specialties: Copings, flashing and counterflashing
3. Division 07 72 00 Roof Accessories: Roof curbs and roof hatches
4. Division 22 40 00 Floor, Area and Roof Drains
5. Division 26 41 13 Lightning Protection for Structures: Lightning protection systems devices and connectors

1.2 SUMMARY

A. Section Includes:

1. A nominal 45-mil KEE ethylene interpolymer (EIP) Elvaloy membrane, reinforced with knitted polyester fabric, and having a heat bonded 6 oz. polyester backing and fully adhered in hot asphalt over 2 plies of type VI glass felt. Membrane manufactured by The Seaman Corporation.

   OR

2. A nominal 60 mil KEE ethylene interpolymer (EIP) Elvaloy membrane, reinforced with knitted polyester fabric, and having a heat bonded 6 oz. polyester backing and fully adhered in hot asphalt over 2 plies of type VI glass felt. Membrane manufactured by Johns Manville Corporation.

3. Roof Insulation.

1.3 DEFINITIONS

A. Roofing Terminology: See 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.

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

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

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

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. Roofing system must meet the design intent and wind uplift capabilities associated with the uplift rating requirements listed in this specification and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-120

2. Hail Resistance Rating: SH

3. Clear Lake Campus to meet the requirements of the Texas Windstorm Act.

D. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing

agency. Provide roofing membrane to meet applicable local Building Department requirements and initial solar reflectance not less than 0.70 and thermal emittance not less than 0.75 when tested according to one of the test methods listed below.

1. Solar Reflectance Test Methods: ASTM C1549, ASTM E903, ASTM E1175, or ASTM E1918.

2. Thermal Emittance Test Methods: ASTM C835, ASTM C1371, or ASTM E408.

E. Insulation R Value: Minimum R-19 Long Term Thermal Resistance (LTTR) as determined in accordance with CAN/ULC-S770 **(Specifier to choose R value to meet HVAC demands with R-15 minimum per city code)**

F. Roof Assembly must meet the current version of ASHRAE 90.1.

1.5 SUBMITTALS

A. Product Data: Roofing-system manufacturer's literature, including written instructions for evaluating, preparing, and treating substrate; technical data including tested physical and performance properties; and application instructions.

1. Provide for membrane and base flashing materials, and roofing cement, asphalt, primer, mastic sealant, and fasteners.

B. Include temperature ranges for storage and application of materials, and special cold weather application requirements or limitations.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Include manufacturer's reviewed and approved details that are project specific. Manufacturer's generic details will not be accepted.

1. Base flashings and membrane terminations.

2. Tapered insulation layout including, crickets, saddles, and tapered edge strips, including amount and direction of slopes.

3. Dimensions and locations of all roof field, perimeter, and corners areas.

4. Base sheet/Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

5. Walkway pad plan and detail

6. Proposed temporary, watertight, tie-off details for each substrate type.

7. Interface with sheet metal components (per Section 07 62 00), including but not limited to:

    a. Counterflashing
    b. Stack flashing assemblies
    c. Edge and fascia sections
    d. Interface with coping cap assemblies (per Section 07 62 00)
    e. Interface with roofing accessories including but not limited to:
    f. Equipment curbs
    g. Roof hatches
    h. Expansion joints assemblies

D. Samples for Verification: For the following products:

1. Sheet roofing materials, including membrane cap sheet, of color specified.

2. Roof insulation.

3. Insulation cover board.

4. Walkway pads or rolls.

5. Six insulation fasteners of each type, length, and finish.

E. Installer's Certificate

1. Signed by roofing-system manufacturer, certifying that Roofing Installer complies with manufacturer's requirements to install specified, warranted, roofing system.

2. Submit evidence that Installer's existing company has minimum of 5 years continuous experience in application of specified materials. Submit list of at least five completed projects of similar scope and size, including:

    a. Project name.
    b. Owner's name.
    c. Owner's Representative name, address, and telephone number.
    d. Description of work.

e. SBS-modified-bitumen materials used.
f. Project supervisor.
g. Total cost of roofing work and total cost of project.
h. Completion date.

F. Manufacturer Certificate: Signed by roofing-system manufacturer, certifying that roofing system complies with specified requirements.

1. Written approval by membrane manufacturer for use and performance of membrane over specified board insulation, including that materials supplied for project comply with requirements of cited ASTM standards. Approval should also indicate materials are suitable for ASTM E 108, Class 1A roof and meet specified wind uplift classification.

2. Submit evidence of meeting performance requirements including applicable FMG assembly number.

3. Include all methods of attachment and attachment spacing for insulation and membrane system.

G. Certify that materials are free of asbestos.

H. Sample Warranty: Copy of roofing-system manufacturer's warranty, stating obligations, remedies, limitations, and exclusions. Submitted with bid.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Prior to installation of the roof system, provide a written report with fastener withdrawal values (pull out tests) per ANSI SPRI FX-1 on all projects to verify the suitability of decking to accept a mechanically fastened insulation and/or membrane roofing system.

K. Following completion of Work, submit roofing-system manufacturer's inspection report of completed roofing installation and completed warranty; submit Installer's completed warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project with a minimum of 10 years of documented experience.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty. Must have installations of specified materials in the local area in use for a minimum of 5 years.

C. Source Limitations: Obtain components including **[roof insulation] [fasteners] <Insert products>** for membrane roofing system **[from same manufacturer as membrane roofing] [or] [approved by membrane roofing manufacturer].**

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Testing: At Owners cost, Owner reserves the right to perform wind uplift testing of installed roof system per FM 1-52. Locations and quantities to be determined by Architect/Engineer.

G. Pre-Installation Testing: Provide fastener withdrawal testing at metal deck and lightweight insulating concrete deck areas per the latest version of ANSI/SPRI FX-1 testing procedures to verify fastener withdrawal resistance and identify fastener quantity and spacing.

H. Fumes And Environmental Considerations (Note: Contractor may provide either Fume Recovery or Afterburner System depending on environmental concerns.)

1. Fume Recovery - Provide for the use of a Fume Recovery System to capture and filter bituminous fumes from the roofing kettle on the ground. The following Fume Recovery System is approved for work on this project:

   a. FRS-6000 Fume Recovery System as manufactured by National Tool & Equipment, Inc., 60 Boardman, OH 44512, 1-800-558-TOOL.
   b. Cleasby Eliminator Fume Emissions System as manufactured by Cleasby Mfg. Co., Inc., 1414 Bancroft Ave., San Francisco, CA 94124, 800-CLEASBY.

