

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for conventional modified bituminous roofing work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 ASTM D6162/D6162M, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
 - .2 CSA A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.
 - .3 CSA A231.1/A231.2, Precast Concrete Paving Slabs/Precast Concrete Pavers.
 - .4 CAN/ULC S107, Fire Test For Roof Coverings.
 - .5 CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.
 - .6 CRCA Roofing Manual, Canadian Roofing Contractors Association.
 - .7 OIRCA, Ontario Industrial Roofing Contractors Association.
- 1.3 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 10 10 indicating:
 - .1 Systems, materials, and methods of installation proposed for use, showing system and each component. Certify compliance of each component with applicable standards.
 - .2 Submit cold weather construction procedures and methods of protection which will be initiated, installed and maintained when ambient temperature falls below 0°C.
 - .2 Shop Drawings: Submit Shop Drawings in accordance with Section 01 10 10 indicating roof layout, sections, details, materials, flashings and membrane terminations, perimeter securement, vapour barrier terminations, insulation wrapping procedures, tapered insulation layout, membrane penetrations, control joints, solar panel layout and roof accessories.

- .3 Samples:
 - .1 Submit following samples in accordance with Section 01 10 10:
 - .1 Substrate board.
 - .2 Vapour retarder and adhesive.
 - .3 Insulation boards.
 - .4 Tapered insulation.
 - .5 Insulation overlay.
 - .6 Roofing membranes.
 - .7 Roof accessories.

- .4 Reports and Certificates:
 - .1 Submit copy of membership in good standing of OIRCA.
 - .2 Submit certification from manufacturer that roof system has a minimum Class C classification in accordance with CAN/ULC-S107.
 - .3 Submit Pre-Installation Notice (PIN): Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.
 - .4 Submit project specific report, issued by certified material testing laboratory, confirming that proposed roofing assembly conforms to CSA A123.21. As a minimum report shall indicate uplift pressures for field of roof, perimeter of roof and corners of roof.
 - .5 Submit written inspection reports in duplicate from manufacturer, stating that materials proposed for use on this project meet criteria specified and are compatible with each other.

- .5 Project close-out submittals:
 - .1 Submit close-out submittals in accordance with Section 01 10 10.
 - .2 Submit membrane manufacturer's certificate that membrane has been installed in accordance with Contract Documents.

- .6 Extended warranties: Submit extended warranties signed and registered by the manufacturer providing the warranties in the name of the Owner for the timeframe and coverage specified in this Section.

1.4 **QUALITY ASSURANCE**

- .1 Qualification: Perform work of this Section by a company that is a member in good standing of the Ontario Industrial Roofing Contractors Association (OIRCA) and has a minimum of 5 years proven acceptable roofing experience on installations of similar complexity and scope.
- .2 Perform roofing work in accordance with the CRCA Roofing Specifications Manual and in accordance with membrane manufacturer's printed installation instructions.
- .3 Ensure roofing system has been tested and conforms to CAN/CSA A123.21 to ensure wind uplift resistant applicable to the Place of Work.

- .4 Roof system shall have a minimum Class C classification in accordance with CAN/ULC-S107.
- .5 Ensure membrane manufacturer's representative has full access to this work for proper inspection prior to and during membrane installation. Roof inspections shall be conducted when the roof is 10%, 50%, and 100% complete minimum. Membrane manufacturer to certify that roof installation was in conformance to manufacturer's written requirements.
- .6 Mock-ups: Refer to Section 01 43 00 for additional information regarding mock-ups pertaining to this Section.
- .7 Pre-installation meetings: Arrange meeting on Site to be attended by Consultant, Contractor, and roofing manufacturer's representative to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle Products in accordance with the Conditions of the Contract and as specified herein.
- .2 Deliver Products in original containers and keep in protective storage until used.
- .3 Indicate on containers or wrappings of Products:
 - .1 Manufacturer's name and brand.
 - .2 Compliance with applicable standard.
 - .3 Weight of material, where applicable.
- .4 Handle and store Products to prevent damage. Keep manufacturer's labels and seals intact. Store roofing rolls on end to prevent flattening. Ensure that shelf life of Products has not expired.
- .5 Protect Products from inclement weather. Keep insulation, insulation overlay, and roofing membranes absolutely dry. Remove from storage only as much Product as can be applied, made weathertight, and covered with roofing in same day. Do not install Products which are damp at time of installation or showing evidence of having been damp or exposed to moisture.
- .6 Store roofing membranes for 24 hours minimum in area kept at 10⁰C minimum and remove for application with minimum exposure to low temperatures. Keep membranes dry, stored off-the-ground, on end and well ventilated.
- .7 Do not store more than one day's supply of Products on the roof at any time. Stack materials on pallets on roof. Cover Products with incombustible waterproof tarpaulin whenever work is interrupted, or when there is precipitation of any kind.

