ROOF SPECIFICATION

I-1B-16-30-A

Insulated Fluid Applied Membrane Roof System with Title 24 Compliant Cool Roof Coating

For New Construction or Tear-Off Applications

Project: TBD
Buildings: TBD
Location: TBD

Section 07 56 00

COLD FLUID APPLIED ROOFING

WeatherWeld – A Division of Liquiform Technologies
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SECTION 07 56 00

FLUID APPLIED ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Seamless Fluid Applied Composite Roof Systems.

B. Roof Flashings.

C. Roof Accessories.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Cap flashing and expansion joints.

C. Section 07 71 00 - Manufactured Roof Specialties: Counter flashing, gravel stops, fascia, scuppers, gutters, and downspouts.

D. Section 07 72 00 - Roof Accessories.

E. Section 22 30 00 - Plumbing Equipment: Adjacent Piping Vents and Drains.

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

1.3 REFERENCES

A. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.

B. American Society of Civil Engineers (ASCE) - ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
1. ASTM C 728 - Standard Specification for Perlite Thermal Insulation Board.
2. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.
3. ASTM D 1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials.
4. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
5. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
6. ASTM D 2523 - Standard Practice for Testing Load-Strain Properties of Roofing Membranes.

Specification

7. ASTM D 3019 - Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered.
8. ASTM D 3909 - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules.
9. ASTM D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
10. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
11. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
12. ASTM E 548 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence.
13. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

D. Underwriters Laboratories (UL): ANSI/UL 790 - Standard Test Methods of Roof Coverings.

E. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide.

F. CRRC - Cool Roof Rating Council.

G. California Building Standards Code - Title 24.

H. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) - Architectural Sheet Metal Manual.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to Work in this Section.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide watertight roofing membrane and flashing system that does not permit the passage of water, resists uplift pressures specified in this section, and is capable of withstanding thermally induced movement and exposure to weather without failure.

B. Energy Performance:
1. Low-Slope Roofs: Provide roofing system with Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
2. Roof membrane finish must comply with current California Title 24 Part 6 requirements:
   a. Minimum three (3) year aged solar reflectance: 0.55.
   b. Minimum Thermal Emittance: 0.75.

Specification

C. Wind Resistance: Provide roofing membrane, base flashings and component materials that comply with requirements in FMG 4450, FMG 4470, UL 580 or UL 1897 as part of a membrane roofing system.
   1. Wind Load Resistance: 1-90

D. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings from the applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A ASTM E 108 for application and roof slopes indicated.

1.6 SUBMITTALS

A. Submit in accordance with Section 01 30 00 - Administrative Requirements.

B. Product Data: For each product note in this section, submit printed or digital copies of manufacturers product information including the following:
   1. Printed affirmation of performance characteristics.
   2. Roofing system design.
   3. Application Instructions.
   4. Technical Data Sheets.
   5. Safety Data Sheets.

C. LEED Submittals:
   1. Product Data for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
   2. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

D. Warranty Documents: Provide sample copies of the Manufacturer's standard form outlining the terms and conditions of the warranty specified for the Work in this section.

E. Shop Drawings: Provide plan, elevation, section, and isometric drawings outlining waterproofing conditions at transitions, terminations, penetrations and attachments to adjacent work.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of the roofing system.

G. Research & Evaluation Reports: For components of the roofing system.
   1. Include reports from UL, ICC, FMG or another testing and inspecting agency acceptable to authorities having jurisdiction, stating entire system meets fire-test-response characteristics listed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer must be authorized by roofing system manufacturer to perform all Work specified in this section and provide an executed manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for roofing system identical to that used for this project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations:
   1. Obtain roof system components from a single manufacturer.
   2. Secondary products required must be recommended and approved in writing by the roofing system Manufacturer.
   3. Upon request, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to commencement of Work, conduct a conference at project site. Comply with the requirements of Section 01 31 00 - Project Management and Coordination. Review and affirm methods and procedures related to the work specified in this section, including but not limited to the following:
   1. Meet with owner, architect, owner's insurer if applicable, testing and inspecting agency representative, roofing installer, roofing system manufacturer’s representative, deck installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including the manufacturer's written instructions.
   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 during and after installation.

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

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver 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. For bulk-delivered materials, identify manufacturer’s name and product designation with delivery receipts and material manifests.

B. Protect roofing materials from physical damage and from deterioration due to sunlight, moisture, soiling and other sources. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

C. Store liquid materials in their original, undamaged containers in a clean, dry, and protected location, between 50 degrees F to 80 degrees F (10 degrees to 26.7 degrees C). Ensure jobsite storage is in a shaded and well-ventilated area, away from open flame or welding sparks. Indoor Storage is recommended.

D. Do not stockpile materials on roof without first obtaining acceptance from the Architect.

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

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit the roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside Manufacturer's absolute limits.

