

Part 1 General**1.1 GENERAL**

- .1 Contractor to provide an original, complete insurance policy identifying specific coverage for torch applied systems.

1.2 RELATED SECTIONS

- .1 Section 06 10 53 – Miscellaneous Rough Carpentry.
- .2 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 08 44 13 – Glazed Aluminum Curtain Walls
- .5 Section 22 05 11 – Plumbing and Drainage.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C1177/C1177M-17, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A123.22-08 (R2018), Self-Adhering Polymer Modified Bituminous Membrane Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .2 CSA A123.23-15 - Product specification for polymer-modified bitumen sheet, prefabricated and reinforced.
 - .3 CSA A231.1-19/A231.2-19, Precast Concrete Paving Slabs / Precast Concrete Pavers.
- .3 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S107-2019, Standard Methods of Fire Tests of Roof Coverings.
 - .2 CAN/ULC-S704.1-2017, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .3 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 COORDINATION

- .1 Coordinate work of this Section with related work specified in other Sections to ensure construction schedule is maintained and water tightness and protection of the building and finished work is maintained at all times.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 System summary:
 - .1 Provide a one page synopsis of each roof type that lists the assembly components in order from top to bottom.
- .3 Product Data:
 - .1 Provide two copies or an electronic copy of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations for all products to be incorporated in the new system.
 - .2 Provide two copies or an electronic copy of WHMIS 2015 Safety Data Sheets to Departmental Representative for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Liquid membrane.
 - .4 Adhesives.
- .4 Provide shop drawings:
 - .1 Indicate sloped insulation layout and details.
 - .2 Provide shop drawing or submittal indicating adhesive pattern specified by adhesive manufacturer for the required wind uplift pressures indicated on the Drawings.

1.7 QUALITY ASSURANCE

- .1 Installer qualifications: Company or person specializing in application of modified bituminous roofing systems with 5 years documented experience, approved by manufacturer. Installer to be members of Ontario Industrial Roofing Contractors Association (OIRCA) and/or Canadian Roofing Contractors' Association (CRCA) in good standing.
- .2 Only certified applicators are permitted to use torch welding equipment.
- .3 Hold a pre-installation meeting prior to the start of roofing works, with the roofing contractor's representative and the Departmental Representative, to review installation conditions particular to this project.

1.8 FIELD QUALITY CONTROL

- .1 Adhesion Testing:

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- .1 If requested by the Departmental Representative, at each roof drainage area, following installation of membrane base sheet, carry out adhesion tests to confirm adhesion of membrane to substrate and substrate layers to each other, down to first mechanically attached layer.
 - .2 Locations and timing of tests will be directed by Departmental Representative. Provide labour and materials as required to assist Departmental Representative in conducting tests.
 - .3 If inadequate adhesion is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Departmental Representative. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 Contractor is to assume all costs of testing and correction.
- .2 Sample Testing:
- .1 If requested by the Departmental Representative, at each roof drainage area, following installation of membrane base sheet, carry out sample tests to confirm materials and installation of roof assembly components. Sample size to be 300 mm x 300 mm.
 - .2 Locations and timing of tests will be directed by Departmental Representative.
 - .3 If inadequate construction is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Departmental Representative. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 Contractor is to assume all costs of testing and correction.

1.9 FIRE PROTECTION

- .1 Fire Extinguishers:
- .1 Pressure rechargeable type with hose and shut-off nozzle,
 - .2 ULC labeled for ABC class protection.
 - .3 ULC labeled for A class protection, for wood, paper and fibreboard.
 - .4 Size 14 kg.
 - .5 Have one fully charged ABC extinguisher and one fully charged Type A extinguisher on roof per torch applicator, within 3 m of the propane source.
- .2 Maintain fire watch for 2 hours after each day's torching operations cease.

1.10 GENERAL REQUIREMENTS

- .1 Comply with the General Requirements, General Instructions and Supplementary Conditions.
- .2 Execute work in accordance with this Section and other related Sections, Drawings and Details.

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- .3 Attach roofing to structure to meet requirements of insurance underwriter and authorities having jurisdiction.
- .4 Regard manufacturer's printed recommendations as minimum requirement for materials, methods and workmanship not otherwise specified.
- .5 Contact the Departmental Representative if the specifications conflict with the manufacturer's recommendations. Otherwise it will be assumed that the Contractor and manufacturer are in agreement with procedures outlined.
- .6 Advise the Departmental Representative of adjustments to specified roofing procedures caused by weather and site conditions. Make adjustment to specified procedures only after review with the Departmental Representative.
- .7 Maintain equipment in good working order to ensure control of roofing operations and protection of work. Types of roofing equipment and laying techniques to be employed are to meet the approval of the Departmental Representative.
- .8 Do not penetrate roof deck with any fastening devices that would do damage or impair the function of the assembly.
- .9 All temporary drains shall be connected with a mechanical connection (MJ coupling) or a U-flow connection, until new drains are installed.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of, sealing compounds, primers and caulking materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.
- .5 Ensure that shelf life of materials has not expired.
- .6 Remove damaged material from site and replace all rejected materials with new product.
- .7 Elevate on raised platform and store as to prevent deformation of materials.
- .8 Provide and maintain dry, off-ground weatherproof storage.
- .9 Store rolls of membrane in upright position. Store membrane rolls with selvage edge up.

- .10 Remove only in quantities required for same day use.
- .11 Place plywood runways over completed Work and over areas not in Contract, as required, to enable movement of material and other traffic.
- .12 Store sealants at +5°C minimum.
- .13 Protect insulation by slitting manufacturer's packaging and installing a waterproof UV-resistant tarp.
- .14 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .15 Avoid stockpiling of materials or use of equipment on decks in a way which could cause overloading.

1.12 ENVIRONMENTAL REQUIREMENTS

- .1 Ensure protection of products that are sensitive to damage by moisture. Do not work during rain, snow or fog. Stop work and make watertight before the onset of inclement weather or when weather appears imminent.
- .2 Ensure protection of the building from weather at all times. If inclement weather is forecast or appears imminent, postpone work that would risk the building from moisture damage.
- .3 If it becomes apparent that work would threaten the building watertightness, the Departmental Representative has the right to stop work. Any additional expenses due to work stoppage or postponement of work will be at the Contractor's expense.
- .4 Ambient Conditions
 - .1 Do not install roofing when ambient temperature remains below -18°C for torch application.
 - .2 Minimum ambient temperature for solvent-based adhesive is -5°C.
- .5 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.13 COMPATIBILITY

- .1 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a complete assembly. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 Defective work resulting from work with incompatible materials will be considered the responsibility of the Contractor.
- .3 Repair all work that could result in damage or interfere with performance.

