SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

ALL LIBRARIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Mechanically fastened PVC membrane roofing system.
2. Roof insulation and cover board.
3. Prefabricated flashings, corners, parapets, stacks, vents, and related details.
4. Fasteners, adhesives, and other accessories required for a complete roof installation.
5. Traffic protection.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Section 077129 "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 REFERENCES

A. UL: Underwriters Laboratories.

1. Roofing Materials and System Directory: TGFU.R10128.

B. FMG: Factory Mutual Global.

1. Factory Mutual Standard 4470 – Approved Standard for Class 1 Roof Covers.

C. ASTM: American Society of Testing and Materials.

1. ASTM C 578-04a, Standard Specification for Rigid, Cellular Polystryrene Thermal Insulation @ 2004, ASTM International.

2. ASTM C 1177/C1177M-04e1, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing, @ 2004, ASTM International.
3. ASTM C 1289-04, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, @ 2004, ASTM International.
4. ASTM C 1396/C1396M-04, Standard Specification for Gypsum Board, @ 2004, ASTM International.
5. ASTM D 146-04, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing, @ 2004, ASTM International.
6. ASTM D 570-98, Standard Test Method for Water Absorption of Plastics, @ 1998, ASTM International.
7. ASTM D 751-00e1, Standard Test Methods for Coated Fabrics, @ 2000, ASTM International.
8. ASTM D 828-97 (2002), Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus, @ 2002, ASTM International.
9. ASTM D 1079-05, Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials, @ 2005, ASTM International.
10. ASTM D 1204-02, Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature, @ 2002, ASTM International.
11. ASTM D 2136-02, Standard Test Method for Coated Fabrics-Low-Temperature Bend Test, @ 2002, ASTM International.
12. ASTM D3045-03, Standard Practice for Heat Aging of Plastics Without Load, @ 2003, ASTM International.
13. ASTM D 4434-96, Standard Specification for Poly (Vinyl Chloride) Sheet Roofing, @ 1996, ASTM International.
14. ASTM D 5602-98, Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens, @ 1998, ASTM International.
15. ASTM D 5635-04, Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens, @ 2004, ASTM International.
16. ASTM E 108-04, Standard Test Methods for Fire Tests of Roof Coverings, @ 2004, ASTM International.
17. ASTM E 119-00a, Standard Test Methods for Fire Tests of Building Construction and Materials, @ 2000, ASTM International.
18. ASTM G 154-00, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials, @ 2000, ASTM International.

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 PERFORMANCE REQUIREMENTS

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

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

C. Physical Properties: Roof product must meet the requirements of Type III PVC sheet roofing as defined by ASTM D4434-96 and must meet or exceed the following physical properties.

1. Thickness: 50 mils (1.25 mm), nominal per ASTM D751.
2. Breaking Strength: Less than or equal to lbf. (MD) and less than or equal to 366 lbf. (XMD) per ASTM D751, Grab Method.
3. Elongation at Break: Less than or equal to 31% per ASTM D751, Grab Method.
4. Heat Aging per ASTM D3045: 176 degrees F for 56 days. No sign of cracking, chipping or crazing (per ASTM D4434).
5. Factory Seam Strength: Less than or equal to 575 lbf. Per ASTM D751, Grab Method.
6. Tearing Strength: Less than or equal to 68 lbf. (MD) and less than or equal to 92 lbf. (XMD) per ASTM D751, Procedure B.
7. Low Temperature Bend (Flexibility): Pass minus 40 degrees F per ASTM D2136.
8. Accelerated Weathering: No cracking, checking, crazing erosion or chalking after 5,000 hours per ASTM G154 (formerly G53).
9. Linear Dimensional Change: Greater than or equal to 0.5% per ASTM D1204 @ 176 plus or minus 2 degrees F for 6 hours.
10. Water Absorption: Greater than or equal to 3% per ASTM D570 @ 158 degrees F for 166 hours.
11. Static Puncture Resistance: Greater to or equal to 56 lbs. per ASTM D5602.
12. Dynamic Puncture Resistance: Greater to or equal to 474 pdl.-ft. per ASTM D5635.

D. Minimum UL Class A fire rating.

E. Attach roofing system using the fastener spacing requirements in the current edition of the manufacturer's specification.

F. Current International Code Council Evaluation Services Report or Legacy Report showing compliance with the International Building Code.

1.6 ACTION SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. 4-inch by 6-inch sample of roofing membrane, of color specified.

2. Sample of roofing membrane with factory weld and T-shaped lap.
3. 4-inch by 6-inch sample of walkway pad.
4. Termination bar, Fascia bar with cover, drip edge and gravel stop if to be used.
5. A sample of each fastener type to be used for installing membrane, insulation/recover board, termination bar and edge details.
6. Roof Insulation.

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

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

F. ASTM D4434-96 Certification: Supply test results from qualified testing agency that states that the roofing product meets the requirements for Type III PVC sheet roofing as defined in ASTM D 4434-96.

G. Warranties: Submit a current sample of the manufacturer's warranty that will be issued for the project.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer must utilize a Quality Control Manual during the production of the membrane roofing system that has been approved by and is inspected by Underwriters Laboratories.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing.

D. There shall be no deviations from roofing membrane manufacturer's specifications or the approved shop drawings without the prior written approval of the manufacturer.

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

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

G. Preinstallation Roofing Conference: Conduct conference at Project site.

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 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 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. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

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

1.10 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.