C. The minimum temperature for application of WeatherWeld Emulsion and WeatherWeld Acrylic Coating is 50 degrees F (10 degrees C) and rising.

D. Product application must not be performed when rain or other ambient moisture conditions such as fog or heavy dew are possible within a 72-hours of completion. Roof surface must be a minimum of 6 degrees F (3 C) above the dew point and rising.

E. Safety Data Sheets (SDS) must be on location during the transportation, storage, and application of materials.

F. Schedule and phase work such that new roofing materials are not subject to construction traffic. Protect new roof sections and inspect for damage upon completion.

G. When applying materials with spray equipment, take precautions to prevent overspray and/or solvents from damaging or defacing surrounding walls, building surfaces, vehicles, or other property.

H. The surface on which the roof system is applied shall be clean, smooth, dry, and free of projections or contaminants that could prevent proper application of or be incompatible with the new installation. Correct all sharp edges, foreign materials, oil, and grease.

I. Take precautions to ensure that materials do not freeze.

J. Protect completed roof sections from foot traffic for a period of at least 48 hours at 75 degrees F (24 degrees C) and 50 percent relative humidity or until fully cured.

1.11 WARRANTY

A. No Dollar Limit (NDL) Warranty: Provide Manufacturer's written and signed No Dollar Limit (NDL) warranty document, affirming coverage in the event of a leak in the roofing membrane or base flashings applied within the scope of work outlined in this section.
   1. Warranty Period: Forty (40) years from date of Substantial Completion.
   2. Coating Warranty: Twelve (12) years from date of Substantial Completion.

B. Project Warranty: Submit roofing installer's signed and executed warranty document affirming coverage of all work of this Section, including but not limited to insulation, cover board, fasteners, base sheet, roofing membrane, base flashings, and walkway products.
   1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Liquiform Technologies Inc – WeatherWeld.
   1. Within 72 hours of the initial site visit, equivalent systems from The Garland Company or Tremco Roofing may be considered, providing the systems meet warranty requirements, physical characteristics and do not use solvents or fire during installation.

B. Acceptable Manufacturers:
   1. Liquiform Technologies Inc – WeatherWeld.
   2. _____.
   3. _____.

2.2 THERMAL PROTECTION

A. Insulation: Rigid polyisocyanurate board, with a fibrous glass facer meeting or exceeding the requirements of ASTM C 1289.

Specification

1. Board Thickness: _____.
2. Long Term Thermal Resistance (LTTR value): _____.

B. Insulation Cover Board: Overlayment board with a water-resistant gypsum core and glass fiber facers embedded on both sides. Pre-primed on one side; Dens-Deck Prime Roof Board, Manufactured by GP.
1. Board Thickness: 1/4 inch (6 mm).
2. Board Thickness: 1/2 inch (13 mm).

2.3 COMPOSITE MEMBRANE SYSTEM

A. General:
1. Roofing system must comply with 2007 CBC, Chapter 15.
2. Subject to compliance with requirements, provide the specified membrane configuration, applied over existing low slope roofs.

B. Basis of Design: I-1B-16-30-A, by WeatherWeld. Composite roof applied over an approved deck with CA Title 24 compliant cool roof surface coating.
1. Physical Properties:
   a. Total Weight: 2.2 pounds per square foot (1.0 kg) dry.
   b. Nominal Thickness: 350 mil Dry Film Thickness (DFT).
   c. Minimum Strength: 600 psi (4136 kN/m2) per ASTM D 2370.
   d. Minimum Elongation: 10% per ASTM D 4830.
   e. Minimum Puncture Resistance: 700 lb. (318 kg) per ASTM D 4830.
   f. Water Absorption: 1% max by weight per ASTM D 570.
   g. Fire Rating: UL Class “A” assembly.
2. Membrane Configuration:
   a. Base Sheet: Mineral surfaced cap sheet – Inverted.
   b. Fiberglass Roving: 16 Lbs per 100 square feet.
   c. Asphalt Emulsion: 30 gallons per 100 square feet.
   d. Acrylic Base Coating: 1.5 Gallons per 100 square feet.
   e. Reflective Acrylic Top Coating: 1.5 Gallons per 100 square feet.

2.4 COMPOSITE MEMBRANE MATERIALS

A. Asphalt Emulsion: WeatherWeld Asphalt Emulsion meeting or exceeding the requirements of ASTM D1227. WW471145, by WeatherWeld.
1. VOC Content (Maximum): 0 g/l.
2. Wet Weight: 8.7 Lbs./Gal. (1041 g/l).
3. Dry Weight: 4.35 Lbs./Gal. (521 g/l).
4. Solids Content by Volume: 49-53%.

B. Fiberglass Reinforcement (Type E): Multi-end continuous fiberglass roving designed for spray operations. WWFG100, by WeatherWeld.
1. Yield: 207 yd/lb.
2. Tex: 2400 g/km.