2. Afterburner: Provide for the use of a Fume Reduction System to reduce fumes and odors from the roofing kettle on the ground. The following fume reduction system is approved for work on this project:

    a. Reeves Afterburner/Safety Loader System as manufactured by Reeves Roofing Equipment Company, Inc., P.O. Box 720, Helotes, TX 78023, (210) 695-3567.
    b. Garlock FumeGuard Asphalt Fume Elimination System - Garlock FumeGuard as manufactured by Garlock Equipment Company, 2601 Niagara Lane, Minneapolis, MN 55447, (612) 553-1935.
    c. Similar systems submitted for approval must be certified by the Environmental Protection Agency to remove 95% of odors and fumes.

3. Proper Usage: The Contractor shall ensure through training and proper supervision that the fume protection device is used correctly and maintained in good working order throughout the job. Doors, vents, and exhausts shall be kept closed to prevent smoke and fume escape. Operators failing to use the devices properly shall be dismissed from the job and replaced by a worker satisfactory to the Engineer.

4. Air Intake: The contractor will coordinate with the Roof Engineer and Owner to create a schedule for all rooftop air handler intake protection during the project.

5. Rooftop Air Intakes - The Owner will close or otherwise adjust rooftop air intakes for minimum attraction of roofing material fumes from rooftop work.

6. Vent Covers - Contractor will furnish plastic, charcoal, or other suitable covers for air intake vents, and shall install and remove such covers where requested to do so by the Owner

I. Pre-installation Roofing Conference: Conduct conference at Project site. Contractor’s site foreman, roofing-system manufacturer’s technical representative, Roofing Installer, Owner’s Representative, Architect/Engineer shall attend.

1. Site use, access, staging, and set-up location limitations.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions. Including, but not limited to, the following: forecast weather conditions, storage and

protection of materials prior to installation, surface preparation and pretreatment, environmental conditions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.

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

7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system and surrounding work during and after installation.

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

10. Reporting procedures.

11. Related project details and interfaces with adjacent work.

12. Testing and inspection requirements.

13. Notification procedures for inspections.

14. Documentation of modifications and repairs for project record.

15. Documentation required for manufacturer’s warranty.

16. Governing regulations and requirements for insurance and certificates if applicable.

17. Quality control and quality assurance plans.

1.7 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, approval or listing agency markings, and directions for storing and mixing with other components. Material storage procedures will be constantly monitored and strictly enforced.

B. Use canvas tarps for protection of moisture-sensitive roofing materials. If plastic coverings are used, venting of each package is required. Roofing-system manufacturer’s standard packaging and covering is not considered adequate weather protection.

C. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to manufacturer's recommendations of handling and storage.

D. 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.

E. Protect roof insulation materials 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. Manufacturer's packaging is not considered adequate protection from moisture.

F. Handle and store materials and equipment on structures to safe loading of structure at time and to avoid permanent deflection of deck. Conspicuously mark wet or damaged materials and promptly remove from Site. Materials, having been determined by the owner/owner's representative to be damaged, shall be immediately removed from the construction site and replaced at no cost to the owner.

G. Store rolled asphalt based materials on ends only, unless otherwise required by roofing-system manufacturer’s written instructions. Discard rolls that have been flattened, creased, or otherwise damaged. All rolls of single ply membrane shall be stored, lying down, elevated above the roof deck and completely protected from moisture with tarpaulins.

H. Do not store materials at locations where new roofing materials have been installed.

I. Remove and replace materials that cannot be applied within stated shelf life.

J. Flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow all precautions as outlined in manufacturer's Material Safety Data Sheets.

1.8 PROJECT CONDITIONS

A. Safety

1. Take all necessary precautions regarding worker health and safety when using solvents, adhesives and hot asphalt.

2. Store flammable liquid and materials away from open sparks, flames and extreme heat.

3. Take necessary precautions when using solvents and adhesives near fresh air intakes.

4. Comply with all OSHA requirements for construction.

B. Daily site cleanup shall be performed to minimize debris and hazardous congestion

C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions e.g. extreme temperature, high winds, high humidity and moisture, permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

D. Verify existing dimensions and details prior to installation of materials. Notify Architect/Engineer of conditions found to be different than those indicated in Contract Documents. Architect/Engineer will review situation and inform Contractor and Installer of changes.

E. Comply with Owner’s limitations and restrictions for site use and accessibility.

F. Install materials in strict accordance with safety requirements required by roofing manufacturer, Material Safety Data Sheets, and local, state, and federal rules and regulations.

G. Protection

1. Schedule installation sequence to limit access and utilization of the newly installed membrane for material storage, construction staging, mechanical and/or excessive foot traffic.

2. Protect roofing membrane, building surfaces, paving, and landscaping from traffic and roofing equipment. Provide temporary walkways constructed of plywood and set on protective material in traffic and construction areas.

3. Restore or replace all work or materials damaged by the roofing operation.

4. Remove protection materials upon completion of work.

5. Adverse weather could have a detrimental effect on adhesives, general production efforts or the quality of the finished installation. Contact manufacturer for recommendations and acceptable tolerances.

H. Daily seal: Ensure that moisture does not penetrate beneath any completed sections of the roof by sealing temporary roof terminations at the end of each work day and prior to the arrival of inclement weather. Inspect existing components for moisture intrusion along the temporary terminations at temporary cut-offs, tie-ins, and night seals after opening the seal on the next workday. Remove any wet, damp or moisture-damaged materials.

I. All construction debris shall be removed from the construction site and legally dispose of offsite

1.9 WARRANTY

A. Special NDL Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, fasteners, insulation, coated metal, drains and other components of membrane roofing system. Warranty shall include wind speeds up to 74 MPH.

2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, 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, vapor retarders, and walkway products, for the following warranty period:

1. Warranty Period: Five years from date of Substantial Completion.

C. Maintenance: Along with the issuance of the warranty, a set of instructions shall be included detailing preventative maintenance and noting a list of harmful substances which may damage the roofing membrane.

