SECTION 07 54 00

THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fully adhered polyvinyl chloride (PVC) roofing system.
   2. Substrate board.
   3. Vapor retarder / temporary roof.
   4. Roof insulation.
   5. Cover board.
   6. Walkways.
   7. Roof Expansion Joint System.
   8. Required Manufacturer's Field Services for inspection of substrates and installation of the roofing system components at various intervals.
   9. Roof and Vapor Retarder System Protection During Construction.
   10. Required roof system testing.

B. Related Sections:
   1. Section 06 10 00 " Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 07 62 00 "Sheet Metal Flashing and Trim" for fabricated scuppers and downspouts
   3. Section 07 71 00 "Roof Specialties" for manufactured, certified roof edge metal flashings, coping and related items.
   4. Section 07 72 00 “Roof Accessories” for roof curbs, equipment supports, roof hatches and related items, safety railings, pipe and duct penetration enclosures, and other items.
   5. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 PRICE AND PAYMENT PROCEDURES

A. This specification Section shall be bid exactly as written. No substitutions, no changes in materials, no changes to configuration, and no changes to design intent shall be considered. Refer to Section 07 71 00 Roof Specialties requirements for fully manufactured and tested associated materials to the roofing system specified herein.
   1. All Roof Specialties shall be fully manufactured and tested only to meet the performance requirements of Section 07 71 00 Roof Specialties with special warranties attached. No consideration shall be given to fabricated items covered

by 07 71 00 Roof Specialties regardless of fabricator qualifications or other considerations.

2. Fabricated metals permitted for the design intent of the roofing system are reflected in Section 07 62 00 Sheet Metal Flashing and Trim.
3. All submittals shall be reviewed by Corgan TDS Roofing Specialists prior to return.

1.3 REFERENCES

A. American Society of Civil Engineers/Structural Engineering Institute
   1. ASCE/SEI 7: Minimum Design Loads for Buildings and Other Structures

B. ASTM International
   1. ASTM C 518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of The Heat Flow Meter Apparatus
   2. ASTM C 1177/C 1177M: Specification for Glass Mat Gypsum Substrate for Use as Sheathing
   3. ASTM C 1278/C 1278M: Specification for Fiber-Reinforced Gypsum Panel
   4. ASTM C 1289: Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
   5. ASTM D 1079: Terminology Relating to Roofing and Waterproofing
   6. ASTM D 4263: Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
   7. ASTM D 4272: Test Method for Total Energy Impact of Plastic Films by Dart Drop
   8. ASTM D 4434: Specification for Poly(Vinyl Chloride) Sheet Roofing
   9. ASTM D 6754: Specification for Ketone Ethylene Ester Based Sheet Roofing
   10. ASTM E 108: Test Methods for Fire Tests of Roof Coverings
   11. ASTM E329: Guide for General Criteria Used for Evaluating Laboratory Competence
   12. ASTM E 1980: Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
   13. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in situ Probes.
   14. ASTM G 152: Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
   15. ASTM G 154: Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
   16. ASTM G 155: Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

C. Code of Federal Regulations
   1. 40 CFR 59, Subpart D: National Volatile Organic Compound Emission Standards for Architectural Coatings

D. Cool Roof Rating Council

1. CRRC-1: Product Rating Program

E. FM Global

1. FM Global 4450: Approval Standard for Class 1 Insulated Steel Deck Roofs (with 1992 Supplement)

F. FM Global 4470: Approval Standard Class 1 Roof Covers (with 1987 and 1992 Supplements)

1. FM Global Loss Prevention Data Sheet 1-29: Roof Deck Securement and Above-Deck Roof Components
2. RoofNav.

G. National Roofing Contractors Association

1. The NRCA Roofing and Waterproofing Manual.

H. Single Ply Roofing Industry

1. ANSI/SPRI WD-1 2012: Wind Design Standard Practice for Roofing Assemblies

I. Underwriters Laboratories Inc.

1. UL 790: Test Methods for Fire Tests of Roof Coverings

J. U.S. Department of Energy

1. DOE ENERGY STAR Roof Products Qualified Product List.

1.4 DEFINITIONS

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

1.5 SUBMITTALS

A. All submittals shall be reviewed by Corgan TDS Roofing Specialists prior to return.

B. Product Data: For each type of product indicated.

C. Intended schedule for Preliminary Roofing Conference and Preinstallation Roofing Meeting.

D. Shop Drawings: For Project and condition specific roofing systems. Include plans, elevations, sections, details, and attachments to other Work in compliance with all specified requirements reviewed and approved by Roofing Manufacturer prior to submittal to Architect. Manufacturer’s standard details as published are not acceptable and do not satisfy shop drawing requirements. Show the following items at minimum with project and condition specific detailing:

1. Substrate boards and mechanical fastening patterns in compliance with all FM and uplift requirements. Indicate any variation in fastening patterns at corner, perimeter and field applications.

