

PART 1 - GENERAL

1.1 PRICING

- .1 All costs associated with the work required by and associated with this Section shall be included as part of the Contract Price and in the price listed in item #1 of the Bid Form.

1.2 GENERAL INSTRUCTIONS

- .1 Read and conform to:
 - .1 the General Conditions and the Supplementary Conditions of the Contract.
 - .2 Division 01 requirements and documents referred to therein.

1.3 SUMMARY

- .1 Work Included: Provide labour, materials, Products, equipment and services to complete the TPO membrane roofing work specified herein. This includes, but is not necessarily limited, to:
 - .1 Conventional roof assembly system consisting of fully adhered single ply TPO sheet materials, flashing membrane materials, and support boards.
 - .2 Auxiliary materials required for complete installation.
- .2 Related Requirements: Specifications throughout the entirety of Divisions of this Project are directly applicable to this Section, and this Section is directly applicable to them.

1.4 REFERENCES

- .1 Definitions:
 - .1 Roofing Terminology: Refer to CRCA Specifications Manuals and ASTM D1079 for the definition of terms related to roofing work in this Section.
- .2 Reference Standards: Unless otherwise stipulated by a specific publication date in this Section or the Ontario Building Code, the latest published editions of reference standards in force as of the Bid Closing Deadline for the Project, including adopted amendments, are applicable.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Prior to starting work of this Section, convene a pre-installation meeting at Project site to review Project requirements and site conditions with pertinent parties. Conform to requirements of Section 01 30 00.
 - .2 Schedule and hold a pre-installation meeting at the Project site at least one week before beginning work on this Section to coordinate activities with related Subcontractors.
 - .1 Required Attendance: Subcontractor performing work of this Section, representatives from manufacturers and fabricators involved in or affected by installation.
 - .2 Notification: Notify Consultant and Owner of scheduled meeting dates in advance; minimum 72 hour notice required.
 - .3 Agenda:
 - .1 Review progress of related construction activities and preparations for particular activity under consideration.

- .2 Make note of required sequencing and coordination with materials and activities that have preceded or will follow.
- .3 Review and finalize construction schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
- .4 Review methods and procedures for roofing installation, including manufacturer's instructions.
- .5 Review structural loading limitations of roof deck during and after roofing.
- .6 Examine supports, deck, and alignment and attachment to structural members.
- .7 Review flashing, details, penetrations, openings, and conditions of other elements that may affect roofing system installation.
- .8 Discuss governing regulations, insurance, certificates, tests, and inspections as applicable.
- .9 Review temporary protection requirements for roofing system before, during and after installation.
- .10 Discuss roof observation and repair procedures after roofing installation.
- .3 Reporting: Record significant discussions, agreements, and disagreements, including required corrective measures and actions.
- .4 Distribution: Distribute minutes of the meeting to each party present and to other parties requiring information not more than 72 hours after meeting.

1.6 SUBMITTALS

- .1 Product Data: Submit manufacturer's literature and data sheets for each type of material provided under this Section for Project in accordance with requirements of Section 01 33 00.
- .2 Product Data: Submit manufacturer's product characteristics, catalogue cuts, installation instructions and other relevant information for each material and product used for TPO membrane roofing work specified in this Section.
- .3 Safety Data Sheets (SDS): Submit SDS for inclusion in Operation and Maintenance Manual specified in Section 01 70 00, for adhesives, sealants and any other material designated by Consultant.
- .4 Shop Drawings: Submit Shop Drawings indicating material layouts, details of construction, connections, and relationship with adjacent construction. As a minimum indicate following:
 - .1 Include plans, elevations, sections and details as applicable.
 - .2 Illustrate tapered insulation, roof cricket infill, setting plan layout, and details.
 - .3 Provide membrane layout on detailed roof plan, complete with full assembly section, vertical parapet details, joint or termination detail conditions, and conditions of interface with other materials.
- .5 Wind Uplift Resistance Calculations: Provide calculations or reports sealed by a Professional Engineer, licensed to practice in Province of Ontario, demonstrating that roof assembly design meets wind uplift requirements specified in this Section. Alternatively, wind uplift calculations prepared by roofer or roof manufacturer determined using NRC's Wind-RCI calculators or equivalent tools that demonstrate compliance with requirements of Contract Documents will be deemed acceptable.