1.10 COORDINATION

A. Prior to installation of materials, a pre-roofing conference should be held with the roofing contractor, and owner/owner's representative(s) to discuss the specified roofing system coordinate its proper application and the expectations of all parties involved. The authorized roofing contractor and the owner/owner's representative shall notify all parties a minimum of fourteen days prior to the meeting.

B. Plan and coordinate the installation of the roofing system with other trades in such a manner to avoid membrane damage, keeping the complete installation weather tight and in accordance with all approved details and warranty requirements.

C. Manufacturer shall be available to make recommendations necessary to ensure compliance with project specifications and specification alternatives due to unforeseen job conditions.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products and components for the roofing system shall be supplied by the roofing system manufacturer.

B. Components other than those manufactured and/or supplied by the roofing system manufacturer shall be submitted for review, prior to ordering. Any product(s) not specifically authorized in writing for the project by the roofing system manufacturer, shall be considered unacceptable and their performance excluded from the warranty.

C. Roofing membranes may be installed over or adhered directly to pre-approved insulation, cover board, decking or composites thereof. Contact manufacturer for additional information regarding compatible substrates.

2.2 MATERIALS

A. Fiberglass Ply Sheets

1. Asphalt impregnated, glass ply sheet meeting the requirements for UL Type G1 BUR and ASTM D2178, Type VI.

B. Fiberglass Ply Sheets Adhered with Hot Asphalt

1. Hot asphalt shall be applied only to properly prepared and pre-approved substrates, free of any debris, dirt, grease, oil or moisture.

2. Two (2) plies of fiberglass ply sheets shall be embedded into a fluid, continuous application of hot ASTM D-312 Type III steep asphalt at a minimum application rate of 25 lbs. per 100 ft². Ply sheets shall be fully bonded to the cover board substrate.

C. FiberTite-FB Membrane

1. FiberTite-FB is a nominal 45-mil KEE ethylene interpolymer (EIP) membrane, reinforced with knitted polyester fabric, and having a heat bonded 6 oz. polyester backing, as manufactured by Seaman Corporation, under the trade name FiberTite-FB. FiberTite-FB shall be embedded into a fluid, continuous application of hot ASTM D-312 Type III steep asphalt at a minimum application rate of 25 lbs. per 100 ft². FiberTite-FB shall be fully bonded to the fiberglass ply sheets.

D. Johns Manville – 60 mil FB PVC Membrane

1. Johns Manville – PVC FB is a nominal 60-mil KEE ethylene interpolymer (EIP) membrane, reinforced with knitted polyester fabric, and having a heat bonded 6 oz. polyester backing, as manufactured by Johns Manville shall be embedded into a fluid, continuous application of hot ASTM D-312 Type III steep asphalt at a minimum application rate of 25 lbs. per 100 ft². Johns Manville 60 FB PVC membrane shall be fully bonded to the fiberglass ply sheets.

E. Flashing Membrane

1. Nominal 45-mil FiberTite-SM membrane or Johns Manville 60 FB PVC,

shall be used for all flashing requirements to match the field membrane and warranty expectations selected for the roofing system.

F. Acceptable substrate(s) **(SPECIFIER TO CHOOSE)**

1. Authorized rigid insulation and cover board.

2. Structural Concrete, insulated or non-insulated.*

3. Insulated Steel Decking.

2.3 MEMBRANE RELATED MATERIALS

A. FiberTite and Johns Manville Adhesives

1. Adhesives, supplied by Seaman Corporation and Johns Manville, Inc. that have been specially formulated for FiberTite and Johns Manville PVC Roofing Systems. Application technique and coverage rates will vary according to substrate and environmental conditions.

2. FTR-190e Bonding Adhesive or Johns Manville PVC Membrane Adhesive solvent base, contact (two sided) bonding adhesive, designed for bonding non-fleece back KEE membranes to properly prepared and pre-authorized horizontal and vertical substrates.

B. FTR-101 Sealant or Johns Manville PVC Polyurethane Caulk

1. A one-component gun-grade polyurethane sealant to seal flashing termination.

C. FTR-SL1 Sealant or Johns Manville PVC Pourable Sealer

1. A one-component pourable, self leveling, polyurethane sealant to fill "pitch pans".

D. FiberClad Metal or Johns Manville PVC-Coated Metal

1. To fabricate metal flashing, 4' x 10' sheets of 24 gauge hot dipped G-90 steel, or 0.040 thick 3003H14 aluminum, laminated with a 0.020 mil polymeric coating.

E. FTR-Pre-Molded Flashing(s) or Johns Manville-Pre-Molded PVC Flashing(s)

1. Injection molded vent stack and inside/outside corner flashing using

EIP compound.

F. FTR Non-Reinforced Membrane or Johns Manville Detail Membrane

1. Field fabrication membrane, 0.060 mil non-reinforced EIP membrane.

G. FTR-Tuff Track Walk Way & Protection Pads or Johns Manville – PVC Walk Pads.

1. High grade walk way/protection material with "slip resistant" design.

H. FTR-Fasteners

1. FiberTite HD or Johns Manville #14 All Purpose fasteners to secure insulation to steel, wood and structural concrete decks. A #14-13, heavy duty threaded steel #3 Phillips truss, self tapping corrosion resistant fastener.

2. FiberTite BS Fasteners or Johns Manville (LWC) base sheet fastener to secure base sheet to gypsum and cellular lightweight insulating concrete decks.

3. FiberTite Purlin Fasteners or Johns Manville High Load Fasteners to secure membrane to the existing metal roofing systems structural members.

I. FTR-Sand Dollar Insulation Stress Plates or Johns Manville UltraFast Plates.

1. Used to secure insulation to steel, wood and structural concrete decking. Manufactured from high density polyethylene, 3 inch in diameter, designed with a self locking mechanism to secure the head of the FTR fasteners into the plate.

J. FTR-Termination Bar or Johns Manville Termination Bar

1. Membrane flashing(s) restraint/termination seals, nominal 1/8 inch x 1 inch x 10' 6060-T5 extruded aluminum bar with pre-punched slots, 8 inch on center.

K. FTR-601 Insulation Adhesive or Johns Manville Urethane Insulation Adhesive

1. Dual component, single bead (ribbon applied) urethane insulation adhesive. Adhesive is a non-solvent, elastomeric, urethane adhesive, specifically designed for bonding roof insulation and insulation

composites to structural roof decks, base sheets, and smooth surfaced BUR.