2. Include all parapet sheathing fastening patterns in roofing system shop drawings. Reference Section 06 16 00 Building Sheathing for materials.
3. Vapor Retarder system including details at parapet walls indicating change in orientation and joints allowing variable movement between vertical and horizontal surfaces; differential expansion detailing.
4. Foam bead sizes and locations for vapor retarder primer / adhesive at field, perimeter, and corner locations.
5. Monolithic and Tapered insulation, including all slopes with identifications of rise per foot.
6. Base flashings and membrane terminations.
7. Tapered insulation, including slopes.
8. Foam bead sizes and locations for insulation adhesion at field, perimeter, and corner locations.
9. Foam bead sizes and locations for cover board adhesion at field, perimeter, and corner locations.
10. Clearly detail sheet metal flashing systems in coordination with adjacent exterior finish materials. Sheet metal items shall be clearly noted regarding metal type, thickness / gauge, profile, fastening, anchor types and compliance with applicable anticipated project specific wind uplift forces.
11. Roof plan showing orientation of steel roof decking, orientation of substrate board and seams, mechanically fastened substrate board and patterns and membrane roofing orientation, seaming and intended flashing.
12. Sheet metal flashing systems, clearly detailed in coordination with adjacent exterior finish materials. Sheet metal items shall be clearly noted regarding gauge, profile, fastening and compliance with applicable anticipated project specific wind uplift forces.
13. Intended roof system protection to be provided to allow for additional Work at rooftop following any system component installation.

E. Samples for Verification: For the following products:
1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Walkway pads or rolls.
4. Metal termination bars.
5. Six Substrate board fasteners of each type, length, and finish.
6. Vapor Retarder Sheet 12 inch by 12 inch with release paper in tact.

F. Qualification Data:
1. For qualified Installer and manufacturer.
2. For qualified Testing Agency with the experience and capability to conduct the testing as indicated and as documented per ASTM E 329.

G. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Evidence shall be submitted in the form of single FM Approvals RoofNav assembly numbers describing the assembly in its entirety. Multiple RoofNav assembly numbers used to describe a single assembly are not acceptable.

H. Installer Certificates: Signed by roofing manufacturer certifying that Installer is approved, authorized or licensed by manufacturer to install roofing system.

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

J. Research/Evaluation Reports: For components of membrane roofing system.

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

L. Sample Warranties: For manufacturer's special warranties.

M. Field Quality Control Reports: Including but not limited to Manufacturer’s Field Service Reports.

1. Roofing system manufacturer’s inspection reports. Include all pre-inspections, intermediate inspections and final report of completed roof installations. Report for review of vapor retarder MUST be provided to the Architect prior to engaging installation of materials over the vapor retarder system.
2. Concrete internal relative humidity: Provide ASTM F2170 test reports to Architect complete with roof plan indicating probe locations and relative humidity results at each location.
3. Fastener pull-out tests.
4. Electronic Field Vector Mapping report(s).

1.6 QUALITY ASSURANCE

A. Refer to the Contract Documents as a whole and the individual specification sections governing related requirements. Nothing in this Section shall remove the responsibility from the Contractor to Coordinate all Work and comply with the Contract Documents.

1. All roofing substrates and all components shall be acceptable to the Roofing Manufacturer and verified in the field just prior to the installation of any roofing system components. Refer to the Field Quality Control Article in this Section for required Manufacturer’s Field Services and Reports required prior to roof system and component installations.

B. Manufacturer Qualifications: Manufacturer having minimum 10 years documented experience in the manufacture of roofing systems that is UL listed listed in FM Approvals' RoofNav for roofing system identical to the system being installed.

C. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product, that is eligible to receive manufacturer's special warranty and has a minimum of 5 years documented experience installing roofing systems similar in size and scope to this Project.

D. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing as indicated and as documented per ASTM E 329.