- .8 Distribute Products stored on roof. Install bases under equipment and Products to distribute weight. Do not store Products on, or transport materials across, completed roof areas.
- .9 Place 19 mm thick plywood runways over work to enable movement of Products and other traffic.
- .10 Where hoisting or pumping occurs adjacent to construction, hang tarpaulins to protect walls and other surfaces.
- .11 Cover walls and adjacent work where Products are hoisted or used.
- .12 Use warning signs and barriers and maintain in good order until completion of work.
- .13 Clean off drips and smears of bituminous immediately.
- .14 Dispose of rain water off roof and away from face of building until roof drainage system has been installed and connected.
- .15 At end of each day's work or when stoppage occurs due to inclement weather, protect completed work and Products.

1.6 **SITE CONDITIONS**

- .1 Install roofing on dry deck, free of snow and ice, use only dry Products and apply only during weather that will not introduce moisture into roofing system.
- .2 Apply roofing only when air and surface temperatures are above 4⁰C, have been so for at least 48 hours and are not likely to go below 4⁰C, until work is completed.
- .3 Proceed with work when temperatures are below 4⁰C only with mutual documented agreement between Contractor and Consultant.

1.7 **EXTENDED WARRANTY**

- .1 At completion of this work, provide a signed OIRCA warranty to the Owner covering defects of workmanship for a period of 2 years commencing from date of Substantial Performance. Agree to make good promptly any defects which occur or become apparent within the warranty period in conjunction with the membrane manufacture's warranty. Defects shall include but not be limited to leakage, failure to stay in place, lifting, and deformation.

- .2 At completion of this work, provide a signed warranty from the roofing system manufacturer to the Owner covering defects in workmanship and materials for a period of 10 years commencing from date of Substantial Performance. Warranty shall include vapour retarder, membrane, roof insulation, sloped insulation, and all other products supplied by roofing system manufacturer. Scope of coverage: Repair and/or replace damaged roofing material caused by the ordinary wear and tear of the elements, manufacturing defect, and the workmanship used to install these materials.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, adhesives and primers are to have low VOC content limits.
- .2 Acceptable membrane manufacturers:
 - .1 Henry Company Canada Inc. (Henry)
 - .2 IKO Industries Inc. (IKO)
 - .3 Soprema Waterproofing Inc. (Soprema)
 - .4 Tremco.
- .3 Plywood sheathing: In accordance with Section 06 10 00.
- .4 Vapour retarder: Minimum 0.8 mm thick self adhesive membrane consisting of SBS modified bitumen adhesive bottom and tri-laminated woven polyethylene top with silicone release film. 'Vapour Block SA' by Henry, 'M.V.P.' by IKO, or 'Sopravap'r by Soprema.
- .5 Insulation (tapered and flat):
 - .1 Tapered Insulation: Factory pre-engineered tapered polyisocyanurate insulation in thickness sufficient for slopes indicated; manufactured by Accu-Plane Systems Inc. IKO, Posi-Slope Manufacturing Ltd. or Soprema.
 - .2 Polyisocyanurate insulation: CAN/ULC S704, rigid, closed cell, polyisocyanurate foam insulation integrally laminated to perforated black glass reinforced felt facers, square edges, thickness as indicated on Drawings, use maximum size board possible. Insulation thickness under 50 mm use single layer board. Insulation thickness over 50 mm use two equal thickness boards.
- .6 Overlay board: Bituminous Board; Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners. 1200 x 1500 x 3.2 mm thick; 'IKO Protection Board' by IKO or 'Sopraboard' by Soprema or approved alternate.
- .7 Insulation and overlay board adhesive: Single component polyurethane adhesive as recommended by roof system manufacturer.

- .8 Base sheet membrane and flashing: ASTM D6162, Type 1, Grade S, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven polyester and glass fiber composite reinforcing, having the following minimum characteristics:
 - .1 Thickness: 2.2 mm.
 - .2 Reinforcing fabric weight: 200 g/m².
 - .3 Cold flex: -18 deg. C.
 - .4 Tensile strength: 13 kN/m.
 - .5 Ultimate elongation: 26%.
 - .6 Tensile-tear: 289 N.
 - .7 Bottom and top surfaces: Sanded/Polyethylene.