2.4 ROOF INSULATION

General:

A. Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. For insulation that will be placed using adhesive, board sizes shall not exceed 4 ft. by 4 ft. maximum. Largest appropriate sized approaching, but not exceeding 4 ft. by 4 ft. as appropriate, shall be installed where possible. Using multiple smaller sized sections of insulation where larger sections would be more appropriate shall not be allowed.

C. Polyisocyanurate Flat Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces; 20-pounds-per-square-inch-minimum compressive strength in accordance with ASTM D1621; and meet flame spread requirements of ASTM E84.

Polyisocyanurate Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated. Drainage crickets and saddles will have a minimum thickness of 1/2” and a minimum slope of 1/2” per foot. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Edges of material that are ½ inch or taller will require the use of tapered edge strips to taper edge to zero inches.

D. Tapered Edge and Cant Strip: Fiber tapered edge strip, ½” to 0 by 6”. Cant strip and/or tapered edge to be mineral aggregate meeting HH-I-529B.

E. Cover Boards: ASTM C 1177; water-resistant, gypsum substrate, 4’ by 4’ in size, without fiberglass facers. . Edges of material that are ½ inch or taller will require the use of tapered edge strips to taper edge to zero inches.

1. 3/8 inch Securock as manufactured by USG or pre-approved equal.

2. ½ inch DensDeck DuraGuard® Roof Board as manufactured by GP.

3. Fire Resistance:

    a. Flame spread 0, smoke developed 0, when tested in accordance with ASTM E 84. Noncombustible when tested in accordance with ASTM E 136.

2.5 OTHER RELATED MATERIALS

A. Wood Nailers

1. Wood shall be No. 2 or better construction grade lumber.

2. Creosote or asphaltic type preservatives are not acceptable.

3. Minimum top nailer thickness shall be 1.5 inch nominal.

B. Vapor Retarder

1. The decision regarding the inclusion of a vapor retarder within the roof system shall fall within the responsibility of the design professional. Consult N.R.C.A. or other technical resource for appropriate guidelines.

2. Vapor retarder for use in a roof system shall comply with identifiable code and/or insurance requirements.

3. The vapor retarder manufacturer shall certify, in writing, that the specified vapor retarder meets identifiable code requirements and is approved for its intended use.

C. Adhesives for Insulation Attachment

1. Polyurethane used to Adhere Polyisocyanurate Insulation

    a. Adhesive shall be either a dual or single component polyurethane adhesive, dispensed from a portable pressurized container or traditional foam equipment.
    b. Pre-Approved Products
        1. FTR-601
        2. Insta-Stik; Dow Chemical Company
        3. OlyBond; Olympic Manufacturing Group
        4. Tite-Set, PolyFoam Products, Inc.
        5. Johns Manville Urethane Insulation Adhesive

2. Polyurethane used to adhere cover board to base layer of insulation

c. Adhesive shall be either a dual or single component polyurethane adhesive, dispensed from a portable pressurized container or traditional foam equipment.
d. Pre-Approved Products
1. FTR-601
2. Insta-Stik; Dow Chemical Company
3. OlyBond; Olympic Manufacturing Group
4. Tite-Set, PolyFoam Products, Inc.
5. Johns Manville Urethane Insulation Adhesive

D. Fiberglass Ply Sheets

1. Pre-Approved ply sheets shall be installed, where specified and/or required, to provide a suitable surface for installation over or adhering the insulation and/or FiberTite FB or Johns Manville 60 mil PVC FB Roofing System.

2. Acceptable products must be pre-approved or approved in writing by the manufacturer and comply with the following minimal characteristics and classification(s).

PART 3 - EXECUTION

3.1 GENERAL

A. The “Authorized” roofing contractor is responsible for ensuring appropriate system specific addendums from manufacturer.

B. The roofing contractor is responsible for providing a suitable substrate surface for the proper installation of the Roofing System, roof insulation and specified components.

C. Application of the roofing system constitutes an agreement that the roofing contractor has inspected and found the substrate suitable for the installation of the Roofing System.

D. The roofing contractor is responsible for coordinating the installation to ensure that the system remains watertight at the end of each working day

3.2 SUBSTRATE EXAMINATION

A. The roofing contractor is responsible for verifying that the deck condition and/or existing roof construction is suitable for the specified installation of the Roofing System.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.

5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

7. The application of adhesives directly to structural concrete; existing smooth and/or granular BUR materials may require sealing or priming with an accepted primer prior to application.

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

9. Examine surfaces for low areas that will not drain properly, foreign material, ice, wet insulation, unevenness or any other defect which would prevent the proper execution and quality application of the Roofing System as specified

C. Prepared substrate shall be smooth, dry, and free of debris and/or any

other irregularities which would interfere with the proper installation of the Roofing System. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Installer and roofing-system manufacturer's representative shall examine substrate to ensure that it is properly prepared and ready to receive roofing system. Roofing-system manufacturer's representative shall report in writing to Installer and Architect/Engineer conditions which will adversely affect roofing-system installation or performance. Do not proceed with roofing-system installation until these conditions have been corrected and reviewed by Architect/Engineer.

E. Provide fastener withdrawal values (pull out tests) per ANSI SPRI FX-1 on all projects to verify the suitability of decking to accept a mechanically fastened insulation and/or membrane roofing system.

3.3 COORDINATION

A. Coordinate Work to ensure that new insulation and roofing materials and building interior are kept continuously dry and that continuous, watertight, new roofing system is provided. Coordinate:

1. With Owner's Representative.

2. With other trades to avoid or minimize work on, or in immediate vicinity of, installation in progress and completed new roofing.

3. To avoid or minimize adverse effects on completed new roofing.

4. Ensure that drains are operational at end of each workday or if precipitation is forecast.

3.4 SUBSTRATE PREPARATION (New Construction) **(SPECIFIER TO CHOOSE DECK TYPE)**

A. Steel Deck

1. Steel decking should conform to Factory Mutual (FM) guidelines for Class-1 insulated steel deck construction.

2. Steel decking should be constructed of a minimum 22 gauge cold rolled steel sheets with factory G-90 galvanized coating.

3. Panel profiles, (ribs) shall be formed to minimize deflection and

provide suitable strength and integrity to support anticipated structural live and dead loads.