1. Testing Agency Qualifications shall be provided prior to the start of any Work.

E. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer**.**

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct a preliminary conference at Project site to support Contractor coordination.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, concrete substrate 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 manufacturer's written instructions.
3. Review requirements for installation of vapor retarder, intent for use as a temporary roof, manufacturer review requirements prior to, during and after installation of the vapor retarder.
4. Review temporary protection requirements for roofing system during and after installation.
5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
6. Review decking and substrate requirements for conditions and finishes, including flatness, fastening and curing, drying and protection of all concrete substrates and meeting requirements for relative humidity and testing per ASTM F2170.
7. Review required finishes for substrate surfaces required for roof system adhesion and ensure coordination with other Work and materials. Confirm all concrete substrate surfaces have been coordinated and are acceptable to receive fully adhered roofing system components.
8. Review any manufacturer recommendations for addressing humidity levels in concrete slabs.
9. Review structural loading limitations of roof deck during and after roofing.
10. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
11. Review governing regulations and requirements for insurance and certificates if applicable.
12. Review roof observation and repair procedures prior to, during and after roofing installation.
13. Preliminary Roofing Conference may not be combined with the Preinstallation Roofing Meeting.

G. Preinstallation Roofing Meeting: Minimum 21 days before starting roofing construction, conduct conference at site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's technical representative, deck Installer, and installers (trades) whose work interfaces with or affects roofing, including installers of roof accessories, roof specialties and roof mounted equipment.
2. Review status of submittals and confirm Architect approval. No Work of this Section may be performed prior to submittal approval.
   a. If submittals are not approved, discuss measures of remedy and compliance.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Review intent for installation, use and term of temporary roofing and schedule intent.
6. Review requirements for the vapor retarder system, manufacturer representative reviews, protection of the vapor retarder and requirements for installing the remainder of the roofing system.
7. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
8. Review structural loading limitations of roof deck during and after roofing.
9. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
10. Review governing regulations and requirements for insurance and certificates if applicable.
11. Review temporary protection requirements for roofing system during and after installation.
12. Review roof observation and repair procedures after roofing installation.

1.7 COORDINATION

A. Coordinate all Work adjacent to and interfacing with the roofing system to ensure that all conditions are acceptable to receive the intended roofing system.

B. Coordinate the finishes and intended seam handling of all concrete substrates to permit fully adhered roofing installation in advance of roof system installation.
   1. Coordinate and confirm that all concrete finishes are acceptable to receive full adhered roofing system components including but not limited to the specified vapor retarder system.
   2. Coordinate and confirm that all seams for concrete and other substrates are level, fully closed without voids and will accept the intended vapor retarder system to the satisfaction of the roofing system manufacturer.
   3. Coordinate all concrete curing times and protection to ensure all substrates are acceptable to receive roofing system components and the specified vapor retarder.

4. Coordinate the Work of all parapets and other construction to ensure that all surfaces and construction is appropriately installed to receive the roofing system and all components.
5. Coordinate all openings and projections to ensure compliance with all detailing, roof system warranty requirements and flashing requirements to ensure a water tight roofing system. Provide sufficient secondary structural support at all openings.
6. Coordinate the Work of all adjacent high walls to ensure through wall flashing is present to disallow water or moisture to penetrate the roofing system and all components below the finished roof system surface.
7. Coordinate to ensure that the required Manufacturer's Field Services are executed at appropriate intervals in construction. Refer to the Field Quality Control Article of this Section for additional requirements. Ensure that Reports of the Manufacturer's Field Services have been submitted to the Architect in a timely fashion for information.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location; protect all insulation from moisture damage. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation. Do NOT utilize moisture damaged insulation; all insulation damaged by moisture shall be completely removed from the Project Site.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

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

B. Make preparations to protect all materials from moisture damage for any periods of inclement weather.

1.10 WARRANTY

A. Manufacturer's Warranty:

1. Submit a written warranty, without monetary limitation, including roofing membrane, membrane flashings, manufacturer's roof cover board, insulation, vapor retarder, thermal barrier board, and including roofing manufacturer’s accessories, signed by roofing system manufacturer’s agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

a. Twenty (20) Year Full System Warranty: Manufacturer’s Warranty shall be non-prorated and shall include coverage for wind speeds up to 100 mph from the date of Substantial Completion.

B. Roofing Installer's Warranty:

1. Completed warranty form at end of Section, signed by Installer and notarized, including:

a. Submit roofing Installer's workmanship warranty, on notarized written warranty form inclusive to this Section, signed by Installer, covering all Work of this Section, including but not limited to roofing membrane, membrane flashings, manufacturer's roof cover board, insulation, vapor retarder, substrate board, adhesives and fasteners and roofing manufacturer’s accessories for the following warranty period:

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed 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. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.