3. Spool Weight: 41.9 LB (19kg).

C. Acrylic Basecoat: WW473049, by WeatherWeld.
1. Solids Content by Volume: >45-50%.
2. VOC Content (maximum): 400 g/l.
3. Weight: 7.7 - 8.7 lbs./Gal. (922 – 1041 g/l).

D. Reflective Acrylic Topcoat: CA Title 24 Cool Roof Reflective Coating as supplied by the manufacturer of the membrane system. WW472049, by WeatherWeld.
1. Solids Content by Volume: >45-50%.
2. VOC Content (maximum): 400 g/l.
3. Weight: 7.7 - 8.7 lbs./Gal. (922 – 1041 g/l).
4. Solar Reflectance:
   a. Initial: 0.83.
   b. 3 Year Aging: 0.75.
5. Thermal Emittance:
   a. Initial: 0.88.
   b. 3 Year Aging: 0.92.
6. Solar Reflectance Index (SRI):
   a. Initial: 104.
   b. 3 Year Aging: 93.

2.5 SHEET MATERIALS

A. Self-Adhering Membrane: SBS-modified membrane sheet with adhesive backing. WW474049, by WeatherWeld.
1. Elongation: 85%.
2. Thickness: 75 mils.
3. Weight: 3 oz/ sq. yd.
4. Roll Width: 36 inches.

B. Venting Base Sheet: Asphalt coated, glass fiber reinforced base sheet meeting or exceeding the requirements of ASTM D 4601, Type II, and UL Type G2.

2.6 ADHESIVES AND SEALANTS

A. Base Sheet Adhesive: General purpose roof adhesive meeting or exceeding the requirements of ASTM D 3019 Type III; Oly-Bond 500 Spot-Shot, manufactured by OMG.

B. Insulation Adhesive: Two-component, low-rise polyurethane foam adhesive designed to secure insulation to roof decks; Oly-Bond 500, manufactured by OMG.

C. Flashing Cement: Trowel grade SBS-modified flashing cement made from heavy-bodied asphalt reinforced with organic fibers.
1. VOC Content (Maximum): 290 g/l.
2. Weight per Gallon: 8.25 – 9.25 Lbs (988 – 1107 g/l).

D. Polyurethane Sealant: Moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant. Meets ASTM C920, Type S, Grade NS, Class 35; Sikaflex-1A, manufactured by Sika.

2.7 SHEET METAL, FLASHING AND TRIM

A. Metal Flashing Sheet: 24 Ga. Galvanized sheet metal flashing as specified in Division 07 Section "Sheet Metal Flashing and Trim."

B. Flashing Boot: 24 Ga. Galvanized sheetmetal pipe boot for sealing single or multiple pipe penetrations adhered in approved adhesives as recommended and furnished by the membrane manufacturer.

C. Vents and Breathers: Heavy gauge aluminum and fully insulated vent that allows moisture and air to escape but not enter the roof system as recommended and furnished by the membrane manufacturer.

D. Pitch Pans: Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints must be welded or soldered to remain watertight.

E. Drain Flashings: 4 lb (1.8kg) sheet lead formed and rolled.

F. Plumbing stacks: 4 lb (1.8kg) sheet lead formed and rolled.

G. Fabricated Flashings: As specified in Section 07 62 00.
   1. Fabricated flashings and trim must conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.

H. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07 71 00.
   1. Manufactured roof specialties must conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

I. Fasteners: Factory-coated steel fasteners and metal meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength and acceptable to roofing system manufacturer.

2.8 WALKWAYS

A. Foot Traffic Walkway Coating:
   1. Acrylic Coating: Fluid applied, single-component, 100% Acrylic, waterproof walking surface with ceramic granules designed to enhance the traffic resistance of the roof surface.
      a. Coating Properties:

1) Tensile Strength: 350 psi when tested in accordance with ASTM D 412.
2) Elongation: 174% when tested in accordance with ASTM D 412.
3) Solids Content: 95% when tested in accordance with ASTM D 2369.
4) VOC: <50 g/l.
5) Flash Point: 141 degrees F min. (60.6 degrees C) when tested in accordance with ASTM D 93.
6) Color: Safety Yellow.

b. Granule Properties:
1) Specific Gravity 2.65 when tested in accordance with ASTM C 128,
2) Bulk Density: 90-100 lbs./Cu. Ft. when tested in accordance with ASTM C29.
3) Color: Yellow.

B. Walkway Pads: Mineral-granule-surfaced, reinforced asphaltic composition, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 1/2 in (13mm). thick, minimum.
1. Pad Size: 36 inches by 60 inches (914mm x 1524mm) minimum.

2.9 ACCESSORIES

A. General: Roofing accessories recommended by manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate and acceptable to roofing system manufacturer.