4. Steel decking shall be installed in compliance with specified design criteria and local building code requirements.

B. Concrete (Poured and/or Pre-cast)

1. Decking shall be installed in strict conformance with industry standards, practices and/or pre-cast panel manufacturer's installation requirements.

2. Decking shall be installed to provide positive slope and subsequent positive drainage of the new Roofing System.

3. Finished decking shall be properly cured and dry, prior to the installation of approved insulation.

4. Finished surface(s) to receive new roof system shall be smooth and level without significant surface depressions or irregularities. Camber differentials greater than 3/16 inch must be leveled using a cementitious grout.

5. Finished surfaces shall be free of moisture, dust, loose debris and any other irregularity that may hinder the proper performance of the new Roofing System.

6. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3.5 SUBSTRATE PREPARATION (Re-Roofing) **(SPECIFIER TO CHOOSE DECK TYPE)**

A. General

1. Roofing Contractor shall be responsible for informing the building owner/owner representative of any issues in regard to the condition and structural integrity of the existing decking.

2. The building owner/owner representative shall make and be responsible for the determination as to the proper method of treatment and/or replacement.

3. Re-roofing applications require fastener withdrawal tests to substantiate proposed attachment patterns for the new mechanically

fastened insulation systems and/or membranes.

4. Re-roofing applications that require modification to the deck and/or insulation system should be installed to provide positive slope and subsequent positive drainage of the new Roofing System.

5. All terminations of the Roofing System must be constructed to prevent water from penetrating behind or beneath the new Roofing System. This includes water from above, beside, below and beneath the new system.

B. Removal of Existing Roof System(s)

1. Remove all existing roofing material(s), insulation, flashing, metal and deteriorated wood blocking and legally dispose off-site.

2. Remove only enough roofing to accommodate the day's work and ensure the exposed area can be made 100% watertight at the end of the day or first sign of inclement weather.

C. Steel Decks

1. All rotted and/or deteriorated decking shall be removed and replaced with like kind.

2. Areas of structurally acceptable steel decking exhibiting slight surface rust shall be properly cleaned, primed and painted prior to installing the approved insulation.

3. All decking shall be inspected for proper attachment and excessive deflection that would compromise the uplift performance of the new Roofing System.

4. Attachment and deflection deficiencies shall be repaired and brought into compliance with current, local building code requirements.

D. Concrete

1. Deteriorated decking shall be repaired and/or replaced with appropriate materials according to standard industry regulations and practices.

2. Repair any depressions and/or areas where reinforcing has become exposed.

3. When new insulation system is to be installed using an approved adhesive:

    a. Cracks and or camber differentials greater than 3/16 inch shall be repaired using an appropriate cementitious grout or fill, and feathered to promote a smooth transition.
    b. Joints between pre-stressed panel units and over bulb-tees shall be taped, stripped or grouted with an appropriate cementitious fill.
    c. All surface irregularities shall be leveled to ensure complete contact with the decking for insulation bonded in hot asphalt or approved adhesives.

4. Where insulation is to be mechanically attached or ballasted, camber differentials and/or surface irregularities of up to 1/2 inch shall be acceptable.

5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

E. Lightweight "Insulating" Concrete **(FOR USE OVER EXISTING DECKS IN A RE-ROOF SITUATION.)**

1. All wet lightweight shall be removed and replaced with appropriate and/or compatible material.

2. Surface to receive new Roofing System shall be smooth and free of ridges, depressions and other irregularities.

3. Repair any depressions, irregularities and/or excessive deflection with compatible material.

3.6 ROOFING SYSTEM INSTALLATION

A. Install roofing membrane and base flashings according to roofing-system manufacturer’s written instructions and applicable recommendations of NRCA/SPRI Quality Control Guidelines for Application of PVC fleece backed membranes.

B. Install materials in strict accordance with safety requirements required by roofing-system manufacturer, Material Safety Data Sheets, and local, state, and federal rules and regulations.

C. Follow safety procedures of OSHA and other applicable governing

agencies. Assume responsibility for Work area safety at all times.

D. Provide fully-charged fire extinguishers, appropriately sized and rated, and water within 50 feet of open flame.

E. Do not use wood-fiber cant strips or insulation.

F. Bitumen Heating:

G. Good Working Kettle - The roofing kettle shall be in safe working order with a working thermometer and thermostatic controls. Set up shall be in accordance with OSHA standards, and the surface upon which it rests shall be protected with sand, plywood, or a suitable tarp. All asphalt remaining on the surface where the kettle was set up shall be cleaned up at the completion of the job. The kettle shall be cleaned prior to the commencement of this job.

H. Experienced Kettle Operator - The operator of the kettle shall be thoroughly trained in the safe operation and maintenance of the kettle, and he shall be dressed in safe protective clothing with proper safety equipment within easy reach at all times. The kettle operator shall wear a hard hat and face mask at all times in accordance with OSHA standards and standard industry practice.

I. Heating Practice - Under no circumstances shall asphalt be heated to or above its flash point. Application temperatures shall not be more than 25 degrees F. more or less than the equiviscous temperature (EVT). EVT information must be furnished by the asphalt manufacturer prior to commencement of work. In the absence of authoritative EVT certification for the specific batch of asphalt produced, the asphalt shall be heated to 475 to 500 degrees F. at the kettle, but not above 525 degrees F. Asphalt shall be applied as near the EVT temperature as possible.

J. Maintain adequate ventilation during installation of roofing materials. Notify Owner’s Representative at least 1 week in advance of Work with materials with noxious vapors. Review application schedule and venting precautions with Owner’s Representative prior to beginning application.

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

L. Coordinate installing roofing-system components so insulation and roofing membrane sheets are not exposed to precipitation, or left

exposed at end of workday or when rain is forecast.

M. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.

N. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.

O. Remove and discard temporary seals before beginning work on adjoining roofing.

P. Prohibit foot traffic and equipment movement over roofing system until adhesive has cured. Minimize foot traffic and equipment movement over base ply prior to installation of membrane top ply/cap sheet.

Q. Cooperate with Architect/Engineer in performing inspections and testing of roofing system.

3.7 ROOF INSULATION INSTALLATION

A. General

1. Roof insulation shall be installed where by the long dimension of the board(s) run in parallel alignment and the short dimensions are staggered.

2. Insulation shall be installed with minimum joint dimensions and shall be tightly butted where possible. Maximum joint widths shall be 3/8 inch. Damaged corners shall be cut out and replaced with an insulation piece a minimum of 12 inch x 12 inch Pieces which are cut from larger panels and are smaller than one square foot are not acceptable.