1.11 WARRANTY

A. Contractor Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the date of favorable inspection by the roof membrane manufacturer. Should any leaks covered under the warranty occur during this period, corrective action will be taken by the contractor to repair the roof to the satisfaction of the owner and the roof membrane manufacturer. All corrective work will be done at no cost to the owner or roof membrane manufacturer.

B. Manufacturer Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition, the warranty must meet the following criteria:

1. Warranty Period: 15 years from date issued.
2. No exclusions for damage caused by ponded water or biological growth, or for incidental or consequential damages.
3. Issued direct from and serviced by the roof membrane manufacturer.
4. Transferable for the full term of the warranty.
5. No additional charge for the warranty.

PART 2 - PRODUCTS

2.1 PVC MEMBRANE ROOFING

A. PVC Sheet: ASTM D 4434, Type III, fabric reinforced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec, Incorporated.
b. Duro-Last Roofing, Inc.
c. GAF Materials Corporation.
d. GenFlex Roofing Systems.
e. Johns Manville.
f. Sarnafil Inc.

2. Thickness: 50 mils (1.25 mm), nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane 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 when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   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. Other Adhesives: 250 g/L.
   g. PVC Welding Compounds: 510 g/L.
   h. Adhesive Primer for Plastic: 650 g/L
   i. Single-Ply Roof Membrane Sealants: 450 g/L.
   j. Nonmembrane Roof Sealants: 300 g/L.
   k. Sealant Primers for Nonporous Substrates: 250 g/L.
   l. Sealant Primers for Porous Substrates: 775 g/L.

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

C. Prefabricated Flashing: Prefabricated flashing for pipes, curbs, inside and outside corners of same material, type, reinforcement, and color as PVC sheet membrane.

D. Bonding Adhesive: Manufacturer's standard.

E. Slip Sheet: Manufacturer's standard, of thickness required for application.

F. Metal Termination Bars: Manufacturer's standard, predrilled exterior rigid vinyl bars, approximately 1-1/ inch (37.5 mm) wide; with slotted holes 6-inches on center.

G. Edge Detail: Fascia bar and cover, prefabricated Drip Edge, prefabricated Gravel Stop and 2-piec Compression Metal Edge must be manufactured by roof membrane manufacturer.

H. Vinyl Coated Metal: 24 gauge, hot-dipped galvanized, grade 90 metal with a minimum of 17 mils of manufacturers membrane laminated on one side.

I. 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.

J. Two-Way Vents: Provided by roof membrane manufacturer. Must install a minimum of 1 vent per each 1000 square feet.

2.3 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by PVC membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Expanded or Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.5-lb/cu. ft. (26-kg/cu. m) if used without rigid cover board, or Type X, 1.25-lb/cu. ft. (21-kg/cu. m) minimum density, square edged if overlain by a rigid cover board.

1. Compressive Resistance: Minimum 18 psi.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AFMR-Control Building Systems.
b. Avron, Inc.
c. Benchmark Foam, Inc.
d. Certainteed Corporation.
e. Diversi-Foam Products.
f. Dow Chemical Company.
g. Falcon Foam.
h. Owens Corning.
i. Pactiv Building Products. Premier Industries, Inc.
j. T-Clear Corporation.

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

2.4 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. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 5/8 inch (16 mm) thick, factory primed.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Corporation; Dens Deck.

2.5 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

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 and curbs are set and braced and that 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 surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. 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 INSULATION INSTALLATION

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

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

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

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

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Fasten insulation according to roof membrane manufacturer.
4. Fasteners and plates must be supplied by the roof membrane manufacturer

G. 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 (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.4 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

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

B. For each prefabricated roofing section pull the first securement tab taut and mechanically fasten to the structural deck. Unfold the roof section to expose the next securement tab. Pull the material taut to remove wrinkles and install fasteners. Continue this procedure for each securement tab.

1. Fasteners and stress distribution plates must be supplied by roof membrane manufacturer.
2. The edge of the stress distribution plates should be aligned with the outside edge of the securement tabs.
3. Securement tab and fastener spacing are based on roof membrane manufacturer specification

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

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

E. 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. Hot-air welded seams must be a minimum of 1-1/2 inch wide.
2. After seam has cooled make a hands and knees inspection with a probe. Repair any deficiencies found immediately.

F. Penetrations: Utilize prefabricated flashings for penetrations such as pipes, equipment curbs, braces, and pitch pockets. These flashings shall be made of the same membrane as the roof sections. Hot-air weld the flashing's skirt to the roofing section and properly terminate the flashing to the penetration per roof membrane manufacturer’s specification.

G. Drains and Scuppers: Follow membrane manufacture’s specification to properly terminate the roofing sections at drains and scuppers. Clamping rings may be used to terminate the roof section at roof drains. If the drain does not have a clamping ring, or it cannot be used, a prefabricated drain boot must be used. Prefabricated flashings must be utilized for scuppers.

3.5 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. Utilize prefabricated flashings for roof penetrations.

C. Utilize prefabricated inside and outside corners where necessary.

D. Hot-air weld the flashing's skirt to the roofing section and properly terminate the flashing to the penetration per membrane roofing system manufacturer’s specification.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

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

1. Deficiencies: Any deficiencies identified during the inspection will be corrected and made ready for reinspection within five (5) working days. Such corrections will be made at no expense to the Owner.
2. Warranty: Upon receipt of the required materials, certifying inspection and acceptance of the installation by the roof membrane manufacturer, the warranty shall be duly executed and issued to the Owner.

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

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. 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.

B. 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.

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

END OF SECTION 075419