- .9 Cap sheet membrane and flashing: ASTM D6162, Type 2, Grade G, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven polyester and glass fiber composite reinforcing, having the following minimum characteristics:
 - .1 Thickness: 3.5 mm.
 - .2 Reinforcing fabric weight: 200 g/m².
 - .3 Low temperature flexibility: -27 deg. C.
 - .4 Tensile strength: 13 kN/m.
 - .5 Ultimate elongation: 65%.
 - .6 Bottom and top surfaces: Sanded/Granules.
 - .7 Top surface to provide a minimum initial reflectance of 0.65 and minimum emittance of 0.90 or a 3-year aged SRI value of 64.

- .10 Roof membrane and flashing adhesive: Low pressure, two-component, polyurethane adhesive. Type as recommended by roofing manufacturer.

- .11 Plastic cement: Trowel grade asphalt mastic.

- .12 Roofing nails: Galvanized steel, minimum 19 mm head of length to penetrate wood nailer minimum 19 mm.

- .13 Roof drains: In accordance with Division 22 - Mechanical.

- .14 Stack flashing units: In accordance with Division 22 - Mechanical.

- .15 Reflective Precast Pavers: 610 X 610 x 45 mm thick non-interlocking roof slabs, less than 5% absorption, minimum 55MPa compressive strength, matte finish, chamfered edges, patio quality, conforming to CSA A231.1/A231.2. 'White Solar Reflective' concrete roof slab by armtec Brooklin or approved alternative, providing a minimum initial reflectance of 0.65 and minimum emittance of 0.90 or a 3-year aged SRI value of 64.

- .16 Pedestals: Provide pedestals at each corner of paving slabs to product a level, smooth surface for pedestrian traffic; 'Pave-el' by Envirospec Inc. or approved alternative by Bison.

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- .17 Roof hatch: Preassembled 915 x 762 mm single leaf metal roof scuttle. EPDM rubber gasket adhered to hollow metal cover. Insulation 25 mm thick with metal liner protector. 305 mm high curb with integral flashing and full welded corners. Lifting mechanism will be compression spring operators enclosed in telescopic tubes. Slam latch with interior and exterior turn handles and padlock hasps. 'Type S' by Bilco or approved alternative.
- .18 Solar panels:
- .1 Provide solar panel system having the capacity to deliver 45 kW.
 - .2 Provide all components, accessories and supports as required for complete and secure installation of solar panels.
- 3 Execution
- 3.1 **EXAMINATION**
- .1 Verify condition of previously installed work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- 3.2 **PREPARATION**
- .1 Prior to commencement of work ensure:
- .1 Environmental and Site conditions are suitable for material installation in accordance with manufacturer's recommendations.
 - .2 Decks are sound, straight, smooth, dry, free of oils, grease, snow, ice or frost, and swept clean of dust and debris.
 - .3 Curbs have been built and plywood and lumber nailer plates have been installed.
- .2 Supply to trades concerned in ample time, inserts, reglets and accessories to be built into Work. Assist in setting such items.
- .3 Cooperate with respective trades to determine methods and procedures to ensure watertight junctions to items passing through roof.
- 3.3 **DECK SHEATHING**
- .1 Plywood roof sheathing: Install plywood roof sheathing in accordance with Section 06 10 00 at intended roof systems and reviewed shop drawings.
- 3.4 **VAPOUR RETARDER**
- .1 Prime substrate to manufacturers recommendations.
 - .2 Install vapour retarder in accordance with manufacturers written instructions.

- .3 Lap vapour retarder ends and edges 50 mm minimum. Roll vapour retarder and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .4 Cut and fit vapour retarder as required for passage of protrusions, ensuring continuous adherence to substrate.
- .5 At junction of deck to vertical surfaces and along perimeter of roof deck, extend vapour retarder, set in adhesive, beyond the point where insulation will terminate.
- .6 Seal penetrations, end and side laps, and ends of vapour retarder to substrates and to wall system air/vapour retarder to maintain continuity of building air/vapour retarder system.

3.5 **INSULATION**

- .1 Prior to installation of insulation, examine vapour retarder and make good damage.
- .2 Use full size insulation boards wherever possible, and minimum half boards at abutting vertical surfaces.
- .3 Install insulation promptly to avoid possibility of condensation beneath vapour retarder.
- .4 Install insulation in straight parallel rows, with long dimension parallel to long dimension of roof. Stagger end joints of insulation boards in adjacent rows 50%.
- .5 Place insulation boards in moderately tight contact at joints between boards and abutting surfaces with gaps between boards not exceeding 1.5 mm. Under no circumstances shall the roofing membrane be left unsupported over a space greater than 3 mm.
- .6 When cutting insulation board cut completely through board thickness; do not break or tear insulation board to fit a detail. Any areas of insulation system having voids will be rejected.
- .7 When installing multiple layers of insulation, all joints between layers shall be staggered at least 300 mm.
- .8 Do not lay more insulation than can be completely covered as finished roofing system on the same day.
- .9 Do not cut off insulation in straight lines at the end of a work period, allow stepped boards for tothing-in.
- .10 Install polyisocyanurate insulation in a minimum of two layers.

