

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 Supplementary Conditions of the Contract as amended in the Contract Documents.
 - .2 Division 01 requirements and any additional documents referred to therein.

1.3 SUMMARY

- .1 Work Included: Provide labour, materials, products, equipment and services to complete the modified bituminous membrane roofing work specified herein. This includes, but is not necessarily limited, to:
 - .1 Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.
 - .2 Cap-sheet materials
 - .3 Base-sheet materials
 - .4 Flashing sheet materials
 - .5 Roof Sheathing Boards and insulation overlay boards.
 - .6 Vapour retarders
 - .7 Roof insulation.
 - .8 Auxiliary roofing membrane 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 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.
- .2 Definitions:
 - .1 Roofing Terminology: Refer to CRCA and NRCA Roofing Specifications Manuals and ASTM D1079 for definition of terms related to roofing work in this Section.
 - .2 Roof System: the organization and securement of various interacting materials (apart from the supporting deck structure), designed and installed to prevent the transmission of water through the system into the conditioned space of a building (adapted from ASTM D6630)

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 Meet with Owner, Consultant, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
- .3 Review methods and procedures related to roofing installation, including manufacturer's written instructions.
- .4 Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- .5 Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
- .6 Review structural loading limitations of roof deck during and after roofing.
- .7 Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
- .8 Review governing regulations and requirements for insurance and certificates if applicable.
- .9 Review temporary protection requirements for roofing system during and after installation.
- .10 Review roof observation and repair procedures after roofing installation.

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 30 00.
 - .1 Ensure data sheets provide required information including detailed instructions for installing as well as maintaining, preserving, and keeping materials in clean and safe conditions. Provide adequate warning of maintenance practices or cleaning agents detrimental to specified materials.
- .2 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.
- .3 Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 01 30 00 for roofing system. Include plans, elevations, sections, details, and attachments to other work.
 - .1 Base flashings and membrane terminations.
 - .2 Tapered insulation, including slopes.
 - .3 Crickets, saddles, and tapered edge strips, including slopes.
 - .4 Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- .4 Samples: Submit samples in accordance with Section 01 30 00 for the following:
 - .1 Coloured cap sheet (other than black).
 - .2 Flashing sheet, colour required.
 - .3 Walkway pads or rolls, of colour required.
- .5 Manufacturer's Certificate:

- .1 Submit letter signed by manufacturer certifying that products meet or exceed specified 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.
- .6 Warranties: Submit copies of warranties specified in this Section for Consultant's review.
- .7 System Test Reports: Submit reports substantiating conformance with requirements of CSA A123.21 based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- .8 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 demonstrating compliance will be deemed acceptable.

1.7 CLOSEOUT SUBMITTALS

- .1 Maintenance Data: Submit in accordance with Section 01 70 00 for roofing system to include in maintenance manuals.
 - .1 As a minimum include following: Project name, project location, dated and executed copy of manufacturer's warranty, name, address and phone number of nearest manufacturer's representative.
 - .2 Include recommendations for periodic inspections, care and maintenance. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.