3. Install no more than can be covered during the same working day.

4. Taper roof insulation to drain sumps using tapered edge strips. If an insulation layer is 1-1/2 inch or less, taper 12 inch from the drain bowl. If insulation thickness exceeds 1-1/2 inch, taper 18 inch from the drain bowl. All taper boards or pieces must be adhered or mechanically fastened with a minimum of two fasteners per board.

5. Tapered Edge Strip: Install tapered edge strip at the leading edge of the tapered insulation panels to provide a solid substrate for the cover board.

6. When a cover board and/or multiple layers are installed each layer should be offset from the previous layer a minimum of 12 inch on center.

7. At the end of each working day, provide a watertight cover on all unused insulation as to avoid moisture penetration.

B. Insulation Installation

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

(Retain first paragraph below if mechanically fastening base sheet to substrate before adhering first layer of insulation.)

2. Over nailable substrate, install one lapped vented base-sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.

(For Steep slope applications, slopes 1 in 12 or greater) Use Nailer Strips: Mechanically fasten 4-inch nominal- width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:

3. 16 feet apart for roof slopes steeper than 1 inch per 12 inches but less than 3 inches per 12 inches.

4. 48 inches apart for roof slopes steeper than 3 inches per 12 inches.

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.

D. Mechanically Fastened Insulation: For metal roof decks, install the base layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.

2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

E. Adhered Insulation:

1. Board sizes shall not exceed 4 ft. by 4 ft. maximum. Largest appropriate sized approaching, but not exceeding 4 ft. by 4 ft. as appropriate, shall be installed where possible. Using multiple smaller sized sections of insulation where larger sections would be more appropriate shall not be allowed.

2. For insulation that will be installed using adhesive (not mechanically attached), provide adequate temporary ballast on insulation boards that is sufficient to fully compress each board into the adhesive until adhesive has set.

3. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/8 inch with insulation.

F. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

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

1. Where installing composite and non composite insulation in two or more layers, install non composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

H. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

I. Tapered Edge Strip: Install tapered edge strip at the leading edge of the tapered insulation panels to provide a solid substrate for the cover board.

J. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches in each direction from joints of insulation below. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.

1. Adhere cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.

2. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3. Apply low-rise foam adhesive to underside, and bond cover board to substrate.

4. Provide adequate temporary ballast on cover boards that is sufficient to fully compress each board into the adhesive until adhesive has set.

3.8 ROOFING MEMBRANE INSTALLATION

A. Quality Control

1. It will be the responsibility of the roofing contractor to initiate and maintain a QC program to govern all aspects of the installation of the Roofing System.

2. The project foreman and or supervisor will be responsible for the daily execution of the QC program which will include but is not limited to the supervision, inspection and probing of all heat welding incorporated within the Roofing System.

3. If inconsistencies in the quality of the application of the composite, membrane and/or welds are found, all work shall cease until corrective actions are taken to ensure the continuity the installation.

B. General

1. Work shall be coordinated to ensure that sequencing of the installation promotes a 100% watertight installation at the end of each day.

2. All Roofing Systems or sections shall be designed utilizing and determined to be in compliance with the procedures outlined within the current publication of ASCE Standard 7. Alternative designs may be determined using the criteria within Factory Mutual Research Loss Prevention Data.

3. A FiberTite Roofing System may utilize either conventional "roll goods" or pre-fabricated custom rolls or a combination of both. Custom Rolls must be utilized for ballast and metal recover applications. (Custom rolls of variable width and length are available upon request.)

4. Restrictions regarding outside ambient air temperature are relative only to the exposure limits of the workers and/or adhesives.

5. When using adhesives outside ambient air temperature should be above 40°. Curing or drying time of the adhesive will be affected by

ambient temperatures and must be taken into consideration when determining flashing lengths.

6. Roofing Systems shall only be installed over properly prepared and sound substrates, free from excessive surface roughness, dirt, debris and moisture.

C. Hot Asphalt Adhered Roofing Systems

1. For fleece-backed (FB) membranes - Un-roll approximately 30 feet of the FB membrane and position the roll over the properly installed/prepared substrate. Pull the tail back over the roll to expose a workable area (approx. 30') of substrate. (Do not utilize the “butterfly method).

2. Apply a 100% continuous coat of adhesive to the substrate.

3. Correct Equiviscous Temperature (EVT) must be maintained at point of application. Type III steep asphalt shall be applied within 25°F of the asphalt manufacturer’s recommended EVT. If the manufacturer does not supply the EVT, Seaman Corporation recommends a temperature of 425° F for mopping and 450° F for mechanical spreaders.

4. Asphalt is to be applied by either mopping or mechanical spreaders.

5. Adhesive must be spread to ensure a smooth, even 100% coverage of the substrate with no voids, skips, globs, puddles, or similar irregularities.

6. Do not allow asphalt to contaminate the lap "seam" areas of the membrane. Contaminated areas will inhibit proper welding of the seams.

7. Carefully maneuver the membrane into the adhesive on the substrate surface, avoiding any wrinkles or air pockets.

8. Broom the adhered portion of the membrane to ensure full contact and complete the bonding process by firmly pressing the bonded membrane into place with a weighted, foam-covered, lawn roller.

9. Repeat the process for the remaining un-bonded portion of the membrane, lapping subsequent, adjacent rolls of membrane a minimum of 3 inches, ensuring proper shingling of the membrane to shed water along the laps.

10. No adhesive shall be applied to the lap "seam" areas of the membrane. Areas contaminated with adhesive are difficult to clean, will impair proper welding of the seams and require a membrane patch.

11. Do not use bad or marginal adhesives. Contact MANUFACTURER if the quality of the adhesive is suspect.

D. Peel Stops for Adhered Roofing Systems

1. Membrane manufacturer's standard Terms and Conditions for commercial warranties list 60-mph wind velocity as the first exclusion for wind events. Perimeter "assurance" or restraint must be provided for any modification to the standard commercial warranty.

2. Assurance or restraint is accomplished using rows of fasteners, installed parallel to exterior roof edges at a prescribed interval and fastener spacing to create a "peel stop" during a significant wind event.

3. Peel stops must be mechanically attached into or through the structural decking with rows of Magnum stress plates and fasteners, (or authorized alternate) @ 12 inches on center. The peel stop is sealed by heat welding a nominal 6-inch strip of membrane over the fasteners.

4. Lightweight insulating concrete is generally not considered a structural component and peel stop fastening must penetrate through the lightweight into the structural component. Peel Stop(s) are required on adhered projects with a field design uplift pressure of -45 psf (FM 1-90) or above. Peel stop intervals are based upon the field pressure and are as follows:

a. Buildings with Design Velocity Pressure less than: -45 psf (FM 1-90).

1. No peel stop required.

b. Buildings with Design Velocity Pressure greater than: -45 psf (FM 1-90) but less than or equal to -52.5 (FM 1-105).

1. One peel stop at three feet from all edges.

c. Buildings with Design Velocity Pressure greater than: -52.5 (FM 1-105) but less than or equal to -60 psf (FM 1-120).

1. One peel stop at three feet from all edges and

2. The second peel stop at six feet from all edges.

d. Buildings with Design Velocity Pressure greater than: -60 (FM 1-120 but less than or equal to -67.5 psf (FM 1-135).

1. One peel stop at three feet from all edges and

2. The second peel stop at six feet from all edges and

3. The third peel stop at nine feet from all edges.

e. Buildings with Non Class 1 decking, i.e. lightweight, wood, gypsum, and cementitious wood fiber do not default to the above requirements and require additional evaluation and engineering review by manufacturer.

E. Hot Air Welding

1. General

a. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
b. All field seams must be clean and dry prior to initiating any field welding.
c. Remove foreign materials from the seams (dirt, oils, etc.) with Acetone or authorized alternative. Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. **Do not use denim or synthetic rags for cleaning**.
d. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.
e. Contaminated areas within a seam will inhibit proper welding and will require a membrane patch.

2. Hand Welding

a. The lap or seam area of the membrane should be intermittently tack welded to hold the membrane in place.

b. The back "interior" edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.
c. The nozzle of the hand held hot air welder shall be inserted into the lap at a 45° angle to the lap. Once the polymer on the material begins to flow, a hand roller shall be use to apply pressure at a right angle to the tip of the hand welder. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.
d. Smaller nozzles may be used for corners, and other field detailing, maintaining a minimum 1 inch weld.

3. Automatic Machine Welding

a. Proper welding of the Membrane can be achieved with a variety of automatic welding equipment. Contact manufacturer's MANUFACTURER for specific recommendations.
b. Follow all manufacturers' instructions for the safe operation of the automatic welder.
c. Follow local code requirements for electric supply, grounding and surge protection.
d. The use of a dedicated, portable generator is highly recommended to ensure a consistent electrical supply, without fluctuations that can interfere with weld consistency.
e. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.

F. Inspection

1. The job foreman and/or supervisor shall initiate daily inspections of all completed work which shall include, but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and ensure that any equipment or operator deficiencies are immediately resolved.

2. Ensure that all aspects of the installation (sheet layout, attachment, welding, flashing details, etc.) are in strict accordance with the most current Roofing Systems Specifications and Details.

3. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted at time of FINAL INSPECTION FOR WARRANTY ACCEPTANCE.

4. Any deviation from pre-approved specifications and/or details requires written authorization from the MANUFACTURER prior to

application to avoid any warranty disqualification.

5. It is the contractor, job foreman, and supervisor and/or quality control personnel to perform a final "self" inspection on all seams prior to requesting the inspection for warranty issuance by the manufacturer's warranty.

3.9 FLASHING

A. Clean all vents, pipes, conduits, tubes, walls, and stacks to bare metal. All protrusions must be properly secured to the roof deck with approved fasteners. Remove and discard all lead, pipes and drain flashing. Flash all penetrations according to approved details.

B. Remove all loose and/or deteriorated cant strips and flashing.

C. Flash all curbs, parapets and interior walls in strict accordance with approved details.

D. All flashing shall be adhered to properly prepared, approved substrate(s) with either FTR- 190e Adhesive or FTR-201 mastic or Johns Manville PVC Membrane Adhesive applied in sufficient quantity to ensure total adhesion. Specific projects may require the use of FTR-490 or Johns Manville PVC Membrane Adhesive as a bonding adhesive for FiberTite-SM and Johns Manville PVC Membrane Adhesive. Contact manufacturer's MANUFACTURER prior to this application.

E. The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond the wood nailers to a maximum width of 8 inches.

F. Vertical flashing shall be terminated no less than 8 inch above the plane of the deck with an approved termination bar and counter-flashing or metal cap flashing.

G. When using FTR-201 or FTR-490 or Johns Manville PVC Membrane Adhesive, vertical wall flashing termination shall not exceed 30 inches without supplemental mechanical attachment of the flashing between the deck and the termination point of the flashing.

H. Complete all inside and outside corner flashing details with manufacturer's pre-formed corners or an approved field fabrication detail.

I. Probe all seams with a dull, pointed probe to ensure the weld has created a homogeneous bond.

J. Install penetration accessories in strict accordance with approved details. Ensure penetration accessories have not impeded in any way the working specification. (Refer to the related trade for the technical specification).

3.10 METAL FLASHING

A. All perimeter edge details are to be fabricated from membrane-clad metal or utilize a prefabricated membrane manufacturer's Fascia System.

B. Ensure all fascia extend a minimum of 2 inch lower than the bottom of the wood nailers.

C. Fasten all metal flashing to wood nailers or approved substrate with approved fasteners 8 inches on center.

D. Break and install membrane-clad metal in accordance with approved details, ensuring proper attachment, maintaining 1/2 inch expansion joints and the installation of a minimum 2 inch bond breaker tape prior to sealing the joint.

E. Roof Drains

1. Flash all roof drains in accordance with manufacturer's roof drain details.

2. Replace all worn or broken parts that may cut the membrane or prevent a watertight seal. This includes the clamping ring and strainer basket.

3. Replace all drain bolts or clamps used to hold the drain compression ring to the drain bowl.

4. Non-reinforced 60 mil membrane shall be used for flashing the drain assembly. Drain assemblies and basins or "sumps" must be free of any asphalt or coal tar pitch residue prior to installation.

5. The drain target sheet should be sized and installed to provide for a minimum of 12 inch of exposed 60 mil on all sides of the drain.

F. Pitch Pans

1. **REASONABLE effort shall be made to eliminate the need for pitch pans including the removal of all existing pans. Contact manufacturer for specific design alternatives and recommendations**.

2. In the event of no alternative, fabricate pitch pans from membrane-clad metal, installed in accordance with manufacturer's details, ensuring proper attachment, maintaining a minimum of 2 inch clearance around the penetration.

3. Pitch Pans shall be filled with non-shrinking grout to within 1 inch of the top of the pan. Allow the grout to dry and fill remainder of the pan with FTR-SL1 pour able sealant or Johns Manville PVC Pourable Sealer and covered with a stainless steel weather bonnet and compressible clamp or welded to penetration.

4. Pitch Pans and the sealant will require periodic maintenance by the building owner's maintenance personnel.

3.11 EXPANSION JOINTS

A. Flash all expansion joints in accordance with authorized details. Fasten all expansion joint material according to manufacturer's specifications. Ensure the expansion material has sufficient material to expand to the widest point in expansion without causing undue stress on the expansion joint material.

B. If the expansion joint is a "pre-formed" system, the manufacturer, description and a drawing illustrating the method of installation must be included when submitted.

3.12 WALKWAYS

A. Manufacturer's walkways and protection pads shall be installed at staging areas for roof top equipment maintenance or areas subject to regular foot traffic.

B. Walkway Installation

1. Roofing membrane to receive walkway material shall be clean and dry.

2. Cut and position the walkway material as directed by the specifications or agreement.

3. Hot air weld the entire perimeter of the walk way to the previously cleaned roofing membrane. Avoid excessive heating of the walk way material to prevent scorching the underlying roofing membrane.

C. Protection Pad Installation

1. Roofing membrane to receive protection pad material shall be clean and dry.

2. Prior to installing the protection pads (1/4 inch x 2' x 4’), weld a 6 inch x 6 inch strip of membrane to each of the four corners of the back side of the pad. Position the strips in such a way that they overhang the edge of the pad a minimum of two inches around the 90° corner.

3. Position the protection pads as directed by the specifications or agreement and weld the visible portion of the previously applied stripping to the roofing membrane.

3.13 FIELD QUALITY CONTROL

A. Roof cement shall not be incorporated into the roof membrane or flashing system.

B. Architect/Engineer will inspect roofing system at various stages of construction and at completion.

C. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to prepare test reports.

D. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.

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

3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

E. Infrared Survey: If roofing fleece backed cap sheet is not installed

immediately after the ply sheets are installed (Phased Construction), contractor shall provide an infra-red survey of entire roof area. Survey shall be performed by organization that is approved by the Architect. Infra-red survey and subsequent report shall be performed prior to the installation of the roofing cap sheet.

F. Manufacturer's Inspections: Arrange for the roofing systems manufacturer to provide qualified technical personnel for onsite observation and instruction full time at beginning of membrane installation to establish project standard and thereafter as the manufacturer deems necessary, but not less than 1 time every two weeks when roofing membrane and related work is being performed. A field observation report from each visit will be generated and submitted to the Engineer within 48 hours of the visit.

G. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

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

H. Roofing system will be considered defective if it does not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

2. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

3.14 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove 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.

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

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

3.15 SEALANTS

A. Apply authorized sealant(s) to all surface mounted reglets and per project requirements. Sealant(s) are to shed water. Follow all manufacturer's instructions and installation guides.

B. Use primer when recommended by the manufacturer.

C. Sealants will require periodic maintenance by the building owner's maintenance personnel.

3.16 TEMPORARY SEALS

A. At the end of each working day or at the sign of rain, install temporary, 100% watertight seal(s) where the completed new roofing adjoins the uncovered deck or existing roof surface.

B. The authorized roofing contractor shall create and maintain the temporary seal in such a manner to prevent water from traveling beneath the new and/or existing roof system.

C. The use of plastic roofing cement is permissible when sealing to an existing built up roof.

D. 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 building owner.

E. Prior to the commencement of work, cut out and remove all contaminated membrane, insulation, roof cement or sealant and properly dispose off site.

3.17 LIGHTNING PROTECTION

A. The installation of lightning protection must be coordinated with the authorized roofing contractor, certified lightning contractor and the building owner.

B. The lightning protection must be installed in such a manner that base plates, air terminals and cables do not penetrate the roofing membrane without the use of pre-approved flashing details.

C. Cables and air terminals may be attached to the membrane using base plates and an approved construction adhesive or by welding intermittent strips of membrane over the base plates and cables to the roofing. Contact manufacturer for specific adhesive recommendations.

D. Recommendations regarding the selection of adhesives or alternative affixing of lightning protection systems to the membrane does not in any way imply a warranty covering their performance or ability of the adhesives to remain affixed to the membrane.

3.18 COMPLETION

A. Remove any and all debris, excess materials and scrap of any kind from the roof and surrounding premises prior to demobilization.

B. Inspect all field welds, detailing and terminations to ensure a 100% the watertight installation.

3.19 WARRANTY INSPECTION

A. Upon completion of the project, the authorized roofing contractor shall complete and submit the Project Completion Notice to manufacturer.

B. Upon receipt of the notice of completion, a manufacturer's representative will schedule an inspection with a representative of the authorized roofing contractor to thoroughly review the installation and verify compliance with the manufacturer's requirements.

C. Any corrections or modifications necessary for compliance with the specifications and acceptance for warranty (punch list) will be noted on the Final Inspection for Warranty Form.

D. Upon completion of all punch list items and final acceptance of the installation, a warranty as authorized by the approved manufacturer Notice of Award and Warranty Request Form will be issued.

3.19 ROOFING INSTALLER'S WARRANTY

E. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.

2. Address: <Insert address>.

3. Building Name/Type: <Insert information>.

4. Address: <Insert address>.

5. Area of Work: <Insert information>.

6. Acceptance Date: <Insert date>.

7. Warranty Period: <Insert time>.

8. Expiration Date: <Insert date>.

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

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

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

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. lightning;
b. peak gust wind speed exceeding <Insert wind speed> mph;
c. fire;
d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
f. vapor condensation on bottom of roofing; and
g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

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

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

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

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

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

7. This Warranty is recognized to be the only warranty of Roofing

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

I. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.

2. Name: <Insert name>.

3. Title: <Insert title>.

END OF SECTION 075419