- .11 Install Polyisocyanurate insulation, in adhesive, in straight parallel rows, with long dimension parallel to long dimensions of roof.
- .12 Install subsequent layers of insulation, in adhesive, in straight parallel rows, with long dimension parallel to previous layer of insulation with joints offset as recommended by insulation manufacturer.
- .13 Install tapered insulation in accordance with manufacturer's details and instructions. Miter roof insulation edges at ridge, valley and other similar non-planar conditions.
- .14 Install overlay board over insulation in straight parallel rows, with long dimension parallel to long dimensions of insulation. Stagger side joints in adjacent rows minimum 50%.

3.6 MEMBRANE INSTALLATION

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Install membrane free of blisters, wrinkles and fishmouths in accordance with membrane manufacturer's instructions. Avoid asphalt seepage at seams in cap sheet greater than 5 mm.
- .3 Base sheet application:
 - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet dry over substrates, align and reroll for both ends.
 - .2 Unroll and install membrane in adhesive, extending base sheet to base of cant. Apply pressure on adhered membrane with 27 kg steel roller.
 - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
 - .4 Provide a smooth application, free of wrinkles, fishmouths or air pockets.
- .4 Cap sheet application:
 - .1 Clean base sheet membrane surface of all construction material, debris, dirt and dust.
 - .2 Unroll and install membrane in adhesive, extending over previously installed base sheet membrane. Apply pressure on adhered membrane with 27 kg steel roller.
 - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
 - .4 End laps are sealed using hot air.
 - .5 Provide a smooth application, free of wrinkles, fishmouths or air pockets.

3.7 FLASHING INSTALLATION

- .1 Install flashing free of blisters, sags, wrinkles and fishmouths in accordance with the manufacturer's recommendations. Avoid asphalt seepage at seams greater than 5 mm.
- .2 Base flashing:
 - .1 Lay base flashings in vertical strips 1000 mm wide to curb surfaces as shown.
 - .2 Extend on to flat roof surface minimum 100 mm from toe of cant.
 - .3 Make 75 mm side laps and 100 mm end laps from laps in base sheet of roof membrane.
 - .4 Install flashings in adhesive directly to substrates, proceeding from bottom to top.
 - .5 Apply uniform pressure over flashing surface and seal seams with rubber roller.
 - .6 Nail top leading edge to nailer at 300 mm o.c.
 - .7 Provide a smooth application, free of wrinkles, fishmouths or air pockets.
- .3 Cap flashing:
 - .1 Clean base sheet flashing surfaces of all construction material, debris, dirt and dust. Apply primer as recommended by roofing manufacturer before applying the cap sheet flashings.
 - .2 Unroll cap flashing and apply firmly with adhesive onto base sheet flashing. Immediately apply firm and deliberate pressure by slowly rolling a manufacturer recommended roller over entire surface of the installed flashing to ensure a complete bond to the substrate.
 - .3 Make 75 mm side laps and 100 mm end laps from cap sheet laps and base flashing laps. Heat or hot-air weld side laps, without overheating, as required for uniform adhesion over surface of base flashing.
 - .4 Provide a smooth application, free of wrinkles, fishmouths or air pockets.

3.8 ROOF ACCESSORIES

- .1 Prior to application of membrane set stack flashing units, roof hatch, prefabricated equipment curbs, and other roof penetration accessory units in accordance with manufacturer's Product data. Install removable cap per accessory manufacturer's Product data as applicable.
- .2 Seal joints at items projecting through membrane watertight to acceptance of Consultant.
- .3 Roof pavers: Install pavers on pedestals, one at each corner, in locations shown butted tightly, maximum 6 mm gap. Adjust or shim up as required to obtain smooth surface transition from slab to slab.

- .4 Solar panels:
 - .1 Install solar panels in accordance with reviewed shop drawings and manufacturer's written instructions.
 - .2 Install system level and secure.

3.9 **FIELD QUALITY CONTROL**

- .1 Check completed membrane welds for continuity after by use of screw driver run along welded seams and showing uninterrupted extrusion of melted asphalt material.
- .2 Inspect completed membrane and flashings for punctures, tears and discontinuous weld seams. Apply additional layer of cap sheet membrane over punctures and tears, extending beyond damaged area or open seam in all directions, adhere in-place.

3.10 **CLEANING**

- .1 Clean roofing, metal, masonry, and similar items of dirt, cuttings, stains and foreign matter upon completion of the work.

END OF SECTION