1.8 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacturers: Provide Products for Work of this Section by manufacturer with minimum 10 years' experience in the manufacture of such materials.
 - .1 Manufacturer shall employ trained technical service representatives, independent of sales.
 - .2 Manufacturer shall be an ISO 9001 registered company (or equivalent quality assurance system) and provide a 'Quality Compliance Certificate (QCC)' for reporting/confirming tested values of modified bitumen membrane materials upon request.
 - .2 Installers: Provide work of this Section executed by competent installers with minimum 5 years' experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.
 - .1 Ensure roofer is qualified and approved by membrane manufacturer and is a member in good standing in OIRCA or CRCA or local provincial roofing contractor's association.
- .2 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.
- .3 Mock-ups:
 - .1 Construct mock-up 10 m² (100 sq ft.) minimum size showing typical lap joint, one inside corner and one outside corner.
 - .2 Reviewed mock-up may form part of complete work if undisturbed at time of Substantial Performance of the Work.
 - .3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with roofing work.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Comply with manufacturer's written instructions for handling, storing, and protecting during installation as well as any specific Consultant's 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.
- .6 Fire Protection:
 - .1 Respect safety measures described in manufacturer's literature as well as requirements of authorities having jurisdiction.
 - .2 Store combustible materials away from heat and open flames. Protect and store materials in dry, ventilated area away from welding flame, spark or other combustible materials.
 - .3 Keep two dry chemical or foam-type fire extinguishers acceptable to authorities having jurisdiction, fully charged and in operable condition within easy access of torching applications and at every location where open flames are used.
 - .4 Verify no vent pipes venting flammable fumes (e.g. fuel storage tanks) are located in area of work.
 - .5 Protect against self-starting fires at end of daily roofing operations. Use a heat detector gun to spot smoldering or concealed fires. Examine roof for hot spots one hour after completion of roofing operations, especially at flashings and around roof penetrations. Maintain fire watch for one hour after each day's roofing operations cease.

1.10 PROJECT 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.

- .1 Do not apply any part of roofing system over damp materials, or during a period of damp weather.
- .2 Install roofing on dry deck, free of snow and ice. Use only dry materials and apply only during weather conditions that will not promote the intrusion of moisture into roofing system.

1.11 WARRANTY

- .1 Extended Warranty: Manufacturer's standard or modified form, total system, non-pro-rated, "No-Dollar-Limit", transferrable warranty in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks resulting from manufacturing and/or workmanship defects or deficiencies.
 - .1 Warranty Period: 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:
 - ~~3.1~~ 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 Henry Company
 - .2 IKO.
 - .3 Johns Manville.
 - .4 Siplast, Inc.
 - .5 Soprema Inc.
- .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 REGULATORY REQUIREMENTS

- .1 Exterior Fire-Test Exposure: CAN/ULC-S107, Class A, unless otherwise required by authorities having jurisdiction; for application and roof slopes indicated on Drawings and Schedules, as determined by testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Roof arrangements and configurations provided in Contract Documents are indicative and are intended to convey design intent only. Final roof assemblies must be determined in consultation with manufacturer based on wind uplift criteria specified herein and manufacturer's standard tested assemblies. Indicate all variations and deviations from specified assemblies to Consultant clearly during Shop Drawing review and seek acceptance prior to commencing construction activities.

- .2 Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- .3 Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- .4 Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to requirements of Ontario Building Code:
 - .1 Corner Uplift Pressure: Refer to Structural Drawings.
 - .2 Perimeter Uplift Pressure: Refer to Structural Drawings.
 - .3 Field-of-Roof Uplift Pressure: Refer to Structural Drawings.
- .5 CSA Listings: Provide roofing membrane, base flashings, and component materials that comply with requirements of CSA A123.21.

2.4 BASE SHEET ROOFING MEMBRANE (TORCHED APPLICATION)

- .1 Composite-Reinforced Base Sheet Roofing Membrane: SBS-modified asphalt sheet (reinforced with composite glass/polyester); smooth surfaced; suitable for application method specified.
 - .1 CGSB 37-GP-56M; Classification: Type 2 – Covered Roofing, Class P - plain surfaced, Grade 2 - heavy duty service or equivalent to CSA A123.23; Type C.
 - .2 Reinforcement: combination of polyester and glass fibres to ASTM D6162, having nominal weight of 160 g/m²
 - .3 Top/bottom surfaces: Manufacturer's standard suitable for application indicated.
 - .4 Application: Torched
 - .5 Acceptable Products:
 - .1 "Sopraply Base 520" by Soprema Inc
 - .2 "Torchflex TP-HD-FF-BASE" by IKO
 - .3 "DynaPly® HW" T1 by Johns Manville.
 - .4 "Paradiene 20 TG" by Siplast