C. Cant Strips: ASTM C 728 perlite insulation board.

D. Wood Nailer Strips: Comply with requirements in Division 06 Section “Miscellaneous Carpentry."

E. Tapered Edge Strips: ASTM C 728 perlite insulation board.

F. Substrate Joint Tape: 6 inch (152mm) or 8 inch (203mm) wide, coated, glass-fiber joint tape.

G. Anti-Skid Granules: Granules specifically designed for anti-skid purposes and compatible with all coatings specified in this section.

PART 3 EXECUTION

3.1 EXAMINATION

A. Compatibility, verify all materials including existing roof are compatible.
1. Verify existing roof systems are NOT coated with silicone style coatings.

2. Verify existing roof systems are NOT PVC single ply membrane.
3. Verify the following for installations over lightweight insulating concrete (LWIC):
    a. Decks must be a minimum of 2 inches (51 mm) thick with a compressive strength of no less than 125 psi (0.86 MPa) and a density of 22 pcf (352 kg/sm).
    b. Slopes must not exceed 1 inch per foot (83 mm/m).
    c. Membrane and insulation may not be applied directly to lightweight concrete. Mechanically attach an approved specified base sheet prior to application of subsequent insulation or membrane.

B. Examine substrates, work areas and field conditions, for compliance with the following requirements and other conditions which may affect the performance of the roofing system. Verify the following conditions:
1. Surfaces are clean, rigid, dry, smooth, and free from cracks, holes, blisters, debris and sharp changes in elevation greater than 1/4 inch (6mm).
2. The deck is free of depressions, waves or projections and properly sloped to drains, valleys, eaves, scuppers, or gutters.
3. Roof openings and penetrations are adequately installed, and that roof drains are securely clamped in place.
4. Cant strips, blocking, curbs and nailers are securely anchored and installed in accordance with manufacturers requirements.
5. Drains and scuppers are free of ruptures and sealed on all four sides on the exterior face of walls.
6. Surface plane flatness and fastening of roof deck complies with manufacturers requirements.
7. Concrete curing compounds and any chemicals that may impair adhesion of roofing components have been removed.
8. Existing roof assemblies are dry, confirmed by conducting infrared thermal scans.
9. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D 4263.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.2 PREPARATION

A. Do not begin installation until all substrates have been properly prepared.

B. Prior to application, clean application surfaces with water. Where wash water must be reclaimed due to contamination concentrations, roof water collection design of the building or local ordinances. Conform to local requirements for disposal of wash water.

C. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation in accordance with the roofing system manufacturer's written instructions.

D. Remove or correct all sharp projections which may interfere with the integrity of the membrane.

E. Protect roof drains and edges during construction to prevent materials from entering roof drains and conductors or migrating onto surfaces of adjacent construction. Remove roof drain plugs when no work is taking place or when rain is forecast.

F. Protect adjacent materials and lower paving, prior to starting work, in accordance with roofing system Manufacturer’s instructions.

G. Roof Surface Preparation:
1. Vacuum loose gravel from existing roofs.
2. Remove existing perimeter edge flashings.

3.3 ROOF DECK PREPARATION

A. Metal Roof Deck:
1. Metal roof decks must be a minimum 22 gauge (0.8 mm) with a G-90 galvanized finish.
2. Prior to installation, remove any surface corrosion, oxidization, or rust. Repair or replace any panels with substantial corrosion. Fasten all loose or poorly secured decking.
3. Ensure that all panels achieve the required fastener pull-out resistance.
4. Comply with local building codes where requirements exceed those listed here.

B. Structural Concrete Roof Deck:
1. Structural concrete decks must be lo less than 4” (10.2 cm) thick.
2. Decks must be smooth, level, and free from depressions or damage.
3. If deck is determined to be wet or frozen, allowed to dry prior to commencement of Work.
4. Ensure the roof deck is properly cured for no less than twenty-eight (28) days prior to commencement of the Work in this section. Confirm that all concrete additives or coatings are compatible with the specified roof system.
5. Cracks greater than 1/8” (3 mm) must be repaired with materials compatible with the membrane system specified in this section.
6. Ensure that roof drains have proper sumps, and that water drains adequately.
7. Comply with local building codes where requirements exceed those listed.

C. Plywood / Oriented Strand Board (OSB) Deck:
1. Plywood Sheathing must be a minimum 4 ply 15/32” (12 mm) thick exterior grade. Oriented Strand Board must carry a Structural 1 rating.

2. Where decking is treated with chemical preservatives or fire retardants, confirm compatibility with materials specified in this section.
3. Decking must be installed with all four sides bearing structural members. Secure to joists or cross blocking as required by local building codes.
4. Decking must remain dry during the entire application process.
5. Comply with local building codes where requirements exceed those listed.