1.14 EXISTING SUBSTRATES

- .1 Following removal of existing material to the substrate, inspect the deck for soundness and notify the Departmental Representative of any deck found unsound and not suitable for roofing. Do not commence work until conditions are documented and the Departmental Representative rules on the acceptability of surfaces and/or corrective measures required. The cost of any delays due to postponement of work that results from investigating the site problem or obtaining a ruling will be at the Departmental Representative's expense.
- .2 The commencement of work is proof that the Contractor has accepted surfaces as satisfactory and accepts responsibility for appearance and performance of completed work.
- .3 Defective work resulting from application of material on unsatisfactory surfaces will be considered the responsibility of the Contractor.
- .4 The Contractor will be responsible for all repairs, costs and pay all cost and fees required to rectify damage or defective work. Use materials and finish to match the original preconstruction conditions.

1.15 DAILY OPERATIONS

- .1 Unless otherwise specified, complete the entire roofing operation up to line of termination of each day's work, as required by design intent, in order to safeguard and protect the work and building from damage and weather.

1.16 EXAMINATION

- .1 Before proceeding with roofing application, ensure that:
 - .1 All surfaces are clean and free of debris, snow, frost and moisture.
 - .2 The deck is clean and sufficiently dry to ensure specified adhesion will be obtained.
 - .3 Adjacent construction and installation of related work (i.e. curbs, drains, penetrations, wood nailers, etc.) incorporated with the roof are complete.
 - .4 Roof deck is sound, existing fasteners are tight and irregularities are corrected to provide a suitable surface for new roofing.
- .2 Ensure substrate is smooth. Remove sharp edges or protrusions that could impair the function of the roof assembly.
- .3 Inform Departmental Representative in writing of any defects.

1.17 DRAINS AND DRAINAGE PLANE

- .1 Inspect surfaces and ensure that roof deck is level or sloped to drains in conforming to design intent.
- .2 Inspect surfaces and ensure that roof drains are set at a level to drain and are connected or capped.

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- .3 Ensure plumbing is accessible and work can be completed as specified.
- .4 Inspect roof drains to ensure they are open and working properly.
- .5 Where specified or shown for areas with only one drain, provide overflow scuppers or drains to detail and specified requirements.

1.18 EXAMINE UNDERSIDE OF DECK

- .1 Inspect the underside of deck to ensure fasteners will not damage the structure, affect interior surfaces or electrical and mechanical services.

1.19 HIDDEN SERVICES

- .1 Investigate the location of all known hidden services by reviewing interior conditions, plans, specifications and drawings for the original building, any subsequent alterations, completion of cut tests and interviewing those involved in the construction and maintenance of building services. These services include but are not limited to mechanical, electrical, cable, communication, computer, security or roof assembly. Ensure all services are located and will be protected from damage under the Contract. In some cases, services may be located over the roof deck and within the roof assembly. Notify Departmental Representative in such occurrence and proceed with installation as directed.

1.20 EQUIPMENT

- .1 Inspect equipment affected by the work, including but not limited to rooftop equipment, curbs, existing drains and plumbing, mechanical, electrical and lightning protection services, to ensure they are in good repair and working order. Record any damage and advise the Departmental Representative.
- .2 During re-roofing, ensure that all mechanical equipment, ducts, pipes, etc. are properly supported.
- .3 Notify Departmental Representative of any equipment which is not operational or damaged prior to the commencement of work.

1.21 ADVISE DEPARTMENTAL REPRESENTATIVE

- .1 Advise the Departmental Representative of any unusual circumstances affecting the work. Notify the Departmental Representative of any defective or malfunctioning equipment or drainage deficiencies. Do not commence work until defects and incorrect levels have been verified and rectified.

1.22 PROTECTION OF ROOFTOP EQUIPMENT

- .1 Remove any equipment and flashing intended for re-use and save from harm. Store in approved location and reset at project conclusion unless specified or shown to be removed.

- .2 Protect all openings, vents and stacks from weather and contamination from debris.
- .3 Provide temporary plumbers plugs to protect drains during roofing operations. Ensure that temporary protection is removed at completion of work period and/or at the end of each days work.

1.23 SERVICES

- .1 Services are to be left operational unless otherwise authorized by the Departmental Representative.
- .2 Unless otherwise specified, the Contractor will be responsible for disconnection, relocation, re-installation and extending all services required to facilitate work under this Contract. Co-ordinate work with the Departmental Representative and provide minimum of 48 hours notification if services are to be interrupted.
- .3 Contractor to verify location of services prior to commencement of work. Notify Departmental Representative/Departmental Representative of any unusual conditions.
- .4 The Contractor and their employees must hold valid certificates for the work undertaken.
- .5 Complete work of this Section as required by local authorities having jurisdiction. Have work inspected and pay all fees relative to such inspection to ensure work meets with published standards and codes.
- .6 Submit Certificate or Letter of Approval by authority responsible for the work to the Departmental Representative with final documentation.
- .7 All fans, air handling units, and any electrical equipment affected by the replacement of the roof sections under this Section, whether disconnected or extended must be inspected by an ESA representative to verify the integrity of the existing wiring and/or the new installation.

1.24 WARRANTY

- .1 Contractor's Warranty for Labour and Material:
 - .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period is extended to 24 months.
 - .2 Make all necessary repairs and replacements within 48 hours of receipt of written notification.
 - .3 Nothing contained in this Article shall be construed as in any way restricting or limiting the liability in common law and statutory liability of the Contractor.
 - .4 Provide these written warranties, confirming above, issued on the corporate letterhead, signed and sealed by an authorized signing officer. The warranties will specifically reference the name of the Building, location and Departmental Representative.

- .2 Manufacturer's Warranty:
 - .1 Provide a 10-year membrane warranty.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.

2.2 ROOF DECK SHEATHING MATERIALS

- .1 Glass mat gypsum sheathing: Glass mat faced treated core gypsum roof board, for installation over steel deck to ASTM C1177/C1177M. Boards to be 1.2 m x 2.4 m, thickness as indicated, with pre-primed surface.

2.3 PRIMERS

- .1 Asphalt Primer: To manufacturer's recommendations.
- .2 Self-adhesive membrane primer. As recommended by membrane manufacturer. Use low VOC, polymer emulsion-based primer, unless directed otherwise by Departmental Representative on site.

2.4 AIR/VAPOUR BARRIER MEMBRANE

- .1 For concrete decks and torchable gypsum board surfaces:
 - .1 Torch grade modified bituminous air/vapour barrier, to CSA A123.23, with polyester or glass fleece reinforcement, minimum thickness 3 mm, top side sanded.
 - .1 Type A, B or C.
 - .2 Grade 3.
 - .3 Top and bottom surfaces: sanded/polyethylene.

2.5 SELF-ADHERED MEMBRANE

- .1 To CSA A123.22, self-adhering membrane consisting of SBS rubberized asphalt compound laminated to a polyethelene film. Minimum thickness 1 mm.