2.5 CAP SHEET ROOFING MEMBRANE (TORCHED APPLICATION)

- .1 High SRI Composite-Reinforced Field Cap Sheet Roofing Membrane: SBS-modified asphalt sheet (reinforced with composite glass/polyester); granule surfaced; suitable for application method specified.
 - .1 CGSB 37-GP-56M; Classification: Type 2 – Exposed roofing, Class G – Granule surface, Grade 2 – Heavy-duty or equivalent to CSA A123.23; Type B.
 - .2 Reinforcement: combination of polyester and glass fibres to ASTM D6162, having nominal weight of 160 g/m²
 - .3 Top/bottom surfaces: Manufacturer's standard suitable for application indicated.
 - .4 Solar Reflectance Index (SRI): As specified in this Section.
 - .5 Granule colour: Bright white.

- .6 Application: Torched.
- .7 Acceptable Products:
 - .1 "SOPRASTAR FLAM HD GR" by Soprema Inc
 - .2 "DynaWeld FR CR (coated)" by Johns Manville
 - .3 "Armourcool Granular TP-HD " by IKO
 - .4 "Parafor 30 TG BW" by Siplast
 - .5 "modifiedPLUS® NP250gT4 with Solarflex Coating" by Henry Company

2.6 BASE SHEET FLASHING MEMBRANE

- .1 Flashing Base Sheet Roofing Membrane: SBS-modified asphalt sheet (reinforced with polyester fabric or composite glass fibre/polyester); smooth surfaced; suitable for application method specified.
 - .1 CGSB 37-GP-56M; Classification: Type 2 – Covered Roofing, Class P - plain surfaced, Grade 2 - heavy duty service or equivalent to CSA A123.23; Type B or C.
 - .2 Reinforcement: nonwoven polyester fibres to ASTM D6164, having nominal weight of 180 g/m² or combination of polyester and glass fibres to ASTM D6162, having nominal weight of 160 g/m²
 - .3 Top/bottom surfaces: Manufacturer's standard suitable for application indicated.
 - .4 Application: Cold-applied/Self-Adhesive
 - .5 Acceptable Products: as recommended by manufacturer.

2.7 CAP SHEET FLASHING MEMBRANE

- .1 Identical to field roofing cap sheet membrane.

2.8 ROOF SHEATHING BOARDS

- .1 Provide roof sheathing board as specified in this Section and conforming to the following characteristics:
 - .1 Combustibility: non-combustible in accordance with ULC CAN4-S114-M.
 - .2 Fire-test response characteristics (CAN/ULC-S102/S102.2-M):
 - .1 Flame spread: 0,
 - .2 smoke developed: 0
 - .3 Mould Resistance: Rating of 10, no mould growth after four weeks exposure when tested in accordance with ASTM D3273.
 - .4 Material to act as thermal barrier in accordance with UL 1256/ CAN/ULC-S126-M.
 - .5 Maximum size: 1220 mm x 1220 mm (84' x 84').
- .2 Following types are acceptable:
 - .1 Glass-Mat Roof Sheathing Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 16 mm (5/8 inch) thick, factory primed.
 - .1 Application: as recommended by manufacturer.
 - .2 Acceptable Products:

- .1 "DensDeck Prime with EONIC Technology" by Georgia-Pacific LLC.
- .2 Approved equivalent by CGC Inc.
- .2 Fibre-Reinforced Roof Sheathing Board: ASTM C 1278/C 1278M, cellulosic-fibre-reinforced, water-resistant gypsum substrate, Type X, 16 mm (5/8 inch) thick.
 - .1 Application: as recommended by manufacturer.
 - .2 Acceptable Products:
 - .1 "Securock® - Brand Gypsum-Fiber Roof Board" by CGC Inc.
 - .2 Approved equivalent.
- .3 Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof sheathing board to roof deck.