D. Lightweight Insulating Concrete Deck:
1. Lightweight insulating concrete decks must be no less than 2” (5.1 cm) thick with a compressive strength of no less than 125 psi (87,000 kg/m²) and a minimum density of 22 pcf (352 kg/m²).
2. Do not apply the specified roof system directly to lightweight concrete decks. Over old, dry decks, additional board insulation may be solidly mopped to an approved mechanically attached anchor sheet (base sheet).
3. Comply with local building codes where requirements exceed those listed.

E. Cementitious Wood Fiber Deck:
1. Cementitious wood fiber decks must meet the minimum design loads recommended by the deck manufacturer.
2. Decks must be adequately secured for protection from both uplift pressure and lateral movement.
3. Ensure that the deck is level, without deflection, depressions, or irregularities. Replace damaged panels prior to commencement of Work.
4. A base sheet must be mechanically attached to the deck prior to installation of insulation or roofing membrane.
5. Comply with local building codes where requirements exceed those listed.

F. Gypsum
1. Gypsum decks must be smooth and free from deflections or sharp edges.
2. Fastener pull-out resistance must exceed 40 lbs. (178 N) per fastener.
3. Wet or frozen decks are not acceptable substrates to receive a roof.
4. Where the roof is installed over a new gypsum deck, avoid trapping moisture beneath the roofing system by providing underside ventilation to allow for proper curing, and include topside and perimeter venting.
5. Comply with local building codes where requirements exceed those listed.

3.4 INSULATION INSTALLATION

A. General Requirements:
1. Comply with roofing, system and insulation manufacturers’ written instructions and applicable recommendations of NRCA for installing roof insulation.
2. Install and secure preformed 45 degree cant strips at transitions between roofing membrane system and vertical surfaces or angle changes greater than 45 degrees.

3. Install tapered insulation under areas of roofing to conform to slopes indicated.
4. Where indicated in the contract drawings, tapered insulation crickets must be installed to eliminate ponding water.
5. Attach insulation in accordance with the requirements of local codes as necessary to achieve the required uplift pressure resistance within the field, perimeter, and corner zones of each roof section.
6. Install one or more layers of insulation and/or cover board to achieve specified thickness. Where overall insulation thickness is 1 1/2 inch (39mm) or greater, install two or more layers, staggering joints of each succeeding layer a minimum of 6 inches (152mm) in each direction.
7. Install insulation with long edges in a continuous straight line, staggering end joints between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6mm) with insulation.
8. Cut and fit insulation within 1/4 inch (6mm) of nailers, projections, and penetrations.
9. Where necessary, taper insulation at roof drains so completed surface is flush and does not restrict the flow of water.

B. Adhered Attachment:
1. Adhere each layer of insulation to substrate in a cold fluid-applied adhesive approved for use by the insulation manufacturer for substrates found on this project.
2. Apply adhesive in accordance with the adhesive manufacturer's recommendations, and immediately bond cover board to substrate.

C. Mechanically Fastened and Adhered Attachment:
1. Secure the first layer of insulation to substrates using the appropriate size and type mechanical fastener for attaching the specified roof insulation to the substrate type.
2. Install subsequent layers of insulation in a cold fluid-applied adhesive.

3.5 SUBSTRATE BOARD

A. Placement: Loosely abut and install cover boards with long joints in continuous and straight lines, with end joints staggered between rows.
1. Install with a nominal 1/4 inch (6mm) gap at vertical surfaces and a 1/8 inch (3mm) gap at board edges.
2. Offset joints a minimum of 6 inches (152mm) in each direction from joints of insulation below.

B. Attachment - Adhered: Apply adhesive to underside per adhesive Manufacturers' requirements to satisfy local building code. Immediately bond cover board to substrate.

3.6 VENTING BASE SHEET INSTALLATION

A. Install venting base sheet with a minimum 4 inch (103mm) head lap and minimum 6 inch (152mm) side lap.

B. Extend base sheet beyond cant strips and terminate at the top of all base flashings.

C. Attach base sheet with adhesive or fasteners as specified by the manufacturer for each type of substrate found on the project.

3.7 ROOFING MEMBRANE INSTALLATION - GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA and NRCA.

B. Commence installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Cooperate with testing and inspecting agencies engaged or required to perform services during roofing system installation.

D. Coordinate installation to ensure that materials that will not be permanently exposed are protected from moisture and covered at the end of each workday.
   1. Provide tie-offs at the end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Substrate Joint Penetrations: Where exceeding 1/4 inch in width (6mm), tape joints to inhibit roofing cement from penetrating substrate, entering building, or damaging roofing system components or adjacent building construction.