2.6 MEMBRANE AND MEMBRANE FLASHINGS

- .1 Base sheet membrane and base sheet membrane flashing (non-combustible substrates): To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer polyester or composite polyester/fibreglass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 2.
 - .4 Top and bottom surfaces:

- .1 polyethylene/polyethylene.
- .2 Self-adhesive base sheet membrane flashing (combustible substrates): To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer prefabricated sheet, polyester or composite polyester and glass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 2.
 - .4 Top and bottom surfaces:
 - .1 Polyethylene/release paper.
- .3 Cap sheet membrane and membrane flashing: To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer, prefabricated sheet, polyester or composite polyester/fibreglass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 1, granule surfaced.
 - .1 Colour for granular surface: Gray.
 - .4 Grade 1-standard service.
 - .5 Bottom surface polyethylene.
- .4 Fireguard tape:
 - .1 Modified bituminous membrane supplied in strips, 150 mm wide, 1.6 mm thick, glass fleece reinforced with self-adhesive underside.
 - .2 Provided by membrane manufacturer.

2.7 LIQUID MEMBRANE

- .1 Two-component methacrylate or one component polyurethane/bitumen resin, solid content 80% or greater, compatible with roof membrane.
- .2 Reinforcement mesh: As recommended by liquid membrane manufacturer.

2.8 ADHESIVES

- .1 Adhesive for securing overlay board and insulation: To be fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.
- .2 Acceptable products shall be as recommended by the membrane manufacturer and shall consist of a two part vulcanized black adhesive or a two part urethane foam, specifically developed for adhering insulation and protection boards.

2.9 POLYISOCYANURATE INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704.1, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x

1200 mm. Fibre-reinforced inorganic facers on both major surfaces of the core foam.

2.10 SLOPED INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704.1, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Fibre-reinforced inorganic facers on both major surfaces of the core foam.
- .2 Insulation slopes shall be as indicated on the detailed drawings and roof plans. Modules shall be factory cut to correct slopes.
- .3 Sloped insulation must terminate at 0 thickness. Supply an additional nosing piece if required, factory fabricated of compatible, flame-resistant sloped rigid insulation material, to smoothly terminate sloped insulation at 0 thickness.

2.11 OVERLAY BOARD

- .1 Overlay board: 6 mm thick asphalt based overlay board with non-woven glass facers, as recommended by the membrane manufacturer.

2.12 SEMI-RIGID MINERAL WOOL INSULATION

- .1 Semi-rigid mineral wool, rockwool, or slagwool boards.

2.13 SEALERS

- .1 For sealants, mastic, adhesives or caulk, refer to Section 07 92 00 – Joint Sealants.

2.14 WALKWAY MATERIALS

- .1 One additional ply of cap sheet membrane. Colour to be different from field membrane as selected by Departmental Representative.
- .2 Rubber walkway pad: Heavy duty grade, 1500 mm x 1200 mm or for size as indicated, 19 mm thick, masticated recycled rubber with reinforcement and UV resistant, dimpled surface

2.15 CONCRETE PAVERS

- .1 Concrete pavers: To CSA A231.1, 600 x 600 x 50 mm thick of sizes indicated natural, air entrained precast concrete paving slabs having non-slip finish with 51 mm plain margin around perimeter.

2.16 MEMBRANE FASTENING BAR

- .1 Galvanized sheet steel or extruded aluminum, thickness 1 mm (20 ga.), 38 mm width, supplied in minimum 2.4 m lengths, with pre-drilled 2 mm holes, secured with #14 stainless steel screws @ 150 mm c/c.

2.17 FASTENERS

- .1 Fasteners for gypsum board to steel deck: No. 12 flat head, self-tapping, Type A or AB, cadmium plated screws. Use fastener plates (see below).
- .2 Fasteners for insulation to steel deck: No. 12 or thicker, corrosion resistant, self-drilling, self-tapping, length to penetrate deck maximum of 20 mm, with steel plate washer, FM Global approved. Fastener density as indicated. Fastening to be in pattern as recommended by insulation manufacturer. Use fastener plates (see below).
- .3 Fastener plates: FM Global approved 75 mm hexagonal metal plates, 75 mm hexagonal plastic lock plates.
- .4 Fasteners for exposed metal flashing and cladding to wood or steel: Minimum 38 mm #10 cadmium plated hex head screws, colour matched, with neoprene and steel washers.

2.18 PLUMBING VENTS

- .1 2-piece spun aluminum with integral flange, diameter to suit existing pipe size, equipped with vandal proof cap.

2.19 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage.

2.20 SPLIT FLASHING FOR PIPE PENETRATION

- .1 Fabricated from 0.48 mm (26 ga.) Type 304, stainless steel, 2-piece, with EPDM triple pressure grommet seal around cap and continuous EPDM seals at split junctures of sleeve and deck flange, with stainless steel bolted closure design, size to suit structure, 450 mm in height.

2.21 (GENERATOR) EXHAUST FLASHING

- .1 Cap flashing to be custom made 1.52 mm (16 ga) galvanized metal flashing with welded integral flange.
- .2 Round-to-square storm collar to be fabricated from same material, size to suit pipe diameter and cap flashing flange.
- .3 Mechanical clamp to be worm gear clamp, stainless steel, 13 mm band width, size to suit exhaust pipe.

2.22 B-VENT BASE FLASHING AND STORM COLLAR

- .1 Rain collar to be shop fabricated from 0.61 mm (24 ga.) galvanized sheet, to be same material as base flashing, 100 mm girth, with integral tightening clamp.

2.23 LIGHTNING PROTECTION CONDUCTOR ATTACHMENT

- .1 Components to reinstate lightning protection system shall comply with CAN/CSA B72-M87 Installation Code for Lightning Protection Systems.
- .2 Report system deficiencies in writing prior to commencing roofing demolition phase. Commencement of demolition in the absence of any reported deficiencies will be considered such that the pre-construction conditions met current code requirements.
- .3 Include for all copper/brass base plates, anchorage, straps, rods and connectors to reinstate the lightning protection system to comply with CAN/CSA B72-M87 and provide copy of certification prior to contract close-out.

2.24 ROOF HATCH

- .1 Salvage existing and retain.

2.25 MODULAR CURBS

- .1 Modular curb consisting of polyester forms bonded to the roof surface around the penetration, creating a cavity that is filled with a one-part, non-shrinking sealant creating a unified bond integrated to the penetration.

2.26 DRAINAGE LAYER

- .1 Geotextile composite drainage sheet comprised of a nonwoven filter fabric that is bonded to the individual dimples of a molded polystyrene core to minimize fabric intrusion into the flow channels caused by backfill pressure. CORE thickness ASTM D1777 9 mm minimum and compressive strength ASTM D1621, 719 kPa.

2.27 LIGHTENING CABLE CLIPS

- .1 Factory designed for securing lightening cables - metal base/clip combination anchors designed to be adhered to membrane surfaces. Adhesive shall be weather and UV resistant, as recommended by the membrane manufacturer.

Part 3 Execution**3.1 QUALITY OF WORK**

- .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual.
- .2 Do priming in accordance with manufacturer's written recommendations.

- .3 Fit the interface of all walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.
- .4 Make assembly, component and material connections in consideration of appropriate design loads, with reversible mechanical attachments.
- .5 In the event that any product contains a manufacturing defect or anomaly, the Contractor shall notify the Departmental Representative and manufacturer immediately and request direction.

3.2 REMOVAL OF EXISTING ROOFING

- .1 Remove all roofing, flashing and insulation materials down to deck. Leave existing blocking and parapet construction in place where indicated. Where a built-up air/vapour barrier is present, remove this from the deck unless agreement is otherwise obtained from the Departmental Representative to leave in place.
- .2 Remove existing rooftop equipment where indicated.

3.3 EXAMINATION OF ROOF DECKS

- .1 Verification of Conditions:
 - .1 Inspect with Departmental Representative deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.
- .2 Evaluation and Assessment:
 - .1 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
 - .3 Do not install roofing materials during rain or snowfall or when such weather is imminent.

3.4 MECHANICAL EQUIPMENT DISCONNECTION / MODIFICATION / RECONNECTION

- .1 Perform disconnection, extension, modification, and reconnection of mechanical equipment in accordance with drawings provided. Work shall be performed by a licensed trade sub-contractor. Obtain approval from Departmental Representative prior to making adjustments not scheduled.
- .2 In general, Contractor is responsible for disconnection extension, modification, and reconnection of all operating HVAC equipment in work area. Departmental

Representative is responsible for disconnection (at interior) of those mechanical items indicated for removal by Contractor.

- .3 All mechanical equipment must be properly tagged out of service (especially where gas is present). ESA certificates are required for all mechanical and electrical reconnections.

3.5 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
- .4 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .5 Metal connectors and decking will be treated with rust proofing or galvanization.
- .6 Fit the interface of the walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.

3.6 PRIMING

- .1 Unless otherwise indicated or directed by Departmental Representative, prime all surfaces which will be in direct contact with bituminous materials at the rate of 0.15 L/m² to manufacturer's recommendations, including all pre-primed drywall. For self-adhering membrane, install primer at a rate recommended by manufacturer. Ensure that surfaces are tack-free before proceeding.
- .2 Limit quantity of primer at deck openings and points of termination and provide supplemental protection to prevent bleedthrough to the building interior.
- .3 Roll primer into surface.
- .4 Re-prime all surfaces, including pre-primed surfaces, that become contaminated with dust or become marred due to their exposure to roof traffic or weather.

3.7 INSTALLATION OF GYPSUM BOARD SHEATHING

- .1 Install boards as detailed and specified with primed or top side up.
- .2 Over steel deck, place with long axis of each sheet transverse to steel deck ribs with end joints staggered and fully supported on ribs.
- .3 Cut sheets as required to suit site conditions.
- .4 Butt joints tightly. Use maximum size pieces where possible to reduce joints.

3.8 MECHANICAL FASTENERS FOR SHEATHING (STEEL DECK)

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 In compliance with specified requirements, use mechanical fasteners to secure boards in place.
- .3 Inspect the underside of the deck to ensure fasteners will not be visible, damage the structure or interior surfaces, affect electrical and mechanical services. Fasteners to penetrate top flute of the deck maximum 20 mm.
- .4 Advise Departmental Representative of any unusual circumstances affecting the work. Be responsible and correct all damage caused by work to match existing materials and finish.
- .5 Secure to top flute of steel deck with screws spaced in pattern specified. Use screw-type anti-backout corrosion resistant fasteners with 75 mm metal plates as generally approved or required by the fastener manufacturer.
- .6 Prime all surfaces including metal plates that will be covered with bitumen roofing. Ensure primer is tack-free before proceeding.

3.9 TORCH-APPLIED AIR/VAPOUR BARRIER ON SHEATHING

- .1 Ensure all surfaces to be covered with self-adhering membrane are complete and free of moisture and contaminants and surfaces are above 5°C (40°F). At temperatures below 5°C (40°F) heat materials to be covered with hot air gun. Store all materials in heated storage when temperatures fall below 5°C (40°F) and remove only as much material that can be used before cooling.
- .2 Prime all vertical surfaces to be covered with torch-applied membrane, and horizontal surfaces as required. Use roller application – no spray application permitted. Let primer tack dry and complete thumb test to test set-up.
- .3 Use fireguard tape or overlay board to protect all open joints in substrate and all combustible surfaces.
- .4 Working up slope from drain, install air/vapour barrier membrane using torch methods, true to line to completely cover the area intended to be protected to points shown on the drawing.
- .5 Membrane is to be installed without air blisters and wrinkles. Rework, repair or replace all poorly installed membrane. Do not stretch material that would result in pullback and deformity of the membrane at intersections.
- .6 Lap all side laps 75 mm and end laps 150 mm. Torch all seams to achieve bleedout. At nailable surfaces, secure all membrane on vertical surface at points of termination at 150 mm c/c, using large head roofing nails.
- .7 Turn up membrane 150 mm at edge where horizontal surface meets vertical planes. Lap onto existing surfaces as required to provide continuity of air/vapour

barrier at terminations. Use fireguard tape or overlay board to protect all open joints in deck and all combustible surfaces

- .8 Seal all points of termination at horizontal planes and vertical surfaces with modified sealant. Tool sealant to consistent smooth and even surface.
- .9 Seal all perimeters and penetrations, and ensure drains are operational and prevent backflow, if air/vapour barrier is to be left exposed as an overnight temporary waterproofing.

3.10 INSULATION – BASE LAYER – MECHANICALLY FASTENED

- .1 Attach insulation as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Inspect the underside of the deck to ensure fasteners will not damage the structure, interior surfaces or affect electrical, mechanical, communications, fire alarms or security services.
- .3 Install base insulation layer over air/vapour barrier to specified design intent and thickness. Secure base insulation to existing deck using screw and plate fasteners at the rate indicated. No individual boards shall exceed 100 mm thick and plan fastener length so that none shall penetrate deck top surface by more than 20 mm.
- .4 Fasteners shall engage steel deck in top flute. Use fastener density as indicated on Drawings. Departmental Representative may alter fastening requirements based on field testing. Fastener pattern to be in conformance with requirements of insulation manufacturer for specified number of screws. Use additional fasteners and/or score insulation boards at deck irregularities.
- .5 Butt sheets of insulation with moderate contact. Do not force insulation into place. Cut neatly at projections and points of termination. Replace all broken, damaged or misfit boards as work progresses.

3.11 INSULATION – ALL LAYERS EXCEPT BASE LAYER – ADHESIVE ADHERED

- .1 Attach insulation as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Install insulation layer over base layer to specified design intent and thickness. Secure insulation laid with adhesive, in pattern as per adhesive manufacturer's directions and as indicated. Apply boards before adhesive cures, skims over or loses adhesive qualities.
- .3 Stagger all joints of insulation a minimum 300 mm.
- .4 Stagger both end and side joints between insulation layers.

- .5 Butt sheets of insulation with moderate contact. Do not force insulation into place. Cut neatly at projections and points of termination. Replace all broken, damaged or misfit boards as work progresses.
- .6 Where necessary, back-cut insulation to allow it to conform and stay bonded to irregular surfaces without bridging. Subsequent to placement, walk insulation into place to ensure positive bonding is achieved.

3.12 SLOPED INSULATION

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 At all locations of sloped insulation provide shop drawings from sloped insulation manufacturer for Departmental Representative's review prior to installation.
- .3 At all new and existing drain locations, provide sloped polyisocyanurate insulation sump around drain to promote positive drainage. Total sump size to be as shown on drawings, with maximum depression of 25 mm, unless otherwise indicated.
- .4 Installation methods for sloped insulation to be same as for upper layers of base insulation, using adhesive as specified.
- .5 At the low termination of sloped insulation, when applying overlay board, Contractor shall increase adhesive application by adding 4 additional ribbons at 100 mm spacing at the 13 mm elevation change from tapered to flat insulation, to compensate for the 13 mm elevation change of tapered insulation.

3.13 OVERLAY BOARD

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Adhere overlay board to insulation with adhesive at the rate and pattern specified, as for insulation.
- .3 Place boards in parallel rows with end joints staggered. Tape joints in overlay board with fireguard membrane where combustible surfaces are directly below.
- .4 Where overlay board is specified on nailable vertical surfaces, secure overlay board using large-head roofing nails at 200 mm centres each direction and tape all joints with fireguard tape.

3.14 MODIFIED BITUMINOUS MEMBRANE - GENERAL APPLICATION

- .1 Inspect and seal all substrates to eliminate fire hazard. Use fireguard tape as required or recommended by manufacturer.
- .2 Mechanical spreaders are not permitted to install modified membranes.

- .3 Use only bitumen, sealants, adhesive or mastics as specified by membrane manufacturer. Provide written approval from manufacturer when proposing any alternatives or substitutions.
- .4 Lay out all sheets as to allow them to relax a minimum of 30 minutes. When temperatures are below 4.4°C keep and lay out rolls in heated storage. Install rolls before temperature fallback of the sheet occurs.
- .5 Roof membrane to be installed in one sheet if possible.
- .6 Lay all membrane starting at low point to ensure that seams do not face water flow. Roll all membrane into place, true to line, free of buckles, air pockets, fishmouths and tears.
- .7 Overlap all end laps minimum 150 mm and side laps 75 mm.
- .8 Offset all side laps between plies by 50%.
- .9 Offset all end laps between plies minimum 1200 mm.
- .10 At valley locations, run membrane continuously with the slope of the main roof. Lay out all sheets to ensure minimum side laps are maintained through valley area and short section of roof beyond. At these locations the side laps for the main roof will increase. Install membrane to details and Departmental Representative's direction onsite.
- .11 Ensure that a watertight seal is achieved at all overlaps and points of termination.
- .12 Carry base sheet flashing over face of building as shown on the drawings.
- .13 Carry membrane up all vertical surfaces to point shown. Cut off corners at 45° at end laps to be covered by the next roll prior to installation of following sheet.
- .14 Verify procedure with Departmental Representative on site. Seal fasteners through membrane immediately with Type 'A' sealant.
- .15 Do not walk on membrane during applications and until sufficient cooling has taken place as to allow for traffic without doing damage or marking surface.

3.15 BASE SHEET (TORCH APPLICATION)

- .1 Install 1-ply base sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching.
- .2 Fully torch in place base sheet membrane using proper application techniques as specified by membrane manufacturer.
- .3 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane

application and correct the deficiency before proceeding. Notify Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced.

- .4 Ensure that a watertight seal of all membrane joints and points of termination is achieved with a torch and trowel.
- .5 Terminate base sheet up all verticals 50 mm, secure on vertical with membrane fastening bar and fasteners @ 150 mm c/c.
- .6 Review base membrane for low areas (ponding) and correct with additional base sheet membrane.

3.16 BASE SHEET FLASHINGS (TORCH APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.
- .4 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membrane slowly into fluid bitumen ensuring consistent 6 mm flow protrudes each side of the roll.
- .5 Unroll and work sheet into place using torch, trowel and wet sponge to ensure proper placement and adhesion.
- .6 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced.

3.17 BASE SHEET FLASHINGS (SELF-ADHERED APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Ensure wall or eave surfaces are clean and dry, free of contaminants or other irregularities. Re-prime as necessary.

- .4 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.
- .5 Place sheet into primer or adhesive and press into place using hand roller to ensure uniform adhesion. Use hot air welder on all seams and joints to ensure a waterproof seal on all points of termination. Apply flashings free of air pockets, voids, wrinkles or fishmouths.

3.18 CAP SHEET (TORCH APPLICATION)

- .1 Prior to installation, unroll the cap sheet and check for granular embedment width and alignment.
- .2 Layout membrane to ensure side lap of cap sheet does not occur within 150 mm of roof drain.
- .3 Install specified cap sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching. Offset cap sheet side laps 50% to base sheet side laps, ensure lap does not lie within 150 mm of a roof drain.
- .4 Install 1-ply cap sheet membrane full torched in place using proper application techniques as specified by the membrane manufacturer.
- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membranes slowly into fluid bitumen ensuring consistent 3 mm to 6 mm flow protrudes each side of the roll.
- .6 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced
- .7 Using a torch and trowel, embed granules at end laps and where required on surface of cap sheet to ensure proper bonding of membrane overlaps.

3.19 CAP SHEET FLASHINGS (TORCH APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install base sheet gusset reinforcement at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Cap sheet flashings to extend 150 mm onto roof surface and

terminate as shown in drawings. At wall locations, unless otherwise specified, cap sheet flashings to extend up 50 mm higher than base sheet flashings.

- .4 Where required by Summary of Work and details, install 50 mm wide continuous strip of Type 'A' sealant to the tops of parapets or eaves to prevent bitumen spillage on the building exterior.
- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membrane slowly into fluid bitumen ensuring consistent 6 mm flow protrudes each side of the roll.
- .6 Unroll and work sheet into place using torch, trowel and wet sponge to ensure proper placement and adhesion.
- .7 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Departmental Representative and obtain his approval for proposed repair methods. *Questionable* areas will require to be cut out and replaced.
- .8 Touch up bare spots, corners, scuffs and bleedout runs on cap sheet with granules matching membrane colour, immediately following installation. Use hot air welder, torch or Type 'A' sealant to adhere granules to sheet.

3.20

ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage for plumbing work.
- .2 Install self-adhered membrane air seal around drain and extend onto air/vapour barrier minimum 150 mm.
- .3 Unless otherwise specified or shown, provide prefabricated sump of sloped polyisocyanurate insulation 1200 mm each side of the centre of the drain. Reduce polyisocyanurate insulation thickness to minimum 19 mm at drain to provide positive roof drainage (make allowance for thickness of all flanges and clamps) and ensure water flow will not be impeded.
- .4 Complete roof membrane, installing additional 1 m x 1 m base sheet flashing centred over drain opening.
- .5 Fully coat drain flange to receive roofing with modified sealant and continue modified bitumen over flange. Neatly trim and work membrane to interior face and seal with Type 'A' sealant.
- .6 Set clamping ring in solid bed of Type 'A' sealant. Secure clamp ring and integral screen as dictated by drain design immediately after membrane is installed. Tighten bolts to ensure a permanent watertight compression seal.

- .7 Install and bolt strainers with heavy iron mechanical bracket to ensure the drain screen remains permanently in place to the Departmental Representative's approval.
- .8 Install test plug, water test roof and repair leaks. Remove test plug once complete.
- .9 Restore interior finishes affected by work of this Contract to match original materials and finishes to Departmental Representative's approval. Insulate rainwater leader. pipes as required by Summary of Work in accordance with Section 22 05 11 – Plumbing and Drainage.

3.21 PLUMBING VENTS, B-VENTS, STACKS AND SLEEVES

- .1 Inspect and clean soil pipes of debris to ensure they are operational.
- .2 Protect exposed surface during roofing operation and clean surfaces free of bitumen before leaving site.
- .3 Make all penetrations air and watertight at air/vapour barrier by installing self-adhesive membrane flashings 150 mm onto air/vapour barrier and carry up and around projection. Clamp in place and caulk.
- .4 Trim base sheet at roof projections.
- .5 Adjust existing pipes to new flashing heights by either cutting down or extending pipes with matching materials attached with mechanical couplers. Ensure pipes are 38 mm higher than flashing to allow for sealing to prevent condensation.
- .6 Clear all projections free of contaminants and seal junction of base sheet and roof projections with trowel applications of sealant as shown on drawings.
- .7 Install all metal flanges to be built into the membrane before the installation of cap sheet. Insulate sleeves in accordance with drawings as specified. Where required, install telescoping caps to detail.
- .8 Prime topside and underside of all flanges to be incorporated with roofing prior to application. Use primer supplied by the membrane manufacturer. All primer to be dry before installation of membrane roofing or flashing.
- .9 Before installing flashings, install 1-ply base sheet extending to opening. Set flanges in bed of Type 'A' sealant prior to membrane installation, as per manufacturer's recommendations.
- .10 Install 1-ply of base sheet flashings thermofused to the flange to within 25 mm from upturn and continuing a minimum of 225 mm beyond flange. Continue cap sheet to metal upturn. Seal around upturn junction with sealant and touch up with matching granules, as per manufacturer's recommendations.
- .11 Install rain collars over sleeves and stacks as indicated to match adjoining materials and seal with sealant as indicated on drawings.

3.22 MODULAR CURBS

- .1 Remove all dirt, dust and other contaminants such as, but not limited to, water, ice, oil, grease, animal fat and industrial solvents, away from the application area. Do not use splice wash or gasoline.
- .2 Apply a very thin bead of structural sealant to the outside base of the curb and tool it smooth, making sure to seal all voids and gaps. Apply a bead of pourable sealer over top of the bead of structural sealant.
- .3 With a wire brush and scraper, thoroughly clean and remove all loose roof cement, mastics, coatings, scaled rust and caulking that may be adhered to the penetrations inside the curb. If any fresh roof cement is present, it must be removed completely. Apply structural sealant around the penetration starting at the base of the penetration. Tool smooth around the entire circumference of the penetrations, extending a minimum of 75 mm above the roof surface or beyond the point where any mastics or sealants may have been previously applied. Tool the structural sealant smooth to an approximate thickness of 3 mm.
- .4 Do not use any asphalt primer inside the curb area.
- .5 Apply a bead of structural sealant around the base of all penetrations that are inside the curb. Apply additional structural sealant to the penetrations, starting at the base and extending a minimum of 75 mm above the roof or 13 mm above the point where previous sealants may have been installed. Tool smooth, covering the entire circumference of the penetrations.
- .6 Hold the curved section of the curb "flat side up" and apply a 6 mm bead of structural sealant to the entire bottom perimeter and an additional bead down the center of the curb section. Structural sealant shall also be applied to the scarf joints. Place the freshly treated section into place on the prepared surface and press down firmly.
- .7 Apply structural sealant to the second section (or succeeding sections for large curbs) as described above. Press the sections together and down firmly. Apply additional structural sealant to any voids. Neatly tool any excess that extrudes from the scarf joints.
- .8 When the entire curb is assembled and pressed into place, apply a 6 mm round continuous bead of structural sealant around the outside base of the curb. All joints and seals shall be tooled to a smooth finish. Apply a thin bead of structural sealant to the outside of the curb and tool smooth. An additional bead of pourable sealer should be applied over the structural sealant to ensure proper granule adhesion.
- .9 Maintain 50 mm depth of the sealer inside the entire curb. On pipes extending through a vertical wall, apply the external bead of structural sealant around the outside base perimeter and tool it quickly.
- .10 Fill the entire curb with sealant specified by curb manufacturer. Hand tool the sealant to a metal smooth finish flush with the top of the curb.

3.23 CONCRETE PAVERS

- .1 Install concrete pavers where shown to requirements of Summary of Work, drawings and details.
- .2 Set pavers on rubber protection pad, in turn on walkway membrane cap sheet.

3.24 DRAINAGE LAYER

- .1 Install new drainage layer on curbs adjacent to skylight as indicated on detail drawings. Fold perimeter locations and changes in plane. Adhere sufficiently in place until sheet metal is installed.

3.25 LIQUID MEMBRANE FLASHING

- .1 Using a slow-speed mechanical agitator, thoroughly mix the entire container of resin for two minutes before the addition of catalyst. Pour the resin into a second container if you make a batch mix. Add pre-measured catalyst to the resin component according to the amounts indicated in manufacturer's Catalyst Mixing Chart. Add catalyst only to the amount of material that can be used within 10 to 15 minutes. Stir again for two minutes before applying.
- .2 Apply the first resin layer to the substrate using rollers, brushes or notched squeegees provided for this purpose. The thickness of the first layer must be 1.3 mm to 1.5 mm when wet.
- .3 Lay out the polyester reinforcement on the resin to prevent the formation of wrinkles, swellings or fishmouths.
- .4 Use rollers, brushes or notched squeegees in order to fully saturate resin reinforcement and remove wrinkles and air bubbles under the reinforcement. The appearance of the reinforcement should be slightly opaque without any white trace. It is important to correct these defaults before the resin cures.
- .5 Apply the second resin layer on top of the reinforcement using rollers, brushes or notched squeegees provided for this purpose. The second layer thickness must be 0.6 mm to 0.7 mm when wet.
- .6 Excess resin which is not absorbed should be used to saturate adjacent reinforcement.
- .7 The final resin coating should be smooth and even.
- .8 Each reinforcement shall overlap the previous one by 50 mm laterally and by 100 mm at the ends.

3.26 LIGHTENING CABLE CLIPS

- .1 Locate cable clips at valley locations to match path of preconstruction cable alignment. Surface granules in cap sheet membrane shall be embedded at clip locations to ensure maximum adhesion.

- .2 Clips shall be installed at approximately 1.8 m c/c and embedded in adhesive. Adhesive shall be applied in a liberal fashion to fully accept base and to penetrate up through holes in base plate, ensuring plate is sandwiched in the adhesive.
- .3 Once base plates are fully adhered and set, clip cable into place, ensuring moderate contact without pinching cable.

3.27 CLEAN UP

- .1 At all times, keep the premises free from accumulation of waste materials or rubbish. Stock piling of debris on the roof will not be permitted.
- .2 Repair defects in surface and bitumen runs with granules to match existing to leave the roof in an even consistent finish.
- .3 Leave roof clear of debris and bitumen left by spills and machine tracking.
- .4 Leave grounds and building free of debris and bitumen spread by pedestrian traffic where applicable.
- .5 Clean surfaces and penetrations of all contaminants and touch up to the satisfaction of the Departmental Representative. Include rooftop equipment, curbs, soil stacks, sleeves, gas lines, vents, drains and ladders.
- .6 Check drains to ensure they are functional and where required remove all debris by vacuum.
- .7 At the completion of the work remove all rubbish, tools, equipment and surplus materials.
- .8 Be responsible to repair and pay all costs and fees required to rectify damage caused by work of the Contract with materials and finish to match original.

END OF SECTION

SHEET METAL FLASHING AND TRIM**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 06 10 53 – Miscellaneous Rough Carpentry.
- .2 Section 07 52 00 – Modified Bituminous Membrane Roofing.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-19a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS 2015)
 - .1 Safety Data Sheets (SDS).
- .5 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual – 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit to the Departmental Representative a list of materials intended for use before they are ordered. Submit samples in accordance with Division 01.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitation.
 - .2 Submit copies of WHMIS 2015 SDS - Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit shop drawings for all sheet metal fabrications.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.

SHEET METAL FLASHING AND TRIM

- .3 Submit manufacturer's catalogue cut sheets for manufactured items.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.4 COORDINATION

- .1 Coordinate work of this Section with Related Work specified in other Sections to ensure construction schedule is maintained and watertightness and protection of the building and finished work is maintained at all times.

1.5 EXAMINATION

- .1 Do not commence work until surface to be covered has been inspected.
- .2 Inspect work and advise the Departmental Representative of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepts responsibility for appearances and performance of completed work.
- .4 Repair damaged and inferior work caused by work of this Contract with materials and finish to match original to the Departmental Representative's approval.

1.6 MOCK-UPS

- .1 Submit shop drawings and provide mock-up. Before installing materials, provide a 1200 mm mock-up for skylight flashing profile before fabrication. Cost of mock-up to be included in the Contractor's base bid.
- .2 Mock-up samples to indicate type, colour, size, method of joints, seam, expansion provisions, stiffeners, cleat fasteners and method of sealing joints. Fit mock-up to each applicable roof profile or edge.
- .3 Review mock-up with drawings to ensure design intent can be achieved. Verify all elevations including those with matching materials and sections. Verify that continuity of air seals can be achieved. Verify attachments, methods for securing and strengths to ensure that work can support the anticipated loads and will remain in place against all wind, weather and service condition without warping or deforming.
- .4 Make adjustments to the work that results from a review of the mock-up without additional cost.
- .5 Acceptable mock-ups may be left in place as part of the final product.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

SHEET METAL FLASHING AND TRIM

- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.

Part 2 Products**2.1 GENERAL**

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.

2.2 PREFINISHED SHEET METAL FLASHING

- .1 Pre-finished metal flashings: As shown on drawings, fabricate from 0.65 mm (24 ga.) steel to ASTM A653 Grade 230 with G90 zinc coating. Surface with Perspectra Series baked enamel finish. Colour to match existing from manufacturer's standard colour range.

2.3 ACCESSORIES

- .1 Metal cleat: Same material as metal flashings, 50 mm wide @ 600 mm c/c.
- .2 Continuous metal starter strip: 0.71 mm (24 ga.) galvanized steel, secured at 400 mm c/c.
- .3 Use galvanized, copper, aluminum or stainless steel nails or screws as most compatible with materials and preservatives being utilized.
- .4 Nails: Annular threaded nails of length to penetrate into bases minimum 25 mm. No. 8 screws to penetrate wood 19 mm at 600 mm c/c.
- .5 Masonry fasteners: Spike sized to penetrate concrete 38 mm minimum as specified or shown.
- .6 Exposed fasteners: Where exposed fasteners are specified or as shown, use #10 screws with metal and neoprene washers pre-finished to match colour of flashing. Alternatively, use screws with colour match nylon caps where shown or approved by the Departmental Representative.
- .7 Screws for starter strips and fascia: #8 @ 400 mm c/c.

SHEET METAL FLASHING AND TRIM

- .8 Wedges: Rolled plumber sheet lead.
- .9 Sealant: Refer to Drawings and Section 07 92 00 – Joint Sealants.
- .10 Touch-up paint: As recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable details, as indicated. Where not indicated, follow applicable CRCA 'FL' series details and SMACNA architectural details.
- .2 Metal shall be formed on a bending brake, shaping trimmed and hard seaming shall be done on bench, as far as practicable, with proper sheet metal working tools. Angles of bends and folds for interlocking metal shall be made with full regard to expansion and contraction to avoid buckling and to avoid damaging metal surfaces.
- .3 Fabricate all possible work in shop in maximum 2400 mm lengths by brake forming, bench cutting, drilling and shaping. Match existing profiles where metal flashing is to be repaired.
- .4 Hem exposed edges on underside 13 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Dry joints are to be tight but not dented so as to permit slight adjustments of sheets and yet remain watertight.
- .7 Lock seams at all corners.
- .8 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .9 Supply all accessories required for installation of sheet metal work of this Section. Fabricate accessories of same material to which they will be used.

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SHEET METAL FLASHING INSTALLATION

- .1 Install sheet metal flashings at copings, walls, expansion joints, roof openings and other components required to protect the membrane flashings as shown on the drawings or otherwise required. Where not indicated, follow applicable CRCA 'FL' series details.

SHEET METAL FLASHING AND TRIM

- .2 Install continuous concealed starter strips at all exterior faces. Install cleats between lock joints and as indicated to permanently hold flashing in place. Install hook strip fasteners with 2 fasteners per cleat.
- .3 Sheet metal work shall be installed to cover the entire area it protects and shall be watertight under all service and weather conditions. Install in a uniform manner, true to line, free of dents, warping and distortion.
- .4 Back-paint sheet metal that comes into contact with another kind of metal, masonry or concrete with bituminous paint at the rate of 0.15 L/m².
- .5 Install sheet metal with concealed fasteners at lock joints. Exposed fastening will only be permitted with the approval of the Departmental Representative. When exposed fasteners are shown, space all fasteners evenly in an approved manner. Use lead plugs and screws with neoprene washers where fasteners are exposed, otherwise use concrete drive fasteners where metal flashings are installed over concrete masonry.
- .6 Join sheet metal by "S" lock seams, to permit thermal movement. Seal all fasteners and completely fill all joints with Type 'B' sealant as flashing is being installed. Clean off all excessive visible material subsequent to installation.
- .7 When flashing is being installed in more than one piece, offset joints in adjacent flashings by approximately 50%.
- .8 Form inside and outside corners by means of locked seams. Do not use pop rivets unless accepted by Departmental Representative.
- .9 Slope all metal to interior of roof area to maintain slope, unless otherwise indicated. Do not form open joints or pockets that fail to drain water.

3.3 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment. Remove and replace all sheet metal sections that received surface damage or scratches during fabrication, delivery or installation.
- .2 For scratches and scuffs to be retained in the new installation, use touch up paint recommended by the metal material supplier.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

JOINT SEALANTS**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 06 10 53 – Miscellaneous Rough Carpentry.
- .2 Section 07 52 00 - Modified Bituminous Membrane Roofing.
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .4 Section 08 44 13 – Glazed Aluminum Curtain Walls.
- .5 Section 22 05 11 – Plumbing and Drainage.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS 2015)
 - .1 Safety Data Sheets (SDS).

1.3 COORDINATION

- .1 Coordinate work of this Section with Related Work specified in other Sections to ensure construction schedule is maintained and watertightness and protection of the building and finished work is maintained at all times.

1.4 EXAMINATION

- .1 Do not commence work until surface to be covered has been inspected.
- .2 Inspect work and advise the Departmental Representative of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepts responsibility for appearances and performance of completed work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.6 ENVIRONMENTAL AND SAFETY REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials; and regarding labeling and provision of safety data sheets acceptable to Labour Canada.

JOINT SEALANTS

- .2 Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 In confined spaces provide portable supply of outside air and exhaust fans to ensure fumes will not impact workmen or building occupants.
- .4 Compatibility is essential in use of any materials that will be compatible when incorporated in finished assembly.

Part 2 Products**2.1 MATERIALS**

- .1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.
- .2 Modified bitumen sealant (Sealant Type 'A'):
 - .1 For penetration and terminations of bituminous and modified bituminous membrane: As recommended by membrane manufacturer.
- .3 Urethanes one part (Sealant Type 'B'):
 - .1 Non-sag: To ASTM C920, Type S, Class 25 or higher, use NT.

Type		Use	Movement Capability Class	
S	Single Component	T	Traffic	Class 100/50 100% expansion
M	Multi-Component	NT	Non-traffic	50% compression
Grade		I	Immersed	Class 50 50%
P	Pourable	M	Mortar	Class 35 35%
NS	Non-sag	G	Glass	Class 25 25%
		O	Other	Class 12.5 12.5%

- .4 High temperature sealant (Sealant Type 'C'):
 - .1 One component, low modulus, gun grade, non-sag, moisture-cure polyurethane sealant with UV resistance, designed to cure into a fire rated, elastic weatherproof seal.
- .5 Preformed compressible and non-compressible back-up materials:
 - .1 Backer rod:
 - .1 Polyethylene, urethane, neoprene or vinyl foam closed cell, oversized 30 to 50 %, Shore 'A' hardness 20, tensile strength 140 to 210 kPa.
 - .2 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

JOINT SEALANTS**2.2 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

2.3 PRIMER

- .1 As recommended by sealant manufacturer for specific substrate adhesion.

Part 3 Execution**3.1 PROTECTION**

- .1 Protect installed work of other trades from staining or contamination.

3.2 PREPARATION OF JOINT SURFACES

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful substances including dust, rust, oil, grease and other matter, which may impair work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.3 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.4 APPLICATION

- .1 Sealant - General:
 - .1 Apply sealant when air and substrate temperatures are not forecast to be less than minimum recommended by manufacturer. Do not work during inclement weather. Perform all work in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.

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- .5 Use sufficient pressure to fill voids and joints solid.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets and embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.
- .9 The use of liquid tooling aids, such as soapy water or alcohols, are prohibited as they may impact effective sealant cure, adhesion and potentially cause aesthetic issues.
- .2 Sealant Type 'A':
 - .1 Install sealant Type 'A' to the top of membrane flashings where required or as shown on drawings. Modified sealant to be installed around finished flashings at all protrusions including soil stacks, sleeves, pitch boxes and fasteners securing membrane to walls.
 - .2 Apply sealant Type 'A' with hand trowel to achieve a 25 mm width and minimum 3 mm thickness.
 - .3 Apply sealant Type 'A' immediately after flashings have been installed and are still warm. No membrane flashings shall be left uncovered at the end of any work period. *(Non-compliance with this mandate may result in rejection, removal and replacement of the membrane flashings to the affected area).*
 - .4 Trowel sealant Type 'A' in two directions to ensure proper adhesion to substrate and that all surface irregularities are filled. Tool surface of modified sealant to smooth finish.
 - .5 Install sealant Type 'A' at the underside of drains, metal sleeves and other location where specified on drawings.
- .3 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .4 Install sealant Type 'B' at sheet metal terminations.
- .5 Install sealant Type 'C' at all B-vent collars and at all high temperature locations.

3.5 CLEANING

- .1 Clean adjacent surfaces immediately and leave work neat and clean.
- .2 Remove excess droppings using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.
- .4 Clean all contaminated surfaces to Departmental Representative's acceptance.
- .5 Remove all rubbish and surplus materials from the job site on a daily basis.

JOINT SEALANTS

3.6 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION