PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Adhered thermoplastic polyolefin (TPO) roofing system.
   2. Roof insulation.

1.03 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.04 PREINSTALLATION MEETINGS

A. 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 field representative, deck Installer, and installers / contractors 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 affects 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.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:
   1. Sheet roofing, of color required: 6 inch square piece.
   2. Walkway pads or rolls, of color required: 6 inch square piece.
   3. Inseam Tape: 3" wide by 12 inch length.
   4. Fasteners: Two of each type.
   5. Insulation Board: 3" square piece.
   6. Cover Board: 3 inch square piece.

D. Submit all Shop Drawings, Certifications

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements.
   2. Submit certification that the all products submitted are approved for use with the Total Roofing System and are included in the 20-year Total System Warranty.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Material Safety Data Sheets (MSDS): Submit to the Architect at the Pre-Installation Conference.

F. Warranty: Sample copy of the 20-Year Total System Warranty.

1.07 CLOSEOUT SUBMITTALS

A. Warranty: Original of 20-Year Total System Roofing Warranty signed by a currently authorized representative of the roofing manufacturer.

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

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that specified for this Project and which has a minimum of 5 years of TPO manufacturing experience and which has completed a minimum of five (5) previous TPO roofing projects of similar complexity and size to this project. Manufacturer shall provide names and addresses for these five projects to the Architect for review.
   1. The manufacturer shall have been actively marketing a TPO roof system in the United States for a minimum of five (5) years.
   2. The manufacturer shall have the technical expertise and qualified field representatives to resolve questions or field issues that may arise both during and after the work is completed. The manufacturer shall submit the name and qualifications of the manufacturer's Field Representative for this project to the Architect as part of the submittal process.
   3. The manufacturer shall require that the roof system be installed by a The manufacturer shall require that the roofing system be installed by a contractor currently licensed, certified or approved to install the manufacturer's roofing system as specified complete with warranty requirements.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by approved roofing system manufacturer to install the manufacturer's product and that is eligible to receive manufacturer's Total System warranty.
   1. Provide reference names, addresses, telephone, contact numbers of three (3) buildings where the installer has installed TPO sheet membrane roofing systems that have had the manufacturer's Total System warranty issued. Include the type(s) of TPO systems installed, the manufacturer's name and warranty numbers.

2. Provide written certification that the project supervisor or crew chief and at least one other member of the roofing crew have installed at least three (3) TPO sheet membrane roof systems and are thoroughly familiar with all aspects of the installation.

C. Manufacturers Field Advisor: The Manufacturer's Field Advisor shall be present at the Pre-installation meeting and at the beginning of the actual membrane installation for each roof area for the following:
   1. Render technical assistance to the contractor regarding installation procedures for the system and respond to any questions pertaining to the roof system.
   2. Familiarize the Architect with all aspects of the system including inspection techniques.
   3. Accept the roofing sub-base.
   4. Provide inspections during and upon completion of each roof area to determine that the system has been installed in accordance with the approved manufacturer's specifications and details.

1.09 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. Remove any materials from the site that are wet or damaged. Properly discard and replace with new materials at the contractor's expense.

E. Do not remove materials from factory packaging until ready for use.

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

1.10 FIELD 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. Substrate shall be dry and free of dirt and debris.

1.11 WARRANTY

A. Total Roofing System Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Total Roofing System warranty includes roofing membrane, adhesives, base flashings, roof insulation, cover boards, fasteners and plates, sealants, termination bars, clamps, walkway pads and other components of the Total Roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

3. The warranty shall specifically state that it covers gusts of up to 120 mph measured 10 meters above the ground.
4. The warranty shall specifically state that any standing water on the roof(s) shall not void the warranty.
5. The monetary value of the warranty shall be at least equal to the original cost of each installation.
6. All warranty requirements specified herein shall be fully paid for by the contractor. The receipt of payment and warranty documents shall be submitted and accepted by the Owner prior to completion and acceptance of the work

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Carlisle SynTec Incorporated.
2. Firestone Building Products.
3. Versico Incorporated.

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

2.02 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 G155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
1. Corner Uplift Pressure: 75 lbf/sq. ft. (3.5kPa/sq. m).
2. Perimeter Uplift Pressure: 50 lbf/sq. ft. (2.39kPa/sq. m).
3. Field-of-Roof Uplift Pressure: 30 lbf/sq. ft. (1.43kPa/sq. m).

D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-120.
2. Hail-Resistance Rating: MH.

E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980, 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. Exterior Fire-Test Exposure: ASTM E108 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.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.03 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: White, ASTM D6878/D6878M, Energy Star, fully adhered, internally fabric- or scrim-reinforced, with TPO smooth backing, membrane thickness over the reinforcing scrim shall be nominal 0.015" thick; .29 lbs. / s.f membrane weight, 12 feet wide minimum, uniform, TPO sheet.
   1. Thickness: 0.060" thick (1.5 mm).
   2. Exposed Face Color: White.

2.04 AUXILIARY 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. Non-membrane 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 unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Low VOC, High strength, Manufacturer's standard, water based.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

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

F. 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.

G. Cut Edge Sealant: TPO, solvent -based liquid used to seal cut edges of the reinforced membrane, as recommended by the approved roofing manufacturer.

H. Pipe Flashing: Pre-molded white flashing with stainless steel clamping ring for roof piping penetrations.

I. Weathered Membrane Cleaner: Material shall be used to clean membrane surfaces that have been exposed to the elements for 7 days or more prior to heat welding or to remove general construction dirt / dust / footprints.

J. Coated Metal Sheet: 24 gauge galvanized sheet metal laminated to a 0.035" thick membrane film as furnished by the approved roofing manufacturer , to be used as metal base and curb flashing, gooseneck and sealant pans.

K. Inside / Outside corners: Pre-moulded corner flashing for inside and outside corners, 0.060" thick, color to match roofing.

L. TPO pressure-sensitive RUSS: 6" wide, 0.045" thick reinforced TPO membrane with nominal 3" wide, 0.035" thick cured synthetic rubber pressure-sensitive adhesive laminated along one end. Use in conjunction with manufacturers Primer. Use as a base membrane attachment along walls, curbs, etc.

M. Pourable Sealant: One-part, moisture curing, elastomeric polyether sealant as approved by the roofing manufacturer.

N. Pressure-sensitive Cover Strips: Nominal 0.060" thick reinforced TPO membrane laminated to nominal 0.035" thick cured synthetic rubber pressure-sensitive adhesive utilized in conjunction with manufacture's primer to strip in metal flanges.

O. Water Cut-off Mastic: sealant to prevent moisture migration at drains, compression terminations and beneath conventional metal edging shall be as furnished by the approved roofing manufacturer.

P. Wood Nailers, Blocking and Roof Curbs: ACQ Pressure treated lumber. Field treat all cuts with treatment material. Final moisture content shall not exceed 15% after treatment or before installation. Install Vycor or similar self adhering rubberized separation membrane between treated lumber and metal roof decks and flashings. All fasteners in contact with treated wood material shall be type 304 stainless steel.

2.05 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1278/C1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.
   1. Products: Subject to compliance with requirements, provide the following:
      a. USG Corporation; Securock Gypsum-Fiber Roof Board.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening substrate board to roof deck.

2.06 VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil- (1.0-mm-) total thickness; maximum permeance rating of 0.1 perm (6 ng/Pa x s x sq. m); cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

2.07 ROOF INSULATION

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

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. UL classified.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Carlisle SynTec Incorporated.
      b. Firestone Building Products.
      c. Hunter Panels
      d. Johns Manville

C. Tapered Insulation: Provide Manufacturer's approved factory tapered closed cell Polyisocyanurate foam core skinned on both sides with factory applied facers of generic type recommended by the membrane manufacturer fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated. ASTM C1289, Type II Class Grade 2, UL classified.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Factory fabricate to 1/2 inch per foot minimum or to slopes indicated on approved shop drawings. ASTM C1289, Type II Class Grade 2, UL classified.

E. Tapered Edge Strips: Factory tapered fiberboard, ASTM C208.

2.08 INSULATION ACCESSORIES

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

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 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 C1278/C1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. USG Corporation; Securock Gypsum-Fiber Roof Board.
      b. Carlisle SecurShield HD.

2.09 WALKWAYS

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
   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 in accordance with FM Global Loss Prevention Data Sheet 1-49 requirements, to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Testing of Pull-Out Resistance of Fasteners: Prior to commencing with the roofing work, conduct fastener pull-out tests to determine the pull-out values meet the requirements of the Contract documents and the approved membrane manufacturer.
      a. Conduct a minimum of three pull-out tests at representative locations and/ or where selected by the Architect.
      b. Repair holes at the pull-out test locations.

B. Proceed with installation only after satisfactory pull-out tests are achieved and any unsatisfactory conditions have been corrected.

3.02 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.

3.03 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.

3.04 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of roof deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
   2. Nailers shall be anchored to resist a force of 75 lbs per linear foot in any direction in accordance with the recommendations of Factory Mutual Bulletin 1-49.

3.05 VAPOR-RETARDER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches (90 mm) and 6 inches (150 mm), respectively. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.06 INSULATION INSTALLATION

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

B. Comply with 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. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
   1. Where installing composite and non-composite insulation in two or more layers, install non-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

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

F. 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.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

I. 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 Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.07 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

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

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

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

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

F. Apply roofing with side laps shingled with slope of roof deck where possible. Overlap and bond edges as recommended by the approved roofing manufacturer.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of 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.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.08 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to 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.

3.09 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
   2. Flood each area for 48 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

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

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

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

3.11 PROTECTING AND CLEANING

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

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

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

END OF SECTION