3.8 FLASHING INSTALLATION

A. General:
   1. Refer to the manufacturer’s application manual for flashing specific details.
   2. All flashings must have a minimum of 536 mil of fiberglass composite upon completion of the installation.
   3. Fabricated flashings and trim must conform to the requirements found in the current SMACNA "Architectural Sheet Metal Manual".
   4. Manufactured Roof Specialties: Manufactured copings, fascia, control joints, and related flashings and trim must conform to the requirements found in the SMACNA "Architectural Sheet Metal Manual" and/or the National Roofing Contractors Association "Roofing and Waterproofing Manual".
   5. Any joint in the structure intended to allow for movement must be divorced from the seamless reinforcement composite.

a. Install an 18 inch (457mm) wide slip sheet consisting of inverted (mineral-side down) cap sheet, laid dry over the joint and extending 36 inches (914mm) at each end.
b. Over the slip sheet, solidly adhere a 36 inch (914mm) polyester ply in 4 gallons per 100 square feet (1.63 L/m2) of emulsion and reinforce with 536 mil of seamless composite.

B. Base Flashings and Cant Strips: Minimum 3 inch (76mm) cant strips must be installed at base flashings, walls, and curbs. Miter cants at ends to provide a smooth transition and set in adhesive.

C. Metal Drip Edges:
1. Inspect nailers for proper attachment and configuration.
2. Run one ply of self-adhering membrane 2 inches (51mm) over the edge. Assure coverage of all wood nailers.
3. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
4. Install new metal edge, securing to cleat and set in bed of roof cement. Fasten flange to wood nailers every 3 inches (76 mm) o.c. staggered.
5. Apply primer to metal edges at a rate of 100 square feet per gallon and allow to dry.
6. Adhere a continuous strip of self-adhering membrane to the metal flange 2 inches (51mm) from the edge and extend 6 inches (152mm) onto the existing roof surface.
7. Coordinate placement to ensure membrane laps do not coincide with metal laps.
8. Reinforce with 500 mil of seamless composite. Extend the field application of composite to the outside edge of the metal flashing.
9. Apply composite flush with the edge to ensure that water does not pond.

D. Roof Edge with Gutter:
1. Inspect nailers for proper attachment and configuration.
2. Install one ply of self-adhering membrane 2 inches (50mm) over the edge. Assure coverage of all wood nailers.
3. Install gutter and strapping.
4. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
5. Install new metal edge, securing to cleat and set in bed of roof cement. Fasten flange to wood nailers every 3 inches (76 mm) o.c. staggered.
6. Apply primer to metal edges at a rate of 100 square feet per gallon and allow to dry.
7. Adhere a continuous strip of self-adhering membrane to the metal flange 2 inches (51mm) from the edge and extend 6 inches (152mm) onto the existing roof surface.
8. Coordinate placement to ensure membrane laps do not coincide with metal laps.

9. Reinforce with 500 mil of seamless composite. Extend the field application of composite to the outside edge of the metal flashing.
10. Apply composite flush with the edge to ensure that water does not pond.

E. Scuppers:
1. Inspect nailers for proper attachment and configuration.
2. Run one ply of self-adhering membrane 1 inch (25mm) over the edge. Assure coverage of all wood nailers.
3. Install pre-formed scupper in a 1/4 inch (6 mm) bed of roof cement. All seams and corners must be soldered, and scupper must have a minimum 4 inch (101 mm) flange. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
4. Fasten scupper flange to nailers every 3 inches (76mm) o.c. staggered.
5. Adhere a continuous strip of self-adhering membrane to the metal flange approximately 2 inches (51mm) from the edge and 6 inches (152mm) onto the existing roof surface.
6. Coordinate placement to ensure membrane laps do not coincide with metal laps.
7. Reinforce with 500 mil of seamless composite. Extend the field application of composite to the outside edge of the metal flashing.
8. Apply composite flush with the edge to ensure that water does not pond.
9. scupper edge must be turned down a minimum of 1 inch (25mm) at outside edge of wall and sealed.

F. Coping Caps:
1. Attach tapered nailer to top of wall with a minimum slope of 1/4 per foot.
2. Cover nailer and all exposed wood with self-adhering membrane, extending 2 inches (50mm) over edges.
3. Reinforce with 500 mil of seamless composite. Extend field application of composite to the outside edge of wall.
4. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
5. Install new metal coping cap hooked to continuous cleat.
6. Overlap joints a minimum of 4 inches (101 mm) and install in a 1/4 inch (6 mm) bed of polyurethane sealant.
7. Fasten inside of cap 24 inch (609 mm) o.c. with approved fasteners and neoprene washers.
8. Install 6 inch (152mm) strips of self-adhering membrane, extending 3 inches (76mm) onto each side of joint. Extend down front and back face of coping.
9. Install coping cap per manufacturer's recommendations.

G. Surface Mounted Counterflashing:
1. Set counterflashing in adhesive and fasten above flashing at 8 inches (203 mm) o.c.
2. Install sealant at top of counterflashing.

H. Recessed Counterflashing:
   1. Cut receiver groove into concrete masonry unit wall located at the first horizontal grout joint above base flashing termination.
   2. Secure recessed “Reglet” type counterflashing with expansion fasteners.
   3. Install sealant at top of counterflashing.

I. Skirted Counterflashing:
   1. Where existing counterflashing does not adequately cover finished base flashings, a “skirt flashing” may be installed.
   2. Specific applications must be approved by the Manufacturer prior to application and conform with manufacturers’ most current construction details for the specific application.
   3. Flashing must extend at least 1 1/2 inches (39mm) behind existing counterflashing and project no greater than 3 inches (76mm) past the bottom edge. Vertical seams must overlap a minimum of 6 inches (152mm).
   4. All metal edges which may come in contact the base flashing must be hemmed to protect the installed membrane.
   5. Mechanically fasten skirt flashing to existing counterflashing using self-tapping screws with neoprene washers.

J. Expansion Joints:
   1. Install compressible insulation in neoprene cradle.
   2. Apply self-adhering membrane sheet to cover expansion joint curb and extend 9 inches (228 mm) onto the field of the roof.
   3. Reinforce with 500 mil of seamless composite. Extend application of composite to the top of expansion joint curbs.
   4. Install pre-manufactured expansion joint cover. Fasten sides at 12 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with sealant between metal covers.

K. Area Dividers:
   1. Apply self-adhering membrane sheet to cover expansion joint curb and extend 9 inches (228 mm) onto the field of the roof.
   2. Reinforce with 500 mil of seamless composite. Extend application of composite to the top of area divider curbs.
   3. Install pre-manufactured expansion joint cover. Fasten sides at 12 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with sealant between metal covers.

L. Equipment Supports:
   1. Apply self-adhering membrane sheet to cover expansion joint curb and extend 9 inches (228 mm) onto the field of the roof.
   2. Reinforce with 500 mil of seamless composite. Extend application of composite to the top of the support curb.

3. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with sealant between metal covers.
4. Set equipment on neoprene pads and fasten as required by equipment manufacturer.

M. Curbs:
1. Apply self-adhering membrane sheet to cover expansion joint curb and extend 9 inches (228 mm) onto the field of the roof.
2. Reinforce with 500 mil of seamless composite. Extend application of composite to the top of the curb.
3. Install pre-manufactured counterflashing with fasteners and neoprene washers.

N. Skylights, Smoke Vents and Roof Hatches:
1. Apply self-adhering membrane sheet to cover expansion joint curb and extend 9 inches (228 mm) onto the field of the roof.
2. Reinforce with 500 mil of seamless composite. Extend field application of composite to the top of the curb.
3. Install pre-manufactured unit in accordance with Manufacturers' recommendations.
4. At all required locations, install OSHA compliant, compression mounted skylight protection screens per skylight manufacturers' written instructions.

O. Roof Drains:
1. Prior to commencing flashing work, plug drains to prevent debris from entering plumbing.
2. Taper insulation towards drains to create a sump 24 inches (609 mm) from center of drain.
3. Apply self-adhering membrane over drain. Cut out sheet inside drain bowl.
4. Set lead or copper flashings (30 inch square minimum) in 1/4 inch bed of roof cement. Extend flashing into drain a minimum of 2 inches (50 mm), apply primer to metal at a rate of 100 square feet per gallon, and allow to dry.
5. Reinforce with 500 mil of seamless composite extending down walls of drain bowl and allow to cure.
6. Install clamping ring, remove drain plug and attach strainer.

P. Pipe Penetrations: All pipe penetrations must be flashed with a minimum 24 gauge galvanized sheet metal storm collars installed approximately 1 inch (25mm) above the top of the flashing boot and secured with a draw band with approved sealant.

Q. Heat Stacks:
1. Run roof system over the entire surface of the roof. Seal the base of the stack with sealant.
2. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.

3. Reinforce with 500 mil of seamless composite.
4. Install new storm collar. Weld or install stainless steel draw brand and caulk.

R. Pitch Pockets:
1. Place the pitch pocket over the penetration and prime all flanges.
2. Apply strips of self-adhering membrane around all sides of pitch pocket, extending 6 inches (152 mm) onto the field of the roof.
3. Fill pitch pocket halfway with non-shrink grout.
4. Encapsulate entire pitch pocket with 500 mil of seamless composite.
5. Caulk joint between roof system and pitch pocket with roof cement.
6. Place a water shedding bonnet over the top of the pitch pocket, clamp the top with a drawband, and apply sealant.

S. Pipe Supports: Install supports in accordance with Manufacturers' guidelines. Traffic pads must be installed under pipe supports and fasteners must not penetrate the roofing membrane.
1. All pipes 2 inches (51mm) in diameter or less may be supported with polymer pipe supports spaced no greater than 8 feet (2438mm) on center.
2. All pipes over 2 inches (51mm) in diameter must be supported with movable pipe hangers or other support system approved by the roofing system Manufacturer.

T. Moisture Vents: Install 1 way aluminum moisture vents every 1000 sq ft. Apply 500 mils of seamless composite to the aluminum flange such that the seamless composite seals a minimum of 3 inches (76mm) to forms a solid continuous seal.

U. Sloped Roof Transitions: Remove roofing material extending a minimum of 24 inches (610mm) onto steep-slope roofs.
1. Install self-adhesive membrane, extending 12 inches(304mm) onto low slope roof and 24 inches (609mm) onto steep slope roof.
2. Reinforce with 500 mil of seamless composite.
3. Install steep slope roofing material in accordance with Roofing Manufacturer's recommendations and requirements.

3.9 FIELD MEMBRANE INSTALLATION

A. Apply one layer of the composite roofing at the following ratio:
1. Asphalt Emulsion (undiluted): 30 gal. per 100 square feet (12.2 l/m2).
2. Fiberglass Reinforcement: 16 lb. per 100 square feet (0.78 Kg/m2).

B. In accordance with the roofing system manufacturer's flashing details, apply seamless composite to the entire roof surface, terminating at the following locations:
1. Tops of base flashings and curbs
2. Outside edges of perimeter metal flashings.
3. Outside edges of walls.
4. Insides of drain bowls.

C. No water or other material may be added to the emulsion to thin or extend pot life.

D. Fiberglass must be disbursed from the applicator in varying intertwined lengths, up to 24 inches (610mm).

E. Thoroughly mix fiberglass and emulsion prior to application on roof deck.

F. Any loose strands must be brushed by hand, removed or filled-in with emulsion to create a solid surface.

G. Upon completion, no area may be less than 330 mil dry film thickness (DFT).

H. Areas such as base flashings and penetrations, where application exceeds 500 mils wet, must be brushed by hand to prevent surface crazing.
   1. Where required due to phasing or weather conditions, composite roofing may be applied in two passes of half the recommended wet mil thickness.

3.10 REFLECTIVE COATING INSTALLATION

A. Prior to reflective coating application, wash the roof surface with water. Do not commence application until the system has thoroughly dried, as registered by a reading of zero with a calibrated moisture meter.

B. Apply specified roof coating to the entire roof surface at a minimum of 1 1/2 gal. per 100 square feet (0.6 L/m2) in each of two passes to total 3 gallons per 100 square feet. (1.2 L/m2). Back rolling is recommended to ensure even coverage throughout.

3.11 ROOFTOP DUCT ENCAPSULATION

A. Rooftop sheet metal ducts may be encapsulated with the rooftop composite membrane system specified in this section, installed at 250 mil DFT.

B. Install on top and sides of sheet metal ductwork. Do not apply membrane to the underside of ductwork, on or above mechanical units or on flexible bellows.

3.12 WALKWAY APPLICATION

A. Walkway Pads:
   1. Install walkway pads using units of size indicated on contract drawings.
   2. Where not expressly specified, install manufacturer's recommended size for the location and anticipated traffic volume.
   3. Install walkway pads with a cold adhesive compatible with the membrane specified.

B. Embedded Granule Traffic Surfacing:
   1. Immediately following the application of the field, mineral granules may be broadcast into the wet acrylic membrane in areas where traffic is likely to occur. Backroll granules with a suitable roller immediately.
   2. Apply granules at a rate of 20 Lbs (9 kg) per 100 square feet.

3.13 FINAL ROOF INSPECTION

A. At completion of roofing installation and associated Work, schedule a conference to include the Architect, Contractor, roof membrane installer, installers of associated work, roofing system Manufacturers' representative and others directly concerned with performance of roofing system.

B. Perform a site walk of roof surface, inspecting perimeter edges and flashings. Identify all items requiring correction or completion and furnish copy of list to each party in attendance.

C. Should roof core testing verify the presence of damp or wet materials, it is the responsibility of the installer to replace the damaged areas at their expense.

D. The repair or replacement of defective work found during inspection is required to produce an installation that is free of damage and deterioration at time of Substantial Completion and is required to execute the Manufacturer's warranty.

E. Notify Architect upon completion of corrections.

F. Upon a successful final inspection, the contractor will provide an executed copy of the Manufacturer's warranty and written acceptance of the installation.

3.14 PROTECTION

A. Prior to allowing any traffic on newly installed roof membrane, authorization in writing must be obtained from the roof system Manufacturer.

B. Provide traffic ways, and erect barriers, fences, guards, rails, enclosures, chutes, and other measures to protect personnel, roofs and structures, vehicles and utilities.

C. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roof for deterioration and damage. Where any defects or damage are identified describe their nature and extent in a written report, with copies to architect and owner.

D. Protect exposed surfaces of finished walls with tarps to prevent damage.

E. Plywood required for material movement and traffic over existing roofs must be a nominal 5/8 inch (16 mm) thick or greater.

3.15 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles, and other debris resulting from these operations.

B. Remove coating markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

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

END OF SECTION