2.9 VAPOUR RETARDER (AVB-3)

- .1 Self-Adhering-Sheet Vapour Retarder: Tri-laminate woven polyethylene film laminated to layer of SBS-modified bitumen, minimum 0.80- mm (31.5-mil) total thickness; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm); self-adhered, with slip-resisting surface and release film backing. Provide primer when recommended by vapour retarder manufacturer.
 - .1 Acceptable Products:
 - .1 "Sopravap'r" by Soprema Inc.
 - .2 "JM Vapor Barrier SA" by Johns Manville.
 - .3 "IKO M.V.P" by IKO Industries.
 - .4 "Vapor Block SA" by Henry Company
 - .5 Approved equivalent by Siplast

2.10 ROOF INSULATION (INS-8)

- .1 Provide preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- .2 Polyisocyanurate Board Insulation: CAN/ULC-S704, Type 3, Class 3 and ASTM C 1289, Type II, Class 2, Grade 2 inorganic glass-fibre mat facer on both major surfaces.
 - .1 Compressive strength: minimum 138 kPA (20 psi).
 - .2 Minimum RSI (R) Value: 1.0 per 25 mm (5.7 per 1 inch) in accordance with CAN/ULC-S770 based on Long Term Thermal Resistance (LTTR) R-value.
 - .3 Thickness: As indicated on Drawings
 - .4 Application: Cold-Adhered.
 - .5 Acceptable Products:
 - .1 "Sopra-ISO Plus" by Soprema Inc.
 - .2 "ENRGY 3® CGF" Johns Manville.
 - .3 "IKOTherm III" by IKO Industries Inc.
 - .4 "Paratherm Poly ISO" by Siplast
 - .5 Approved equivalent by Atlas Roofing Corporation.

- .3 Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of not less than 1:48 (1/4 inch per 12 inches) unless otherwise indicated. Refer to Drawings for specific slopes. Tapered insulation to be of identical composition as roof insulation board.
- .4 Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.11 INSULATION OVERLAY BOARD

- .1 Provide insulation overlay board as specified in this Section and conforming to the following characteristics:
 - .1 Combustibility: non-combustible in accordance with ULC CAN4-S114-M.
 - .2 Fire-test response characteristics (CAN/ULC-S102/S102.2-M):
 - .1 Flame spread: 0,
 - .2 smoke developed: 0
 - .3 Mould Resistance: Rating of 10, no mould growth after four weeks exposure when tested in accordance with ASTM D3273.
 - .4 Maximum size: 1220 mm x 1220 mm (4' x 4').
- .2 Following types are acceptable:
 - .1 Mineral fortified, asphaltic roof insulation overlay board with glass fibre facers.
 - .1 Application: Cold-Adhered.
 - .2 Thickness: 6 mm (1/4 inch)
 - .3 Acceptable Products:
 - .1 "Sopraboard" by Soprema Inc.
 - .2 "Protectoboard" by IKO Industries.
 - .3 "Protecto Board" or "HAL Board" by Siplast
 - .2 Laminated Overlay Board: System consisting of non-woven reinforced SBS modified bitumen membrane base ply factory laminated to 13 mm (1/2 inch) thick high density (HD) polyisocyanurate board as acceptable in lieu of separate insulation overlay boards.
 - .1 Application: Fully-adhered.
 - .2 Basis-of-Design: "2-1Soprasmart ISO HD" by Soprema Inc. or Equivalent.

2.12 WALKWAYS

- .1 Walkway Pads: Polyester reinforced SBS modified bitumen pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 5 mm (3/16 inch) thick, minimum.
 - .1 Acceptable Products:
 - .1 "Soprawalk" by Soprema Inc. or approved equivalent.
 - .2 "DynaTred" by Johns Manville.
 - .3 "Paratread" by Siplast
 - .4 "Torchflex TP-250-Cap" by IKO
 - .5 Approved Equivalent.