- .6 Manufacturer's Certificate:
 - .1 Submit letter signed by manufacturer certifying that products meet or exceed specified wind uplift requirements. Submit evidence of meeting performance requirements by submitting additional test and evaluation reports as well as conformance to applicable listings.
 - .2 Compatibility: Compatibility between components of roofing system is essential. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.
- .7 Samples: Submit selection and verification samples for Products requiring colour, texture, or design selection. Submit manufacturer's list of finishes or colour swatches for Consultant's selection.
 - .1 As a minimum submit samples of the following:
 - .1 Roof membrane selection: minimum 300 mm square.
 - .2 Typical flashing: minimum 300 mm.
- .8 Warranties: Submit copies of warranties specified in this Section for Consultant's review.

1.7 CLOSEOUT SUBMITTALS

- .1 Closeout Submittals, generally: in accordance with Section 01 78 00, Closeout Submittals.
- .2 Operating and Maintenance Data: Submit care and maintenance instructions for TPO membrane roofing to be included in building operation and maintenance manual.
- .3 Warranty Documentation: Submit a copy of extended warranties specified in this Section.

1.8 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Provide Products for work of this Section by manufacturer with at least 10 years' experience manufacturing such materials.
 - .1 The manufacturer shall employ trained technical service representatives, independent of sales.
 - .2 The manufacturer shall be an ISO 9001 registered company and provide a 'Quality Compliance Certificate (QCC)' for reporting/confirming tested values of TPO membrane materials upon request.
- .2 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 obtain manufacturer's extended warranty specified in this Section.
 - .1 The installer must be approved by manufacturer for installing roof system and to authenticate warranties.
- .3 Single Source Responsibility: Ensure primary materials provided in this Section are obtained from 1 source by a single manufacturer and secondary materials are obtained from sources recommended by primary materials manufacturers.
 - .1 Mixing Products across from various manufacturers without manufacturer's or Consultant's written permission is not permitted.
- .4 Mock-Ups / First Installation Review: Construct mock-ups to verify selections made under submittals, demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - .1 Location: In-situ (i.e. first installation), as directed on site by Consultant.

- .2 Construct mock-up 10 m² (100 sq ft.) minimum size showing typical lap joint, one inside corner and one outside corner.
- .3 Purpose: To set benchmarks for installation and to judge subsequent work. Maintain Mock-ups during construction in undisturbed condition.
- .4 Reviewed mock-ups: May become part of the completed work if undisturbed at the time of Substantial Performance of The work, provided they are undisturbed, and comply with requirements outlined in Contract Documents.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle TPO membrane roofing materials in accordance with manufacturer's written instructions.
- .2 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.
- .3 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.
- .4 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.
- .5 Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 SITE CONDITIONS

- .1 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. Do not install roofing system during inclement weather that may affect adhesion, curing or sealing of membranes or components.

1.11 WARRANTY

- .1 Extended warranty: Submit for Owner's review and acceptance, manufacturer's extended warranty in which manufacturer commits to repair or replace components of TPO membrane roofing that fail within specified warranty period. Manufacturer's extended warranty is in addition to, and does not supersede, any other rights that Owner may have under Contract Documents.
 - .1 Warranty Period: Not less than 20 years from date of Substantial Performance of The work.
- .2 Installer Warranty: Submit roofing Installer's warranty, on OIRCA or CRCA standard warranty form, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, insulation overlay boards, Roof Sheathing Boards, vapour retarders, and walkway products, for the following warranty period:
 - .1 Warranty Period: Two years from date of Substantial Performance of the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 Products of following manufacturers may be acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:
 - .1 Carlisle Syntec
 - .2 GAF
 - .3 Holcim Elevate (previously Firestone)
 - .4 Johns Manville
- .2 Comparable Products from manufacturers listed herein offering functionally and aesthetically equivalent products in Consultant's opinion, and subject to Consultant's review, will be considered provided they meet the requirements of this Specification.

2.2 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 General Performance: installed membrane roofing and flashing system must remain watertight and withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defects in manufacture, fabrication, installation, or construction.
- .2 Wind Uplift Design Criteria: Roofing system must have undergone testing by a qualified testing and inspection agency to resist uplift pressure based on Ontario Building Code and CAN/CSA A123.21 requirements as follows:
 - .1 Corner Uplift Pressure: Refer to Structural
 - .2 Perimeter Uplift Pressure: Refer to Structural
 - .3 Field-of-Roof Uplift Pressure: Refer to Structural
- .3 Roof Fire Covering Classification: Conforming to CAN/ULC S107 with Class A, Class B or Class C classification and conforming to Ontario Building Code 3.1.15.2.
 - .1 Provide Class A roof coverings per CAN/ULC S107 in all wood-framed and other buildings consisting of combustible construction as defined by Ontario Building Code.
- .4 Material Compatibility: Ensure compatibility between roofing system components and interfacing materials. Roof system must not adversely affect adjacent materials.

2.3 TPO SHEET MEMBRANE

- .1 TPO Sheet: uniform, flexible TPO sheet.
 - .1 Compliance: ASTM D6578/ASTM D6878, internally fabric or scrim reinforced.
 - .2 Accelerated Weathering: Must withstand 2000 hours in accordance with ASTM G152, ASTM G154, or ASTM G155.
 - .3 Impact Resistance: Must resist impact in accordance with ASTM D3746, ASTM D4272, or FM Approvals 4470 Foot Traffic Test.
 - .4 Application: fully adhered
 - .5 Thickness: Not less than 1.5 mm (60 mils), nominal.
 - .6 Exposed Face Color: White.
 - .7 Basis-of-Design: "Sure-Weld® TPO" by Carlisle Syntec or approved equivalent.

2.4 ROOF INSULATION (INS-8)

- .1 Polyisocyanurate foam insulation board:
 - .1 Classification: CAN/ULC S704, Type 2 and ASTM C1289, Type II, Class 2, Grade 2 inorganic glass-fibre mat facer on both major surfaces. Organic facers are not permitted.
 - .2 Compressive strength: minimum 138 kPa (20 psi).
 - .3 Minimum RSI (R) Value: 1.0 per 25 mm (5.7 per 1") based on LTTR testing per CAN/ULC S770.
 - .4 Thickness: As indicated on Drawings and required to provide specified R-values.
- .2 Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- .3 Insulation Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer for wind uplift criteria specified.

2.5 ROOF VAPOUR RETARDER (AVB-3)

- .1 Self-Adhering Vapor Retarder
 - .1 Compliance: to ASTM D1970 or CAN/CGSB-51.33
 - .2 Material: Slip-resistant, cold-applied polyethylene film with rubberized asphalt or butyl rubber adhesive, and release paper backing as standard with manufacturer.
 - .3 Thickness: Not less than 1.0 mm (40 mils) for rubberized asphalt; minimum 0.76 mm (30 mils) for butyl rubber type.
 - .4 Permeance: Maximum 6 ng/Pa·s·m² (0.1 perm)
- .2 Primer: Low-VOC, water-based polymer emulsion primer as recommended by roofing membrane manufacturer.

2.6 SUBSTRATE BOARDS

- .1 Fire Response:
 - .1 Combustibility: non-combustible in accordance with CAN/ULC S114.
 - .2 Surface Burning Characteristics: Flame spread: 0 / Smoke developed: 0 in accordance with CAN/ULC S102.
- .2 Mould Resistance (ASTM D3273): Minimum 10 rating (no mould growth after four week).
- .3 Maximum Board Size: 1220 mm x 1220 mm (4 ft x 4 ft).
- .4 Thickness:
 - .1 Sheathing board (over deck): Not less than 16 mm (5/8 in) thick.
 - .2 Cover board (over insulation): Not less than 13 mm (1/2 in) thick.
- .5 Following types are acceptable:
 - .1 Glass-Mat Roof Sheathing Board: to ASTM C1177/ASTM C1177M, glass-mat, water-resistant gypsum substrate, factory primed.
 - .1 Moisture Absorption Rate: 5% or less by weight.
 - .2 Surface Moisture Absorption: 1 gram or less.

- .2 Fibre-Reinforced Roof Sheathing Board: ASTM C1278/ASTM C1278M, cellulosic-fibre-reinforced, water-resistant gypsum substrate.
- .6 Board Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof board to substrate, and acceptable to roofing system manufacturer for wind uplift criteria.

2.7 AUXILIARY COMPONENTS

- .1 Provide auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing. Provide pourable sealers, preformed cone/vent sheet flashings, moulded pipe boot flashings, preformed corner sheet flashings, reinforced TPO securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other elements required for a complete installation.
- .2 Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and colour as TPO sheet membrane; minimum 1.5 mm (60 mils) thick.
- .3 Bonding Adhesive: manufacturer's standard water-based type.
- .4 Seaming Material: butyl splicing adhesive with splice cleaner, or synthetic-rubber polymer primer with butyl splice tape (minimum width of 75 mm) with release film; as recommended by manufacturer to authenticate warranties.
- .5 Lap Sealant: Standard manufacturer's single-component, color matched to roofing membrane.
- .6 Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- .7 Metal Termination Bars: manufacturer's standard, predrilled, stainless steel or aluminum, types; approx. 25 x 3 mm (1 x 1/8 inch), with anchors.
- .8 Fasteners: Corrosion-resistant, factory-coated steel with metal or plastic plates, complying with FM Global 4470, for securing membrane to substrate; and approved by roofing system manufacturer.

2.8 PAVERS, BALLAST AND WALKWAYS

- .1 Pavers: Pre-formed concrete roof pavers. Minimum size: 610 x 610 mm (24 x 24 inches). Maximum weight: 50 kg/m². Must be square, free from chips, spalls, or cracks.
- .2 Paver Pedestals: Manufacturer's standard paver pedestals complete with levelling plates for smooth, level walkways.
 - .1 Basis-of-Design: Pave-El Pedestals.
- .3 Wood Nailers: New, #2 grade or better, rot-resistant treated wood. Creosote or asphalt treatments are not acceptable. Install at roof edges or gravel stops; install flush with membrane underlayment top, ± 6 mm (1/4 inch).
- .4 Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resistant, textured walkway pads or rolls. Thickness approximately 5 mm (3/16 inch) and approved by roofing system manufacturer.
 - .1 Size: Approximately 914 x 1524 mm (36 x 60 inches).
 - .2 Color: Contrast with roof membrane

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Site Verification of Conditions:
 - .1 Verify actual site dimensions and location of adjacent materials prior to commencing work. Notify Consultant in writing of any conditions which would be detrimental to the installation. Commencement of work implies acceptance of previously completed work.
- .2 Inspect materials for defects before installation.
- .3 Comply with safety regulations of authority having jurisdiction.
- .4 Roof Openings and Penetrations:
 - .1 Ensure roof openings, penetrations are in place, curbs are set and braced.
 - .2 Ensure roof drain bodies are securely clamped in place.
- .5 Wood Cants, Blocking, Curbs, and Nailers:
 - .1 Ensure wood cants, blocking, curbs, nailers and similar components are securely anchored to roof deck at penetrations and terminations.

3.2 PREPARATION

- .1 Design and selection of materials for temporary roofing are responsibilities of Contractor.
- .2 Clean substrate of dust, debris, moisture, and substances detrimental to roofing installation in accordance with manufacturer's written instructions. Remove sharp projections.
- .3 Prevent materials from entering and clogging roof drains and conductors.
- .4 Avoid spillage or migration of materials onto surfaces of other construction.
- .5 Remove roof-drain plugs when work is not in progress or when rain is forecast.