2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 4272.

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. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to FM Global.

1. Roof System Design Main Roof Area:

a. Corner Uplift Pressure (Zone 3): 66.1 lbf/sq.ft..

b. Perimeter Uplift Pressure (Zone 2): 66.1 lbf/sq.ft..

c. Outer Field-of-Roof Uplift Pressure (Zone 1): 50.1 lbf/sq.ft..

d. Inner Field-of-Roof Uplift Pressure (Zone 1'): 28.8 lbf/sq.ft..
e. Structural Performance:
1) Design Wind Speed: 106 mph..
2) Occupancy Category: II.
3) Exposure Category: C.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-90 for all areas with corner and perimeter enhancements as required to meet uplift pressures specified above.
2. Hail Resistance: VSH for all Roof Areas.

E. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 0.70 or initial SRI not less than 0.79 when calculated according to ASTM C 1549, based on testing identical products by a qualified testing agency.

F. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

G. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

H. Exterior Fire Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

I. Roof Assemblies:

1. Basis of Design System at Metal Deck Substrate: Fully-Adhered single-ply thermoplastic membrane system:
a. PVC Sheet: ASTM D 4434, Type III, polyester reinforced, felt backed.
1) Products: Subject to compliance with requirements, provide the following:
a) Sika Corporation; Sarnafil S327.
b) Substitutions NOT PERMITTED.
2) Thickness: 80 mils minimum.
3) Exposed Face Color: White.
b. Class A Exterior Fire Exposure Rating.
c. Very Severe Hail (VSH) exposure rating.
d. Cover Board: 5/8 inch thick VSH rated Cover Board adhered to insulation.
e. Conductive Measurement Grid as required for Electronic Leak Detection (ELD).
f. Insulation: Two layers Factory–Mutual tested insulation adhered providing an R-value of 30. Provide 2 equal layers adhered to vapor retarder or if different thicknesses, thicker layer to be installed first.

g. Vapor Retarder: Single ply minimum self-adhering modified bitumen membrane vapor retarder.

h. Substrate Board, metal deck: 5/8 inch thick Substrate Board mechanically attach to the steel decking.

2. Basis of Design System at Concrete Substrate: Fully-Adhered single-ply thermoplastic membrane system:

a. PVC Sheet: ASTM D 4434, Type III, polyester reinforced, felt backed.

1) Products: Subject to compliance with requirements, provide the following:

a) Sika Corporation; Sarnafil S327.

b) Substitutions NOT PERMITTED.

2) Thickness: 80 mils minimum.

3) Exposed Face Color: White.

b. Class A Exterior Fire Exposure Rating.

c. Very Severe Hail (VSH) exposure rating.

d. Cover Board: 5/8 inch thick VSH rated Cover Board adhered to insulation.

e. Conductive Measurement Grid as required for Electronic Leak Detection (ELD).

f. Insulation: Two layers Factory–Mutual tested insulation adhered providing an R-value of [30]. Provide 2 equal layers adhered to vapor retarder or if different thicknesses, thicker layer to be installed first.

g. Vapor Retarder: Single ply minimum self-adhering modified bitumen membrane vapor retarder.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sarnafil Inc.

2. Substitutions: NOT PERMITTED.

B. PVC Sheet: ASTM D 4434, Type III, polyester reinforced, felt backed.

1. Products: Subject to compliance with requirements, provide the following:

a. Sika Corporation; Sarnafil S327.

2. Thickness: 80 mils minimum.

3. Exposed Face Color: White.

2.3 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.

b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Single-Ply Roof Membrane Adhesives: 250 g/L.
f. Single-Ply Roof Membrane Sealants: 450 g/L.
g. Nonmembrane Roof Sealants: 300 g/L.
h. Sealant Primers for Nonporous Substrates: 250 g/L.
i. Sealant Primers for Porous Substrates: 775 g/L.
j. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: Manufacturer's standard sheet flashing, of same material, type, reinforcement and color as sheet membrane, thickness of 60 mils.

C. Bonding Adhesive: Manufacturer's standard, urethane- or solvent-based adhesive in low VOC formulation.

D. Edge Metal: Heat-weldable metal sheet, formed from manufacturer’s standard unsupported thermoplastic sheet membrane, not less than 20 mils thick, laminated to 0.024 inch thick G90 galvanized steel sheet, and capable of being formed into a variety of shapes and profiles.

