

## SECTION 07 54 23 - TPO ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Thermoplastic polyolefin (TPO) roofing system.
2. Accessory roofing system materials.
3. Substrate board.
4. Vapor retarder.
5. Transition membrane flashing by roofing manufacturer.
6. Roof insulation and accessories.
7. Cover board.
8. Walkways.

##### B. Related Requirements:

1. Section 05 31 00 "Steel Decking" for roof deck.
2. Section 06 16 00 "Sheathing" for wood-based, structural-use roof parapet panels.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 "Plumbing" for roof drains.

#### 1.2 DEFINITIONS

- ##### A. Roofing Terminology:
- Definitions in ASTM D1079 and glossary in NRCA's "Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

#### 1.3 PREINSTALLATION MEETINGS

- ##### A. Preliminary Roofing Conference:
- Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing system Installer, roofing system manufacturer's representative, deck Installer, air barrier 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. Review deck substrate requirements for conditions and finishes, 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.

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

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing system Installer, roofing system manufacturer's representative, deck Installer, air barrier 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 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base and sheet flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of roof deck and orientation of roofing membrane, fastening spacings, and pattern for corner, perimeter, and field-of-roof locations.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Crickets, saddles, and tapered edge strips, including slopes.
8. Tie-in with adjoining wall system air barrier.

C. Samples for Verification: For the following products:

1. Roofing membrane and flashings, of color required.

D. Wind-Uplift-Resistance Submittal: For roofing system indicating compliance with wind-uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roofing membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
    - a. Submit evidence of compliance with specified performance requirements.
  2. Special Warranty Certificate: Signed by roofing membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- B. Product Test Reports: For roofing membrane and insulation, tests performed by an independent qualified testing agency indicating compliance with specified requirements.
- C. Research Reports: For components of roofing system, from an agency acceptable to authorities having jurisdiction showing compliance with specified performance requirements.
- D. Field Test Reports:
1. Concrete internal relative humidity test reports.
  2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- E. Field quality control reports.
- F. Qualification Statements: For roofing system Installer.
- G. Sample warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system.
- B. Certified statement from existing roofing system manufacturer stating that existing roof warranty has not been affected by the Work performed under this Section.
- 1.7 QUALITY ASSURANCE
- A. Roofing System Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
1. Certified Roofing System Installer: Entity that employs a supervisor who is an NRCA ProCertified Roofing Foreman or installers who are NRCA ProCertified thermoplastic system or a supervisor who is an NRCA ProCertified Roofing Foreman and not less than 20 percent of installers who are NRCA ProCertified thermoplastic system installers.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing system 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.

1. Protect stored liquid material from direct sunlight.
  2. 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.
1. Store in a dry location.
  2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing system materials. Place materials equipment in a manner to avoid damage and permanent deflection of deck.

#### 1.9 FIELD CONDITIONS

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

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
1. Special warranty to include all components of roofing system, including but not limited to substrate board, vapor retarder, roof insulation, fasteners, adhesives, cover board, roofing membrane, base flashing sheet, walkways, and other components of roofing system.
  2. Warranty Period: 20 years from date of Substantial Completion.
- B. Roofing System Installer's Warranty: Submit roofing system Installer's warranty, on warranty form at end of this Section, signed by roofing system Installer, covering the Work of this Section, including all components of roofing system, including but not limited to vapor retarder, roof insulation, fasteners, adhesives, cover board, roofing membrane, base flashing sheet, walkways, and other components of roofing system.
1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 SOURCE LIMITATIONS

- A. Obtain components for roofing system from roofing membrane manufacturer or manufacturer approved by roofing membrane manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings to 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 system and flashings to remain watertight.

1. Accelerated Weathering: Roofing membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
  2. Impact Resistance: Roofing membrane to resist impact damage when tested in accordance with ASTM D3746/D3746M, ASTM D4272/D4272M, or the Resistance to Foot Traffic Test in FM Approvals 4470.
- B. Material Compatibility: Roofing system materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Wind-Uplift Resistance: Design roofing system to resist the following wind-uplift pressures when tested in accordance with FM Approvals 4474, UL 580, or UL 1897: As indicated on the Structural Drawings, for the following:
1. Zone 1 (Roof Area Field).
  2. Zone 2 (Roof Area Perimeter).
    - a. Location: From roof edge to inside roof edge.
  3. Zone 3 (Roof Area Corners).
    - a. Location: In each direction from each building corner.
- D. Exterior Fire-Test Exposure: Class A; for application and roof slopes indicated; when tested by a qualified testing agency in accordance with ASTM E108 or UL 790.
1. Identify products with appropriate markings of applicable testing agency.

## 2.3 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

- A. TPO Roofing Membrane Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, TPO sheet.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle Syntec Sure-Weld TPO, or comparable product by one of the following manufacturers under substitution request:
    - a. Siplast
    - b. Tremco.
    - c. Holcim.
  2. Thickness: 80 mils, nominal.
  3. Exposed Face Color: Gray.

## 2.4 ACCESSORY ROOFING SYSTEM MATERIALS

- A. General: Accessory materials as recommended in writing by roofing membrane manufacturer for intended use and compatible with other roofing system components.
1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
  2. Sheet flashings, scuppers, edge metal and other TPO accessories to match in color as exposed roofing membrane.

- B. Base and Sheet Flashings: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as roofing membrane.
- C. Prefabricated Pipe Flashings: As recommended in writing by roofing membrane manufacturer.
- D. Bonding Adhesive: Roofing membrane manufacturer's standard.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing system components to substrate; tested for required pullout strength, and acceptable to roofing membrane manufacturer.
- G. Safety Accessories: Roofing membrane manufacturer's standard yellow seaming tape for designating safety perimeters and rooftop hazards.
- H. Miscellaneous Accessories: As recommended in writing by roofing membrane manufacturer.
- I. Liquid Flashing: Roofing membrane manufacturer's two-Component, fabric-reinforced, liquid waterproofing; color to match roofing.
- J. TPO-Coated Sheet Metal, Edge Metal and Scuppers: Provided under to comply with Section 07 62 00 "Sheet Metal Flashing and Trim" and installed under this Section, to comply with roofing membrane manufacturer's requirements.

1. Scuppers to be heat welded watertight. Locate through-wall scupper seams at top of scuppers.

## 2.5 SUBSTRATE BOARD

- A. Substrate Board: Water-resistant gypsum roof board, ASTM C1278/C1278M cellulosic-fiber reinforced, or glass-mat ASTM C1177/C1177M; facers compatible with vapor retarder application. Approved for use by and supplied by roofing manufacturer.
  - 1. Products:
    - a. Georgia Pacific, DensDeck Prime.
    - b. USG, Securock Gypsum-fiber roof board.
  - 2. Thickness: 1/2 inch.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

## 2.6 VAPOR RETARDER AND TRANSITION

- A. Transition Sheet: Self-adhering, metal-faced film laminated to adhesive; maximum permeance rating of 0.1 perm; cold applied. Provide primer recommended by manufacturer.
  - 1. Products: Product acceptable to roofing manufacturer for tying in and compatible with roofing vapor retarder and air barrier in Section 07 27 00 "Air Barriers." Types include:

- a. Roofing manufacturer's foil faced, self-adhered membrane flashing, not less than 40 mil overall thickness, with aluminum or stainless steel facing and with a service temperature range of 240 degrees is acceptable.
  - b. See "foil faced, high temperature butyl" in Section 07 27 00 "Air Barriers."
  - c. Roofing manufacturer's metal-faced vapor retarder.
  - d. Roofing manufacturer's metal-faced self-adhered base flashing for bituminous roof systems
- B. Vapor Retarder, General:
1. Self-adhering, product of the types shown below and manufactured or approved by the roofing manufacturer for use and compatible with materials in contract with vapor retarder.
  2. Permeance Rating: Not more than 0.062 perm when tested in accordance with ASTM E96/E96M.
  3. Flame-Spread Index: Not more than 5 when tested in accordance with ASTM E84.
  4. Smoke-Developed Index: Not more than 35 when tested in accordance with ASTM E84.
  5. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Rubberized-Asphalt-Sheet Vapor Retarder, Self-Adhering: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.
- D. Butyl-Rubber-Sheet Vapor Retarder, Self-Adhering: Polyethylene film laminated to layer of butyl rubber adhesive, minimum 30-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

## 2.7 ROOF INSULATION AND ACCESSORIES

- A. General: Preformed roof insulation boards manufactured or approved by roofing membrane manufacturer, approved for use in FM Approvals' RoofNav listed roof assemblies.
- B. Roof Insulation, Polyisocyanurate Board: ASTM C1289, Type II, Class 2 coated glass-fiber facer on both major surfaces.
1. Basis-of-Design Product: Carlisle ThermaThin, CGF.
  2. Thermal Resistance by Thickness: R-7 per inch.
  3. Compressive Strength: Grade 3, 25 psi.
  4. Size: 48 by 48 inches.
  5. Thickness:
    - a. Base Layer: Half of required R-value.
    - b. Upper Layer: Half of required R-value.
    - c. Vertical: 1-1/2-inches or as indicated.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: Match roof insulation: Carlisle InsulBase.
  2. Edges: Square.
  3. Minimum Thickness: 1/2 inch.
  4. Slope:

- a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
  - b. Saddles and Crickets: 1/4 inch per foot unless otherwise indicated on Drawings.
- 5. Layout: Locate butt-ends and edges offset from upper layer of roof insulation.
- D. Roof Insulation Accessories, General: As recommended in writing by insulation manufacturer for intended use and compatibility with other roofing system components.
  - 1. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate and to another insulation layer as follows:
    - a. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
    - b. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
  - 2. Insulation Fasteners: Insulation manufacturer's standard factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

## 2.8 COVER BOARD

- A. General: Cover board as recommended in writing by roofing membrane manufacturer for intended use and compatible with other roofing system components.
- B. High-Density Polyisocyanurate Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2 inch thick, with a minimum compressive strength of 80 psi.

## 2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
  - 1. Size: Approximately 36 by 60 inches.
  - 2. Color: Contrasting with roofing membrane.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with roofing system 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 to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  - 3. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
  - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
  - 5. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.



6. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
  7. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.
- 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 system installation in accordance with 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. Wood Testing: Test wood surfaces for moisture and adhesion.
1. Moisture test wood according to ASTM D4442, Method B, using a moisture meter.
  2. Adhesion Testing: Field test according to ASTM D6862.
  3. Select primer as recommended by primer manufacturer and appropriate for conditions.
  4. Dry wood where moisture limits exceed manufacturer's recommendations for installation of roofing components.
- D. Prime surface of wood and plywood substrates with primer in accordance with roofing system manufacturer's written installation instructions and allow primer to dry.
- E. Perform fastener-pullout tests in accordance with roofing system manufacturer's written instructions.
1. Submit test result within 24 hours after performing tests.
    - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

### 3.3 INSTALLATION OF THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING SYSTEM, GENERAL

- A. Coordinate installation and transition of roofing system component serving as an air barrier with wall system air barrier specified under Section 07 27 00 "Air Barriers."
- B. Install roofing system materials and components in accordance with roofing system manufacturer's written installation instructions, listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- D. Install roofing membrane and auxiliary materials to tie in to air barrier to maintain weathertightness of transition.
- E. Substrate-Joint Penetrations: Prevent adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.4 INSTALLATION OF SUBSTRATE BOARDS

- 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.
  - 4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

### 3.5 INSTALLATION OF VAPOR RETARDER

- A. Install roofing transition sheet.
  - 1. Before vapor retarder: from 4-inches below height of insulation to front of parapet 4 inches.
  - 2. After vapor retarder: Lap over vapor retarder 3-inches and extend over front of parapet and down 4 inches.
- B. Install vapor retarder in a single layer over roof area in accordance with manufacturer's written installation instructions, side and end lapping each sheet a minimum of 2 and 6 inches, respectively.
  - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
  - 2. Continuously seal side and end laps with tape.
- C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

### 3.6 INSTALLATION OF ROOF INSULATION AND ACCESSORIES

- A. Coordinate installation of roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written installation instructions. Install minimum of two layers of insulation under area of roofing to achieve required thickness.
- C. Install each layer of insulation with end joints staggered not less than 12 inches in adjacent rows and offset not less than 12 inches from previous layer.
  - 1. Trim insulation neatly to fit around penetrations and projections, and to fit tightly to intersecting sloping roof decks.
  - 2. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - 3. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
  - 4. Trim insulation, so that water flow is unrestricted.
  - 5. Fill gaps exceeding 1/4 inch with insulation.

6. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
7. Secure insulation in accordance with FM Approvals' RoofNav for specified Windstorm Resistance Classification .
8. Secure insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
9. Place thermal spacers and plates on insulation in required fastening patterns and secure in accordance with manufacturer's instructions.
  - a. Install plates and fasteners tight and flat to substrate with no dimpling, and with fastener extending 1 inch minimum into roof deck; do not overdrive fasteners.
10. Loosely lay each layer of insulation over substrate.

### 3.7 INSTALLATION OF COVER BOARD

- A. Install cover board 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 in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.

### 3.8 INSTALLATION OF TPO ROOFING MEMBRANE

- A. Install roofing membrane over roof area for adhered application method in accordance with roofing system manufacturer's written installation instructions.
- B. Unroll roofing membrane and allow it to relax before installing.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- D. Adhered Application: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply to splice area of roofing membrane.
  1. In addition to adhering, mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roof area.
- E. Seams and End Laps: Clean seam areas, overlap membrane, and hot-air-weld side seams and end laps of roofing membrane and sheet flashings to ensure a watertight installation.
  1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane and sheet flashings.
  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 membrane that do not comply with requirements.
- F. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing membrane in place with clamping ring.

### 3.9 INSTALLATION OF BASE AND SHEET FLASHINGS

- A. General: Install and adhere base and sheet flashing and preformed flashing accessories to substrates in accordance with roofing system manufacturer's written installation instructions.
- B. Apply bonding adhesive to substrate and underside of flashings 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.
- D. Clean seam areas, overlap, and firmly roll flashings into the adhesive. Hot-air-weld side seams and end laps to ensure a watertight installation.
- E. Terminate and seal top of flashings and mechanically anchor to substrate through termination bars.

### 3.10 INSTALLATION OF LIQUID FLASHING

- A. Install liquid flashing products in accordance with manufacturer's written installation instructions.
- B. Install at the following areas:
  1. Around roof drain bodies extending into clamp ring.
  2. Up parapet walls and into openings, over termination bars.
  3. As indicated on Drawings.
  4. Where required by roofing manufacturer to maintain warranty where flashings and stripping is insufficient or otherwise not possible.

### 3.11 INSTALLATION OF WALKWAYS

- A. Flexible Walkways: Install walkway products in accordance with manufacturer's written installation instructions.
  1. Install flexible walkways at the following locations:
    - 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.
    - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
    - f. Locations indicated on Drawings.
    - g. As required by roofing membrane manufacturer's warranty requirements.
  2. Provide 6-inch clearance between adjoining pads.

3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive in accordance with roofing system manufacturer's written instructions.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspect substrate conditions, surface preparation, and installation of roofing membrane, flashings, protection, and drainage components, and to furnish reports to Architect.

1. Tests and Inspections:

- a. Infrared Thermography Testing: Testing agency surveys entire roof area using infrared color thermography in accordance with ASTM C1153. Perform tests before overlying construction is placed.
  - 1) After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection testing.
  - 2) After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
    - a) Cost of retesting is Contractor's responsibility.
  - 3) Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture, if any.

- B. 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.

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

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

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

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

- E. Prepare test and inspection reports.

### 3.13 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 system, inspect roofing system 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.

3.14 ROOFING SYSTEM INSTALLER'S WARRANTY

- A. WHEREAS \_\_\_\_\_ of \_\_\_\_\_, herein called the "Roofing System Installer," has performed roofing and associated Work on the following Project:
1. Owner: Tualatin Hills Park & Recreation District Wahington County, Oregon
  2. Owner Address: 15707 SW Walker Road, Beaverton OR 97006.
  3. Building Name/Type: THPRD Howard M. Terpenning (HMT) Recreation Complex, Pickleball Facility and Outdoor Court Expansion.
  4. Area of Work: New roofing on new building.
  5. Warranty Period: Two years from date of Substantial Completion.
  6. Date of Substantial Completion: \_\_\_\_\_.
- B. AND WHEREAS Roofing System 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,
- C. NOW THEREFORE Roofing System Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period, Roofing System Installer will, at Roofing System Installer's 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 98 mph (Vult), 76 mph (Vasd), 3-second gusts;
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the Work;
    - f. vapor condensation on bottom of roofing; and
    - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When Work has been damaged by any of foregoing causes, Warranty will be null and void until such damage has been repaired by Roofing System Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
  3. Roofing System 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 System Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty will 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 System Installer to perform said alterations, Warranty will not become null and void unless Roofing System Installer, before starting said Work, will 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 will become null and void on date of said change, but only to the extent said change affects Work covered by this Warranty.
6. Owner will promptly notify Roofing System Installer of observed, known, or suspected leaks, defects, or deterioration and afford reasonable opportunity for Roofing System 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 System Installer on said Work and will 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 will not operate to relieve Roofing System Installer of responsibility for performance of original Work in accordance with 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