- .2 Pad Size: Manufacturer's standard type.
- .3 Granule Colour: Contrasting colour as selected by Consultant at a later date.
- .2 Roof Pavers: CSA A23.1/A23.2 Heavyweight, hydraulically pressed, concrete units, square edged manufactured for use as plaza deck pavers; minimum average cube compressive strength 50 MPa (7250 psi), with no individual unit less than 45 MPa (6525 psi).
 - .1 Size: 610 mm x 610 mm x 45 mm (24 inch x 24 inch x 1-3/4 inch)
 - .2 Finish: non-slip finish – shot blast.
 - .3 Colour: As selected by Consultant from manufacturer's full range.
 - .1 Colour Pigment Material Standard: Comply with ASTM C 979.
 - .4 Freeze/Thaw Deicing Salt Resistance: Required.
 - .5 Water Absorption: not greater than 5 percent.
 - .6 SRI: Provide Products having minimum Solar Reflective Index (SRI) values as follows:
 - .1 Initial: Not less than 80
 - .2 3-year test results: Not less than 78.
 - .7 Acceptable Products: "Solar Reflective Slabs" by Brooklin Concrete Products or approved equivalent.
 - .8 Provide pavers at traffic concentration points (i.e. roof hatches, access doors, rooftop ladders, etc.), regardless of traffic frequency or whether or not these are explicitly indicated on Drawings.
- .3 Paver Supports:
 - .1 Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including fixed-height, adjustable or stackable pedestals, shims, and spacer tabs for flush joint spacing sufficient to allow for expansion and contraction while avoiding tripping hazards.
 - .1 Acceptable Manufacturers:
 - .1 "Paver Pedestals" by Soprema Inc.
 - .2 Approved equivalent by Bison Innovative Products
 - .3 Approved Equivalent.
 - .2 Polystyrene: Extruded polystyrene insulation as fabricated with both sides having a matrix of drainage, size as required to support pavers.
 - .1 Grooves: 13 mm x 13 mm (½ inch x ½ inch); staggered

2.13 ASSOCIATED ROOFING WORKS

- .1 Provide required associated roofing accessories and supports as necessary to provide complete roofing work and support roof equipment shown on Drawings. This includes but is not limited to supports for:
 - .1 Mechanical equipment, electrical equipment, pipes, guy wire, stack vents, relief vents, fall restraint anchors and similar components.
 - .2 Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - .3 Provide seismically reinforced supports where required by Authorities Having Jurisdiction.

- .4 Acceptable Manufacturers: Thaler Metal Industries Ltd. Or approved equivalent.

2.14 ACCESSORIES

- .1 Provide roof accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- .2 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.
- .3 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, multicomponent urethane adhesive.
 - .2 Full-spread spray-applied, low-rise, two-component urethane adhesive.
 - .3 Acceptable Product:
 - .1 "Duotack" by Soprema Inc.;
 - .2 "Millenium Adhesive" by IKO Industries;
 - .3 "MJM Green 2-Part UIA Canister" by Johns Manville.
 - .4 Approved equivalent
- .4 Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fibre insulation board.
 - .1 Acceptable Products:
 - .1 "FesCant Plus" by Johns Manville.
 - .2 Approved Equivalent by SOPREMA.
 - .3 Approved Equivalent by IKO Industries.
- .5 Wood Nailer Strips: Comply with requirements in Section 06 10 00.
- .6 Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fibre insulation board.
- .7 Low-VOC Primer: water-based polymer emulsion primer
 - .1 Acceptable Products:
 - .1 "Elastocol Stick Zero" or "Elastocol H2O" by Soprema Inc.;
 - .2 "SAM LVC" by IKO Industries
 - .3 "TA 119" by Siplast
 - .4 "Blueskin LVC Primer" by Henry Company
 - .5 Approved equivalent
- .8 Adhesive for membranes: one-part, asbestos-free, low-VOC, low-odour, cold-applied, elastomeric adhesive compatible with roofing membrane and base flashings.
 - .1 Acceptable Products:
 - .1 "Colply EF Adhesive" and "Colply EF Flashing Adhesive" by Soprema Inc.
 - .2 "Cold Gold Field Adhesive" and "Cold Gold Flashing Adhesive" by IKO Industries.
 - .3 "MBR Cold Adhesive" by Johns Manville.
 - .4 "SFT Flashing Cement" by Siplast