E. Metal Termination Bars: Manufacturer's standard, predrilled 6063 T6 extruded Aluminum bars, approximately 1 by 1/8 inch thick; with anchors. Configuration of flat or T to suit the application and sealing requirements.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

A. Conductive Measurement Grid: Highly conductive, corrosion resistant, geometrically stable stainless steel mesh placed within the roofing assembly and protected building components as approved by the roofing system manufacturer to facilitate Electronic Leak Detection for roofing systems over concrete decking.

B. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate or ASTM C1278/C1278M, fiber-reinforced gypsum board.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Georgia-Pacific Gypsum LLC.
b. National Gypsum Company.
c. USG Corporation.
2. Thickness: 5/8 inch.

3. Surface Finish: Factory primed.

B. Parapet Sheathing: Utilize substrate board in compliance with Section 06 16 00 Building Sheathing.

2.5 VAPOR RETARDER

1. Self-Adhering-Sheet Vapor Retarder: Provide a single ply of self-adhering modified bitumen membrane vapor retarder supplemented with manufacturer's recommended primer and / or adhesive to comply with RoofNav assemblies and FM requirements. 106 mil minimum thick layer; manufactured to act as a temporary roof with a minimum 3 month exposure rating. Maximum permeance rating of 0.01 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer recommended by vapor-retarder manufacturer for adhesion and to meet RoofNav assembly and all uplift requirements.
   a. Vapor Retarder Products:
      1) As recommended by the manufacturer to meet the requirements of this Section, number of plies, minimum thickness, FM assembly, uplift and other performance requirements.
   b. Vapor Retarder primer / adhesive:
      1) As recommended by the manufacturer to meet the requirements of this Section, number of plies, minimum thickness, FM assembly, uplift and other performance requirements.

2.6 ROOF INSULATION

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

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 2, glass-fiber mat facer on both major surfaces.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Sarnafil Inc.
      b. Seaman Corporation.
      c. Atlas Roofing Corporation
      d. Hunter Panels
   2. Compressive Strength: 20 psi.
   3. Size: 48 by 48 inches.
   4. Thickness:
      a. Base Layer: Not less than 1-1/2 inches.
      b. Upper Layer: As required to meet specified R-value.
   5. Tapered Insulation: Provide factory-tapered insulation boards Material: Match specified roof insulation.
   6. Minimum Thickness: 1/4 inch.

7. Slope:
    a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
    b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M fiber-reinforced gypsum board.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Georgia-Pacific Gypsum LLC.
    b. National Gypsum Company.
    c. USG Corporation.
2. Thickness: 1/2 inch unless otherwise indicated.
3. Surface Finish: Factory primed.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, double layer, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, minimum 36 inches (914 mm) wide unless stated otherwise in writing by the Architect, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer; contrasting color or visually distinctive from roof membrane; minimum 3 inch gap between pads to allow drainage.
1. Products:
    a. Crossgrip XTRA; Sika USA
    b. FTR Crossgrip; Seaman Corporation

2.9 WATERPROOF ROOF EXPANSION JOINT

A. Provide watertight, expansion joint in roof deck and roofing system. System shall perform waterproofing and movement-accommodation functions as the result of a single

installation and without the addition of gutters, vapor retarders, bladders, or other devices suspended beneath or within the system.

1. System shall be comprised of the following components:
   a. heat weldable, PVC flexible alloy with dual-level flange.
   b. manufacturer supplied termination bar and anchors
   c. Factory welded downturn transition in the joint sealed at a ship-lapped 45-degree angle to mate with an interlocking factory-fabricated joint transition piece.
2. Basis of Design: RJ-0400 RoofJoint by Emseal or approved equal; Provide Emshield DFR or approved equal insert for fire rating to match roof assembly.
3. Color: White

2.10 ROOF SYSTEM AND COMPONENT ASSEMBLY PROTECTION

A. All roof components and component system installations shall be fully protected against puncture, marring and other damage by materials, personnel, equipment, temporary supports or any other materials, equipment or other construction activities for the full duration of construction and until Final Completion.