3.3 INSTALLATION, GENERALLY

- .1 Installation Compliance: Install roofing membrane system in accordance with roofing system manufacturer's written instructions, reviewed Shop Drawings and applicable recommendations in CRCA's Roofing Specification Manual.
- .2 Supplement manufacturer's installation instructions with additional installation requirements specified in this Section to produce specified work results.

3.4 ROOF SHEATHING INSTALLATION

- .1 Mechanically Fastened Roof Sheathing:
 - .1 Fasten panels to steel deck with fasteners and plates as recommended by membrane manufacturer.
 - .2 For steel decks, ensure fasteners engage top rib and penetrate through deck by at least 19 mm (3/4 inch). Align long edge of board parallel to and on top rib for continuous support.
 - .3 Adhere to membrane manufacturer's guidelines for fasteners' number and spacing.
 - .4 Stagger end joints of adjacent boards; ensure butt joints are moderately contacting.
 - .5 Cut boards cleanly where slopes change, do not break boards to fit deck.
 - .6 Concrete fasteners and anchors must penetrate a minimum of 32 mm (1 1/4 inch), as approved by membrane manufacturer.

3.5 VAPOUR RETARDER INSTALLATION

- .1 Panel Selection: Only use roof sheathing panels approved by the vapor retarder manufacturer.
- .2 Primer Application: On glass-faced gypsum board panels, apply primer in accordance with gypsum board and vapor retarder manufacturers' instructions.
- .3 Surface Preparation: Ensure primed surfaces are clean and free of dust to facilitate effective adhesion. Cover substrates with vapor retarder as soon as they are ready.
- .4 Steel Deck Alignment: When applying directly to steel deck, align roll parallel to deck flutes. Vapor retarder overlaps must sit on top ribs of deck, ensuring full-length support.
- .5 Initial Placement: Roll out vapor retarder on substrate for alignment; do not remove release sheet immediately.
- .6 Overlap and Staggering: Overlap sheets by 75 mm (3 inches) at sides and 150 mm (6 inches) at ends. Stagger end laps by minimum of 300 mm (12 inches).
- .7 Adhesion Technique: Start by peeling back and adhering one end of release sheet to substrate. Gradually remove remaining sheet at a 45-degree angle to minimize wrinkles.
- .8 Realignment: If misalignment occurs, do not readjust. Instead, cut roll, start new section to ensure correct alignment, and overlap over misaligned piece by 150 mm (6 inches).
- .9 Final Rolling: Use a 34 kg (75 lb) roller for application. Align roller edge with side laps' lower end and roll up membrane. Avoid cutting membrane for air bubble removal; push out bubbles by rolling them towards the lap edges.
- .10 Completely seal vapour retarder at terminations, obstructions, and penetrations to prevent air infiltration into roofing system.

3.6 INSULATION INSTALLATION

- .1 Follow manufacturer's instructions for insulation installation. Do not install insulation boards displaying signs of moisture damage.
- .2 Install insulation using staggered layers to minimize thermal bridging.
- .3 Install insulation with long joints in a continuous straight line. Stagger end joints between rows.
- .4 Ensure that edges and ends between boards abut each other. Fill gaps exceeding 6 mm (1/4 inch) with insulation. Cut and fit insulation within 6 mm (1/4 inch) of nailers, projections, and penetrations.
- .5 Secure preformed 45-degree insulation cant strips at junctures of roofing membrane systems with vertical surfaces or angle changes exceeding 45 degrees.
- .6 Install tapered insulation under roofing to match slopes indicated on Drawings. Install insulation under roofing membrane to reach required thickness.
- .7 Provide two or more layers when overall insulation thickness is 75 mm (3 inches) or more.
- .8 Stagger joints of each succeeding layer at least 150 mm (6 inches) in each direction from joints of previous layer.
- .9 Trim surface of insulation as needed at roof drains. Ensure completed surface is flush and does not impede flow of water.
- .10 Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

3.7 COVER BOARD INSTALLATION

- .1 Install cover board over insulation to protect insulation from roof traffic. Ensure tight, staggered joints. Use adhesive specified in roof assembly's CSA A123.21 wind uplift test report.

3.8 ROOFING MEMBRANE INSTALLATION

- .1 Presence of Technical Personnel: Begin installation of roofing membrane only in the presence of roofing system manufacturer's technical personnel. Cooperate with Owner's inspection and testing agencies as needed.
- .2 Temporary Protection:
 - .1 Coordinate roofing system installation to ensure insulation and other non-permanent components are protected against precipitation and are not left uncovered at end of workday or when rain is anticipated.
 - .2 Provide tie-offs at the end of each day of work to cover exposed roofing sheets and insulation.
 - .3 Complete terminations and base flashings; provide temporary seals to prevent water ingress into completed sections of roofing system.
 - .4 Remove and discard temporary seals before starting work on adjoining roofing areas.

3.9 INSTALLATION OF ROOFING MEMBRANE

- .1 Unroll membrane roofing and allow to relax before installation.
- .2 Accurately align roofing and maintain uniform side and end laps in accordance with manufacturer's requirements. Stagger end laps.

Adhesive Application: Apply bonding adhesive to substrate and underside of roofing at the manufacturer-specified rate. Allow to partially dry before installation. Avoid application to splice area.
- .3 Terminations, Penetrations, and Perimeters: Securely fasten or adhere roofing at such areas.
- .4 Shingling: Install roofing with side laps shingled with slope of roof deck.
- .5 Welding Process: Use manufacturer's recommended hot air welding machine for welding seams. Immediately after welding, roll all splice intersections with roller to ensure continuous hot air welded seams. For membranes 60-mil thick or thicker, overlay all splice intersections with manufacturer's standard non-reinforced flashing or TPO T-Joint covers.
- .6 Seam Inspection: Probe all seams after hot air welds cool down. Repair seam deficiencies on same day they are identified. Verify field strength of seams a minimum of twice daily, and repair seam areas.
- .7 Edge Sealing: After seam inspection, seam probing, apply edge sealant on all cut edges of reinforced membrane where scrim reinforcement is visible.
- .8 Repairs: Address and repair tears, voids, and lapped seams that do not meet requirements.

3.10 MEMBRANE FLASHING INSTALLATION

- .1 Install membrane flashing at roof penetrations, walls, and intersections.
- .2 Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof. Secure to substrates according to roofing system manufacturer's written instructions.

- .3 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.
- .4 Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- .5 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.
- .6 Terminate and seal top of sheet flashings.

3.11 INSTALLATION OF WALKWAYS

- .1 Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions. Flexible Walkways: Install flexible walkways at the following locations:
 - .1 Perimeter of each rooftop unit.
 - .2 Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - .3 Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - .4 Top and bottom of each roof access ladder.
 - .5 Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - .6 Locations indicated on Drawings.
 - .7 As required by roof membrane manufacturer's warranty requirements.
 - .8 Provide 6-inch (76-mm) clearance between adjoining pads.
 - .9 Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- .2 Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 75 mm (3 inches) of space between adjacent roof pavers.

3.12 FIELD QUALITY CONTROL

- .1 Roof Inspection: Contractor must have roof system manufacturer's technical personnel to inspect roofing during installation and on completion to confirm substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to supply reports to Consultant.
- .2 Roofing system will be considered defective if it does not pass tests and inspections.
- .3 Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTION

- .1 Protect TPO membrane roofing from damage, soiling and contaminating substances resulting from construction activities or caused by work of other trades.
- .2 Promptly replace TPO membrane roofing work damaged during construction that cannot be satisfactorily repaired.

3.14 CLEANING AND WASTE MANAGEMENT

- .1 Cleaning: Maintain clean construction area at the end of each day. When the activities of this Section are complete, remove materials, tools, equipment and rubbish.
- .2 Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- .3 Waste Management and Disposal: sort waste for reuse, recycling, or disposal, as specified. Remove recycling bins and containers from site and dispose of contents at the appropriate waste disposal facilities.

END OF SECTION