- .5 "MB 80-11 Flashing Adhesive" by Henry Company.
- .6 Approved Equivalent.
- .9 Liquid-Applied Flashing: Low-VOC resin-based, seamless, reinforced waterproofing system flashing that is compatible with adjacent materials.
 - .1 Provide at all flashing details including, but not limited to, mechanical equipment, roof/wall penetrations and similar locations.
 - .2 Acceptable Products:
 - .1 "Alsan Flashing" by Soprema Inc.
 - .2 "MS Detail" by IKO Industries.
 - .3 "PermaFlash" by Johns Manville.
- .10 Mastic Sealant: CAN/CGSB-37.29, Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, non-skinning, and nondrying.
- .11 Board Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

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 Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - .1 Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - .2 Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - .3 Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00, Steel Decking.
 - .4 Verify that deck is securely fastened with no projecting fasteners.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- .2 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 Prime surface of concrete deck with approved primer and allow primer to dry. Refer to product data sheet for coverage and application information.

3.3 INSTALLATION, GENERAL

- .1 Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in CRCA's roofing specifications.
- .2 Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- .3 Coordinate installing roofing system so components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - .1 Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - .2 Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - .3 Remove and discard temporary seals before beginning work on adjoining roofing.
- .4 Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 ROOF SHEATHING BOARD INSTALLATION

- .1 Install Roof Sheathing Board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt Roof Sheathing Boards together.
 - .1 Fasten Roof Sheathing Board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 - .2 Fasten Roof Sheathing Board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.5 VAPOUR RETARDER INSTALLATION

- .1 Self-Adhering Sheet Vapour Retarder: Prime substrate if required by manufacturer. Install self-adhering sheet vapour retarder, side and end lapping each sheet a minimum of 100 mm (4 inches) and 150 mm (6 inches), respectively. Seal laps by rolling.
- .2 Completely seal vapour retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.6 INSULATION INSTALLATION

- .1 Comply with roofing system manufacturer's written instructions for installing roof insulation.
- .2 Mechanically fasten base layer to substrate according to roofing system manufacturer's written instructions.
- .3 Nailer Strips: Mechanically fasten 89-mm actual- (4-inch nominal-) width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 - .1 4.88 m (16 feet) apart for roof slopes steeper than 1:12 (1 inch per 12 inches) but less than 3:12 (3 inches per 12 inches).
 - .2 1220 mm (48 inches)] apart for roof slopes steeper than 3:12 (3 inches per 12 inches).

- .4 Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.
- .5 Install tapered insulation under area of roofing to conform to slopes indicated on Drawings and Schedules.
- .6 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 6 mm (1/4 inch) with insulation.
 - .1 Cut and fit insulation within 6 mm (1/4 inch) of nailers, projections, and penetrations.
- .7 Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 75 mm (3 inches) or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 150 mm (6 inches) in each direction.
- .8 Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- .9 Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- .10 Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - .1 Set each layer of insulation in a solid mopping of hot roofing asphalt.
 - .2 Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

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

 - .3 Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
- .11 Mechanically Fastened and Adhered Insulation: Install first 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 Approvals' "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 a solid mopping of hot roofing asphalt.
 - .4 Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- .12 Install insulation overlay boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 150 mm (6 inches) in each direction from joints of insulation below. Loosely butt insulation overlay boards together. Tape joints if required by roofing system manufacturer.
 - .1 Fasten insulation overlay boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 - .2 Apply hot roofing asphalt to underside, and immediately bond insulation overlay board to substrate.
- .13 Install laminated insulation overlay boards in a shingle fashion (to prevent back water laps) over insulation/substrate with long joints in continuous straight lines with end joints butted and aligned

with the 1-inch membrane overlapped onto the adjacent board. Fasten insulation overlay board in accordance to test approval, the letter of intent to warrant and project specification. Seal side laps and install manufacturer's recommended lapping tape, centered over the aligned end joints.