B. Protection from the finished roof membrane upwards shall consist of a continuous 15 mil Reinforced Polyethylene sheet, a minimum of 1 inch thick extruded polystyrene board insulation, ASTM C578, Type IV and a 3/4 inch CDX plywood continuous cover for the entire roof area where all construction and repair related activities occur.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that all substrate joints are closed, covered or infilled resulting in flush conditions acceptable for the application of new roofing materials, vapor retarder and other components. The substrate shall be free of voids, openings or gaps larger than 3/16 inch.
   4. Verify that surface plane flatness and fastening of steel roof deck complies with requirements indicated for all Steel Decking.
   5. Verify that all concrete substrates have been properly cured for a minimum of 28 days; Verify that minimum concrete drying and curing period recommended by roofing system manufacturer has passed.
      a. Verify that any joints in concrete substrate have been grouted flush with top of concrete.

b. Where detailed, verify that all joints in the concrete substrate have been fitted with securely fastened cover plates, configured and anchored to the satisfaction of the roof manufacturer field representative's satisfaction. Where cover plates are not indicated, all concrete joints shall be fully grouted to the roof manufacturer field representative's satisfaction.

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

6. Verify that concrete substrate is visibly dry and free of moisture, using ASTM D4263, "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method to determine that the deck is sufficiently dry to install the vapor retarder at the determination of the roof manufacturer field representative.

a. Test Frequency: One test probe per each 1000 sq. ft. (93 sq. m), or portion thereof, of roof deck, with no fewer than three test probes.

b. Submit test reports within 24 hours of performing tests.

c. Protect concrete substrate from moisture and inclement weather following testing and prior to vapor retarder installation. Repeat ASTM F2170 testing at Contractor's expense if substrate is not properly protected.

B. All substrates shall be inspected to meet the required Manufacturer's Field Services indicated under Field Quality Control of this Section, and found to be satisfactory for the installation of the roofing system and all components. Any necessary modifications due to non-compliance with the Contract Documents shall be executed without additional cost to the Project or Owner. Do not install any roofing components, accessories, or related items without a substrate inspection by the Roof Manufacturer's Field Representative.

1. Should roofing components be installed without prior inspection by the Roof Manufacturer's Field Representative, all cost for remediation identified in later reviews shall be borne solely by the Contractor.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.
   a. Locate end joints over crests of steel roof deck.
2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.

1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29. Install with mechanical fasteners in pattern and frequency to meet RoofNav assembly and uplift requirements.

3.5 VAPOR RETARDER INSTALLATION

A. Coordinate manufacturer’s representative review of substrates prior to installing vapor retarder system and forward report to Architect. Correct any deficiencies noted in the report prior to continuing with Work.

B. Self-Adhering-Sheet Vapor Retarder: Prime all substrates to meet uplift requirements utilizing manufacturer’s recommended products to comply with RoofNav system and uplift requirements. Prime all substrates to meet the minimum coverage recommendations of the manufacturer.

C. Install self-adhering-sheet vapor retarder over primed area to receive vapor retarder, to meet or exceed manufacturer’s recommendation with minimum 3 inch side laps and end lapping each sheet a minimum of 6 inches. Seal all laps by repeated rolling. Detail all penetrations as recommended by the manufacturer.

D. Extend vapor retarder vertically to completely cover the interior side of parapet walls, overlapping the top of the parapet for complete coverage unless otherwise noted. Provide detailing at intersection of horizontal roof surface and vertical parapet or other surfaces with manufacturer’s recommended differential thermal expansion details.

E. Coordinate installation of vapor retarder to provide night seals or complete coverage over substrate board for moisture protection.

F. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air and moisture and moisture vapor infiltration into roofing system.

G. For use as temporary roof protection, allow the vapor retarder to be exposed for no longer than 90 days. Provide protection for the vapor retarder if allowed to remain

exposed for any length of time during construction. Protection shall consist of a minimum of 1 inch thick extruded polystyrene ASTM C578, Type IV with 3/4 inch CDX plywood cover for the entire area as specified.

1. Prior to installation of any further roofing system components or materials, Coordinate manufacturer's representative review of substrates prior to installing vapor retarder system and forward report to Architect. Correct any deficiencies noted in the report prior to continuing with Work.

3.6 INSULATION INSTALLATION

A. All insulation shall be installed fully adhered with no mechanical fasteners. Do not penetrate the vapor retarder with mechanical fasteners for any reason.

B. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

C. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

D. Install tapered insulation under area of roofing to conform to slopes indicated.

E. Install insulation under area of roofing in thickness required to achieve a minimum thermal resistance value of R-30, except at sumps surrounding roof drains.

1. Install insulation in two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

F. Installation Over Metal Decking:

1. Install roof substrate board over metal decking as indicated herein.
2. Install fully adhered vapor retarder over substrate board.
3. Install fully adhered layers of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
    a. Locate end joints over crests of decking.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    d. Fill gaps exceeding 1/4 inch with spray in place foam insulation compatible with board materials.
    e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
    a. Adhere base layer of insulation to substrate board using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
        1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
4. Install upper layer of insulation and tapered insulation with joints of each layer offset not less than 24 inches from previous layer of insulation.

a. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. Fill gaps exceeding 1/4 inch with spray in place foam insulation compatible with board materials.
e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
f. Adhere additional layers of insulation to base layer using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
1) Set additional layers of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining coverboard in place.

G. Installation Over Concrete Substrate:
1. Verify that concrete substrate is ready to receive the fully adhered roofing system and that moisture levels within the concrete are acceptable.
2. Install fully adhered vapor retarder over concrete substrate.
3. Install fully adhered layers of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof surfaces.
b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
c. Fill gaps exceeding 1/4 inch with spray in place foam insulation compatible with board materials.
d. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
e. Adhere base layer of insulation to substrate board using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
4. Install upper layer of insulation and tapered insulation with joints of each layer offset not less than 24 inches from previous layer of insulation.
a. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. Fill gaps exceeding 1/4 inch with insulation.
e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

f. Adhere additional layers of insulation to base layer using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
   1) Set additional layers of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining coverboard in place.

3.7 INSTALLATION OF CONDUCTIVE MEASUREMENT GRID

A. Install conductive measurement grid materials in accordance with the manufacturer’s installation requirements and to perform accurate Electronic Leak Detection testing for roofing systems over concrete decking. Grid materials shall be fully adhered and meet all uplift requirements of the roof system.

3.8 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.
      a. Trim cover board so that water flow is unrestricted.
   3. Cut and fit cover board tight to nailers, projections, and penetrations.
   4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
      a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining boards in place.

3.9 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

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

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric- or fleece-backed roof membrane.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Contractor shall ensure installation of membrane is free of wrinkles, fish-mouths or other anomalies in all membranes, related flashings and accessories.

H. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane as required by manufacturer.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas. Retain seam samples for review by Owner, Architect and manufacturer’s representative. Samples shall be marked with date and location typical.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

I. Apply approved urethane sealant over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.10 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.11 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated and as follows. Loose lay or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions for compliance with RoofNav Assembly and uplift requirements.

1. For loose laid walkways, provide 2 inch wide heat welded tabs field fabricated from PVC membrane at regular intervals to prevent dislocation of the walkway materials. Place tabs on both sides of walkway at each end and at segment centers. Loop tabs through openings of the walkway products and heat weld to PVC roof membrane.
2. Install flexible walkways at the following locations and as indicated on Drawings:
   a. Perimeter of each rooftop unit.

b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
d. Top and bottom of each roof access ladder and ships' ladder.
e. Between each roof access ladder, Ships' Ladder and each rooftop unit location or path connecting rooftop unit locations
f. As required by roof membrane manufacturer's warranty requirements.
g. Provide 6-inch clearance between adjoining pads and rolls.

3.12 WATERPROOF ROOF EXPANSION JOINT INSTALLATION

A. Preparation:
1. Provide properly formed and prepared joint openings constructed to the exact dimensions and elevations indicated in the Drawings.
2. Clean the joint opening of all contaminants immediately prior to installation of expansion joint system in accordance with the manufacturer's recommendations.

B. Installation: Install joint system by qualified contractor according to manufacturer's published installation procedures. Field weld all seams in accordance with the manufacturer's installation procedures.

C. Cleaning and Protection: Protect the system and all components during construction. Any damage to the expansion joint system shall be repaired at no additional cost to the project or Owner. Prior to Substantial Completion, clean exposed surfaces with cleaners recommended by the joint manufacturer.

3.13 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: At the start of the installation, periodically as the Work progresses, and after completion, furnish the services of the roofing manufacturer's technical representative at the job site as necessary to advise on every phase of the Work. As a minimum, furnish full-time attendance during the first 2 work days, at least once every week during installation, and furnish technical assistance to the Installer as may be required. The representative shall examine the roofing substrates before installation of the vapor retarder; and examine the completed vapor retarder installation before it is covered. Written reports shall be generated for each review by the Manufacturer's Field Representative and submitted to the Architect within 72 hours of each visit. Any items of non-compliance with the Contract Documents shall be remedied by the Contractor in a timely manner to avoid moisture or other damage to the roofing system and all components.
1. Vapor retarder: Inspect the vapor retarder prior to and during installation to assure substrate is properly prepared to receive the vapor retarder, full adhesion and manufacturer's quality requirements are maintained throughout the installation period. If vapor retarder is utilized as a temporary roof, the manufacturer's representative shall inspect the vapor retarder prior to the installation of the remaining roof assembly to ensure the integrity of the vapor retarder system.

Perform any and all repairs recommended by the manufacturer's representative prior to continuing installation.

a. Provide indicated roof protection as required by this Section for all areas of installed vapor retarder and temporary roof components.

b. All penetrations and identified possible breach points shall be repaired by the Contactor at no additional cost to the project.

c. Significant breach points or other anomalies noted during the review of the vapor retarder may require an additional layer of vapor retarder to be provided by the Contractor at no additional cost to the project as determined by the Architect in consultation with the roofing system manufacturer's representative.

2. Fastener Tests: Manufacturer's representative shall witness Contractor perform two fastener pull out tests per SPRI FX-1 test procedure to verify the integrity of the roofing fasteners and compliance with required performance criteria.

3. Securement Tests: Perform two membrane adhesive pull tests according to SPRI IA-1 to verify the integrity of the roof membrane adhesive and compliance with the required performance criteria.

4. Field Seams: Inspect the field seams to assure manufacturer's quality requirements are maintained throughout the installation period. Each field seam shall be 100% inspected and a written report prepared by the roofing manufacturer's technical representative shall be submitted for review prior to final acceptance.

5. Final inspections by the roofing membrane Manufacturer shall be coordinated at least two weeks in advance with the Owner, Architect, and roofing consultant so that their attendance can be properly coordinated. Final inspection reports and signed, completed punch list reports by the Manufacturer shall be submitted to the Owner and Architect. Submittal of the roofing warranty alone is not acceptable.

B. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

1. Electronic Leak Detection: Immediately upon completion of the roof system installation the Testing Agency shall survey entire roof area for potential leaks using electronic field vector mapping. Complete testing of the entire roof areas in compliance with ASTM D7877 with reports forwarded to the Architect within 48 hours of completion. Installer shall inform roofing manufacturer, Architect and Owner's representative of the schedule date for ELD testing.

2. Installer shall make repairs as recommended by the roofing system manufacturer's recommendations to uphold the warranty at no additional cost to the project.

C. A roof inspection is required by manufacturer before warranty issue. Revise scope of inspection and source of report to a qualified roofing consultant or an independent testing agency and inspection if preferred.

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements at no additional cost to the project.

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

3.14 PROTECTING AND CLEANING

A. Roof system and component protection installation:

1. Protect all roof components and partial system installations against puncture and other damage by materials, material staging and transportation, personnel, equipment, temporary supports or any other materials, equipment or other construction activities for the full duration of construction and until Final Completion. Components shall include but not be limited to the vapor retarder or any portion thereof.
2. Lay specified roof protection 15 mil Reinforced Polyethylene membrane, insulation board and plywood specified over installed roof system or related components for full area. Utilize full size boards without mechanical fasters or adhesive. Place Reinforced Polyethylene with all laps seams no less than 6 inches fully taped; Stagger all seams of insulation protection at half-board running bond type pattern and cover with 3/4 inch CDX plywood as specified. Plywood cover shall also be placed with staggered seams at half-board running bond type pattern without mechanical fasteners or adhesive. Ensure seams of insulation and plywood are no greater than 1/8 inch in all areas. Provide sufficient sand bag weights at seams or other intervals to guard against uplift, movement and shifting of protection materials. Protection shall remain in place for the duration of all construction activities.
3. When protection is removed, the entire area shall be thoroughly cleaned to collect and remove all foreign materials, fasteners and other small items which may cause penetrations in the roofing system or components. Remove all foreign items from the roof area and provide thorough cleaning to remove any deleterious items, marring, surface defects or discoloration of the finished system.
4. Repair any discolored or otherwise damaged roof system components including but not limited to roof membrane improperly protected as directed by Architect.

B. Protect membrane 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.

C. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

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

3.15 ROOFING INSTALLER'S WARRANTY

A. WHEREAS_____ of _____, herein designated the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: _____.
2. Address: _____.
3. Building Name/Type: _____.
4. Address: _____.
5. Area of Work: _____.
6. Acceptance Date: _____.
7. Warranty Period: _____.
8. Expiration Date: _____.

B. 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 of FIVE (5) Years.

C. 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.

D. 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 100 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; and
   f. 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.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.
   1. Authorized Signature: _____.
   2. Name: _____.
   3. Title: _____.

END OF SECTION