3.7 ROOFING MEMBRANE INSTALLATION, GENERAL

- .1 Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in CRCA's Roofing Specification Manual.
- .2 Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- .3 Where roof slope exceeds 1:12 (1 inch per 12 inches), install roofing membrane sheets parallel with slope. Refer to manufacturers steep slope installation requirements.
 - .1 Backnail roofing membrane sheets to substrate according to roofing system manufacturer's written instructions.
- .4 Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- .5 Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - .1 Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation.
 - .2 Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
 - .3 Remove and discard temporary seals before beginning work on adjoining roofing.

3.8 SBS-MODIFIED BITUMINOUS BASE-PLY MEMBRANE INSTALLATION

- .1 Install modified bituminous roofing base ply sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, when applicable, installing as follows:
 - .1 Heat Welded (Torch): Torch apply to substrate.
 - .2 Unroll roofing sheets and allow them to relax.
- .2 Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - .1 Repair tears and voids in laps and lapped seams not completely sealed.

3.9 SBS-MODIFIED BITUMINOUS CAP SHEET MEMBRANE INSTALLATION

- .1 Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, when applicable.
 - .1 Heat Welded (Torch): Torch apply to substrate.
- .2 Unroll cap sheet and allow them to relax.
- .3 Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - .1 Repair tears and voids in laps and lapped seams not completely sealed.
 - .2 Apply roofing granules to cover exuded bead at laps while bead is hot.

- .4 Install roofing sheets so side and end laps shed water.

3.10 MEMBRANE FLASHING INSTALLATION

- .1 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, and as follows:
 - .1 Prime substrates with asphalt primer.
 - .2 Backer-Sheet Application: Mechanically fasten backer sheet to walls or parapets.
 - .3 Flashing-Sheet Application: As specified by manufacturer for membrane application method.
- .2 Extend base flashing up walls or parapets a minimum of 200 mm (8 inches) above roofing membrane and 100 mm (4 inches) onto field of roofing membrane.
- .3 Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - .1 Seal top termination of base flashing.
- .4 Install roofing membrane cap-sheet flashing where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- .5 Roof Drains: Coordinate with Division 22, Plumbing. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 150 mm (6 inches) beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring. Install stripping according to roofing system manufacturer's written instructions.

3.11 WALKWAY INSTALLATION

- .1 Walkway Pads: Install walkway pads using units of size indicated on Drawings and Schedules or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
 - .1 Set walkway pads in cold-applied adhesive.
 - .2 Set walkway pads in flashing cement.
 - .3 Torch apply walkway pads.

3.12 FIELD QUALITY CONTROL

- .1 Testing Agency: Owner may engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to supply reports to Consultant.
- .2 Manufacturer's Field Services:
 - .1 Arrange for roofing system manufacturer's technical personnel to visit Project site on day roofing is commenced and at regular agreed-upon intervals until completion.
 - .2 Upon completion of work of this Section, arrange for roofing system manufacturer's technical personnel to inspect roof and verify quality of work.
 - .3 Submit detailed field report prepared by manufacturer's representative to inform Consultant, Contractor and Subcontractor after inspection and issue manufacturer's warranty if roofing installation is satisfactory.
 - .4 Notify Consultant and Owner 48 hours in advance of date and time of inspection.

- .3 Roofing system will be considered defective if it does not pass tests and inspections.
 - .1 Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

- .1 Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Consultant and Owner.
- .2 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 Performance of the Work and according to warranty requirements.
- .3 Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION