## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 02 41 16 – Structure Demolition

.2 Section 06 08 99 – Rough Carpentry for Minor Works

.3 Section 07 62 00 – Sheet Metal Flashing and Trim

.4 Section 07 92 00 – Joint Sealants

### 1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM C726-[05], Standard Specification for Mineral Fiber Roof Insulation Board.

.2 ASTM D41-[05], Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

.3 ASTM D312-[00(2006)], Standard Specification for Asphalt Used in Roofing.

.4 ASTM D1863-[05], Standard Specification for Mineral Aggregate Used on Built-Up Roofs.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-9Ma-[83], Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.

.3 Canadian Standards Association (CSA International)

.1 CSA A123.2-[03], Asphalt-Coated Roofing Sheets.

.2 CSA A123.4-[04], Asphalt for Constructing Built-Up Roof Coverings Waterproofing Systems.

.3 CAN/CSA-ISO 9001-[00], Quality Management Systems - Requirements.

.4 CAN/CSA-ISO 14001-[04], Environmental Management Systems - Requirements with Guidance for Use.

.5 CSA O121-[08], Douglas Fir Plywood.

.6 CSA O151-[04], Canadian Softwood Plywood.

.4 Canadian Roofing Contractors' Association (CRCA)

.1 CRCA Roofing Specifications Manual - 2012.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.2 CAN/ULC-S702.2-[03], Standard for Mineral Fibre Thermal Insulation for Buildings.

.3 CAN/ULC-S704-[03], Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.4 CAN/ULC-S706-[02], Standard for Wood Fibre Thermal Insulation for Buildings.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheets for [bitumen] [roofing felts] [insulation] and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and indicate VOC content for:

.1 Primers.

.2 Asphalt.

.3 Sealers.

.3 Provide shop drawings:

.1 Indicate flashing, tapered insulation details.

.4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

.1 Provide proof that roofing system conforms to CSA A123.21.14.

.2 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens roofing felts, membrane with specification requirements.

.3 Compatibility of materials: submit written declaration to Departmental Representative as described in PART 2, PERFORMANCE CRITERIA.

.5 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.6 Source Quality Control Submittals: provide three copies of roofing materials purchase order as described in DELIVERY, STORAGE AND HANDLING.

.7 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.

.8 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

## 1.4 QUALITY ASSURANCE

.1 Installer qualifications: company or person specializing in application of built-up bituminous roofing systems approved by manufacturer with five (5) documented experience.

.2 Sustainability Standards Certification:

.3 Mock-ups:

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up 10 $m^2$ minimum size showing typical lap joint, one inside corner, one outside corner.

.3 Construct mock-up where directed.

.4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with roofing work.

.5 When accepted, mock-up will demonstrate minimum standard for this work and may remain as part of the finished work.

## 1.5 FIRE PROTECTION

.1 Fire Extinguishers:

.1 Maintain one cartridge operated type with hose and shut-off nozzle.

.2 ULC labelled for A, B and C class protection.

.3 Size 9 kg on roof per torch applicator, within 6 m of torch applicator.

.2 Maintain fire watch for 1 hour after each day's roofing operations cease.

## 1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials in original containers, sealed, with labels intact.

.1 Ensure shelf life of materials has not expired.

.2 Deliver fasteners in boxes or kegs and keep in protective storage until used.

.1 Do not oil or grease fasteners.

.3 Supply three copies of purchase orders to Departmental Representative. Include following data:

.1 Purchase order number.

.2 Supplier's name and address.

.3 Purchaser's name and address.

.4 Contract number and job number.

.5 Material and governing specification including type, grade, colour, class and quantity.

.6 Bills of lading for liquid asphalt showing Equiviscous Temperature (EVT), Flash Point Temperature (FP) and Final Blowing Temperature (FBT).

.7 Shipping instructions.

.8 Destination.

.4 Identification for delivery: indicate on containers or wrappings of and materials:

.1 Manufacturer's name and brand.

.2 Compliance with applicable standard.

.3 [Mass] where applicable.

.3 Storage and Handling Requirements:

.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Store materials on supports to prevent deformation.

.4 Remove only in quantities required for same day use.

.5 Store materials in accordance with manufacturers written instructions.

.6 Store insulation protected from [sunlight] [weather] and deleterious materials exposure.

.7 Remove damaged and rejected materials from site.

.4 Packaging Waste Management: remove for reuse and return by manufacturer in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

## 1.7 SITE CONDITIONS

.1 Ambient Conditions:

.1 Apply built-up bituminous membranes only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

.2 Do not install built-up bituminous membranes when air and substrate temperature remains below 5 degrees C or when wind chill gives equivalent cooling effect.

.3 Install built-up bituminous membranes on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into system.

.2 Ventilation:

.1 Departmental Representative will arrange for ventilation system to be operated during roofing. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and after roofing application.

.1 Run ventilation system 24 hours per day during installation.

.2 Provide continuous ventilation for 7 days after completion of roofing installation.

## 1.8 EXTENDED WARRANTY

.1 For the work of this Section (07 51 00), the 12-month warranty is extended to 24 months.

.2 For all items specified at paragraph 3 of article 2.3 « Performance Criteria », the Contractor, at the Contractor’s expense, must transfer and assign to the Owner and to Canada, the manufacturer’s warranty or guaranty.

## Part 2 Products

### 2.1 PLANT AND EQUIPMENT

.1 Do not use direct fired equipment.

.2 Use only kettles equipped with thermometers or gauges in good working order.

.3 Locate kettles in safe place outside of building or, if approved by Departmental Representative, on non-combustible substrate at location to avoid danger of igniting combustible material below.

.1 When locating kettles, give consideration to direction of prevailing winds, building fans and air handling units to minimize possibility of smoke and fumes entering surrounding occupied buildings.

.2 If wind direction causes smoke and fume problems, relocate kettles on daily basis when directed by Departmental Representative.

.4 Maintain supervision while kettles are in operation and provide metal covers for kettles to smother flames in case of fire.

.1 Provide suitable fire extinguishers.

### 2.2 DESCRIPTION – ROOFING SYSTEM

.1 Cover system for unprotected built-up membrane (exposed, regular) three (3) layers thick of bitumen saturated trilaminate felts. Cold-rolled execution.

### 2.3 PERFORMANCE CRITERIA

.1 Compatibility between components of system and adjacent materials is essential.

.1 Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

.3 The waterproofing membrane products, the built-up sealing strip of the membrane, the cap strips and all other membrane components must have a manufacturer’s warranty of 15 years or more.

### 2.4 VAPOUR RETARDER

.1 Self-adhesive vapour-barrier membrane, polymer-based, thickness 40 mils. Regular membrane for application superior to 4 degree C. 36' x 75' roll.

### 2.5 BITUMEN

.1 Modified bitumen: to ASTM D6511-00.

.1 Asbestos content: None. Test method EPA 600/R-93/116.

.2 Viscosity at 25 degrees C.: 25,000 to 75,000 cPs: ASTM D 2196-86.

.3 Density at 25 degrees C.: 1.0 kg/l (8.4): ASTM D 6511-00.

.4 Non-volatile content: 67%: ASTM D 6511-00.

.5 Minimum bitumen content: 42%: ASTM D 6511-00.

.6 VOC content: 340 g/L: ASTM D 6511-00.

**2.6 FELTS**

.1 Polyester trilaminate felt with a waterproof asphalt-coated fiberglass canvas: to CSA A123.16.

.2 Weight: 38 lb/100 ft2. Test method: ASTM D 5147 - 07b.

.3 Thickness: 55 mils (1, 4mm): ASTM D 5147 - 07b.

.4 Tensile strength at 25 degrees C.: 145 PSI (640 N) MD: ASTM D 5147 - 07b. 135 PSI (600 N) XD: ASTM D 5147 - 07b.

.5 Tear strength at 25 degrees C.: 225 lbf MD and 190 lbf XMD: ASTM D 5147 - 07b.

**2.7 EXPANDED POLYSTYRENE COMPOSITE INSULATION**

.1 Insulation conforming to CAN/CGSB-51.20, type 2, Class 2, thickness as indicated or, as existing.

.1 Uniform thickness insulation

.1 Square edges;

.2 Thermal resistance 0.96 RSI per 25.4mm;

.3 Compressive strength to ASTM D1621; 240 kPa;

.4 Water absorption to ASTM C209: <2.0% by volume;

.5 Water vapour permeance to ASTM E96: 57.5 ng/Pa.s.m2;

.6 Manufactured with no CFCs.

.2 Prefabricated Sloped Insulation : Polystyrene: conforming to CAN/CGSB0-51.20, type 2. Thickness as required by conditions. Panels shall not exceed 200 mm in thickness.

.1 Square edges

.2 Thermal resistance per 25.4 mm: 0.7 RSI

.3 Compressive strength per ASTM D1621: 125 kPa

.4 Water absorption per ASTM D2842: 1.55% by volume

.5 Manufactured without CFC

**2.8 MINERAL FIBRE INSULATION**

.1 Insulation: to ASTM C726, CAN/ULC-S102, 25 mm thickness, maximum size 1219 mm x 1219 mm, with straight edges. Insulating panel, rigid, single density, made from mineral rock wool with one side coated of bitumen.

**2.9 POLYISOCYANURATE INSULATION**

.1 Polyisocyanurate insulation complies with CAN / ULC-S704 Type 3, Class 2, flame spread index below 500, thickness indicated:

.1 Description: polyisocyanurate foam insulation panel with closed cells, laminated on both sides with fiberglass reinforced organic paper.

.2 Uniform thickness insulation as existing.

**2.10 FLEXIBLE FLASHING**

.1 Flexible flashing: Vulcanized rubber membrane: polymer ratio: 30 parts EPDM / 70 parts SBR.

.2 Thickness: 1.14 mm: ASTM D-751.

.3 Weight: 1422 + 15% g/m2: ASTM D-751.

.4 Breaking strength: MD: 37 - GP - 52 M: typical value: 1446N. XMD: 37 - GP - 52 M: typical value: 1288N.

.5 Tear strength: MD: 37 - GP - 52 M: 313N. XMD: 37 - GP - 52 M: 348N.

.6 Flexibility at low temperature: (-40 degrees C): no cracks: 37 - GP - 52 M.

**2.11 FLEXIBLE FLASHING ADHESIVE**

.1 Modified bitumen based polyurethane membrane to adhere flexible flashing.

.2 Elongation at break: 950% (horizontal) & 700% (vertical): ASTM D 412-92.

.3 Recovery after 350 % elongation: 95%: ASTM D 412-92.

.4 Elongation at low temperature (-29 Celsius): 500%: ASTM D 412-92.

**2.12 COLD APPLY ADHESIVE**

.1 Solvent and asbestos free two-component elastomeric urethane adhesive.

.2 Tensile strength: 250 lb/in2 (min): ASTM D-412.

.3 Density: 3.9 kg/liter (8.5 lb/gal): ASTM D-1875.

.4 Adhesion strength: 17 lbf/in (min): ASTM D-903.

.5 Flame-spread rating: 10: ASTM E-84.

**2.13 CARPENTRY**

.1 Refer to Section 06 10 00.01 - Rough Carpentry - Short Form.

**2.14 CANT STRIPS**

.1 Cut from 38 mm thick fibreboard material, to measure 100x100x140 mm on 45º slope.

**2.15 FASTENERS**

.1 Locking tab: aluminium bar, 3 mm (0.12 ") thickness, profile 25 mm (1") wide, pre-punched for mechanical fasteners.

**2.16 ROOF GRAVEL**

.1 Crushed stone or gravel conforming to ASTM D 1863, clean dry cover type, size between 10 and 16 mm. (1/4 "- 5/8"). Must be sifted, crushed, dry, gel, dust or dirt free at time of installation.

**2.17 RUBBER PANELS**

.1 Rubber mat intended to protect roofing membranes from foot traffic. The surface of the panel shall have a hexagonal relief (honeycomb). The underside is composed of longitudinal strips 4 mm large x 3.5 mm deep at a distance of 25 mm to allow for air circulation.

.2 Characteristics:

.1 Shore A Hardness, ASTM D 2240: 70±

.2 Resistance to wear, ASTM D-412: 777 PSI

.3 Maximum extension, ASTM D-412: 160%

.4 Tear resistance, ASTM D-624: 111 lbs/po.

.5 Dimensions: 1220 mm x 1830 mm x 19 mm

**2.18 DRAINS WITH COMPRESSIBLE CONNECTORS OR FLEXIBLE COUPLING**

.1 Copper retrofit drain with vandal-proof cast aluminium screened dome with access hatch and stainless steel heavy duty ballast retainer.

.1 Copper flange 445 mm diameter.

.2 Down pipe 1.651 mm thick copper x diameter to suit existing drain.

.3 Cast aluminium clamping ring.

.4 Proprietary compressible connectors to ensure waterproof seal with existing drain pipe or flexible coupling with new drain pipe.

.5 Provide acceptable separation between dissimilar metals

**2.19 ROOF ACCESSORIES**

.1 Provide products that comply with following requirements:

.1 To CSA B272-93 (prefabricated waterproof roof vent flashing);

.2 Prefabricated sealing box (pitch pocket):

.1 Prefabricated element made of rubber and recycled materials, modular components that fit together to adapt to existing conditions.

.2 Elastomeric polyurethane based sealing products, single component, isocyanate free.

**2.20 MISCELLANEOUS**

.1 Glass-fibre mesh fabric formed of synthetic resin-saturated glass fibres. To 37-GP - 63 M (ONGC).Weight 85 g / m2.

.2 Ironwork: factory pre-stained metal. Size 26, color selected by Departmental Representative.

.3 Liquid membrane: double layer fire-resistant elastomeric polyurethane coating system. Aromatic urethane base coating and aliphatic urethane finish coating. Lengthening of base coating: 450% (ASTM D412) and finishing coating 250% (ASTM D412).

.4 Polyester fabric, 100% stitched, for reinforcement of bilayer membrane joints in a liquid membrane application. Width 10 cm (4 inches).

## Part 3 Execution

### 3.1 QUALITY OF WORK

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

.2 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual, CRCA Roofing Specification Manual, particularly for health and fire safety precautions, and to ULC.

.3 The interface of the walls and roof assemblies will be fitted with durable rigid material sheet metal providing connection point for continuity of air barrier.

.4 Assembly, component and material connections will be made in consideration of appropriate design loads.

.5 Install roofing elements on clean and dry surfaces, in conformance with manufacturer’s instructions and recommendations.

.6 Roofing work must be completed in a continuous fashion as surfaces are readied and weather conditions permit.

.7 Complete all work (temporary supports for equipment and bases, disconnection and connection of equipment as needed, moving and lifting of bases, etc.) required for waterproofing beneath equipment and bases and as shown on drawings; use qualified trade persons as required. Temporary supports for waterproofing beneath mechanical and electrical units must be designed to hold supported loads and distribute these loads to avoid structural damage. Avoid interruption of functioning equipment during roofing. Unavoidable interruptions must be planned with the Departmental Representative and must be scheduled outside normal working hours.

### 3.2 PROTECTION OF IN-PLACE CONDITONS

.1 Cover walls, walks, slopped roofs and adjacent work where materials hoisted or used.

.2 Use warning signs and barriers.

.1 Maintain in good order until completion of work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off substrates and away from face of building until drains or hoppers installed and connected.

.5 Protect from traffic and damage.

.1 Comply with precautions deemed necessary by Departmental Representative.

.6 When transporting materials on roofs and during roof work execution, protect exposed surfaces of the finished work to prevent damage. Put in place walkways made of rigid panels on roofs, over the installed material, to allow the flow of people and goods. Assume full responsibility for any damage.

.7 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.

.8 Install insulation promptly to avoid possibility of condensation beneath vapour retarder.

## 3.3 ROOFING MATERIAL ASSEMBLY REMOVAL

.1 Start demolition of each roof basin assembly at roof drains. Cut a 1 metre x 1 metre opening in roofing assembly, centred over roof drain. Remove existing drain assembly and install a temporary roof drain assembly at deck level. Install a temporary roofing membrane, centred on drain, sealing roof drain flange to deck to ensure a watertight seal. Start demolition of basin roofing assembly after temporary roof drain assembly work has been completed.

.2 Refer to architectural drawings and proceed to remove sealing membrane and support panel by sections, so as to expose roof insulation materials. Leave insulation material in place. Take required precautions to minimize damage to substrate.

.3 Inspect insulating materials to identify spoiled material (wet or damp mass) for replacement. Perform detailed survey of surfaces containing damaged insulation and include information in daily work progress report. Examination of existing conditions must be done in the presence of Departmental Representative.

.4 Do not undertake demolition of roof surface greater than what is possible to waterproof again at the end of a day's work.

## 3.4 SUBSTRATE EXAMINATION

.1 Verification of Conditions: examine substrates and immediately inform of Departmental Representative in writing of defects.

.2 Evaluation and Assessment: prior to beginning of work ensure:

.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.

.2 Curbs have been built.

.3 Drains have been installed at proper elevations relative to finished roof surface.

.4 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

## 3.5 CLEANING DURING WORK

.1 The work site shall be regularly cleared of debris or other hazardous materials that might impede the execution or completion of the work or present a fire hazard.

.2 Cleaning of sub-layers:

.1 Substrates must be clear of dust and grease.

.2 There must not be more than two hours between final cleaning and application of the membrane. If more than two hours passes, surfaces must be re-cleaned.

## 3.6 VAPOUR RETARDER (Repair, restoration of existing vapour retarder)

.1 Torch-apply vapour retarder to substrate in accordance with manufacturer's written recommendations. Dry unroll vapour barrier membrane on substrate for alignment purposes.

.2 Primer should be dry at time of vapour retarder installation.

.3 Roofing vapour-retarder should meet with and overlap air/vapour barrier on adjacent walls to ensure total continuity.

.4 Place vapour retarder on edge of insulation and around each item passing through to ensure joints are sealed to base sheet in vertical surfaces location.

**3.7 INSULATION: FULLY ADHERED, ADHESIVE APPLICATION (Replacement, restoration of existing insulating materials)**

.1 Adhere insulation to laminated vapour barrier with ribbons of solvent-based adhesive.

.2 Place boards in parallel rows and length parallel with slope, with ends staggered, and in firm contact with one another.

.3 Cut end pieces to suit.

**3.8 INSTALLATION OF NEW SURFACE INSULATION**

.1 Install mineral fibre insulation, 25mm (1 " rock wool), following a regular arrangement in order to obtain uniform insulation across the entire roof surface. Cold adhere insulation.

**3.9 CANTS**

.1 Install fibre prefabricated cants over rigid insulation.

.2 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

.3 Install cants as specified. Cold apply adhesive on surface intended to receive cants and drown them firmly by hand, when angle is appropriate, so that rear and lower parts fit perfectly.

**3.10 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION**

.1 Membrane application:

.1 Starting at low point, perpendicular to slope, embed three plies of roofing felts in cold adhesive over surface insulation.

.2 Individually unroll composite felt plies and embed in cold adhesive layer which will be applied at the rate of 2.5 gal/square (10’x10’) between each ply. Leave no surface free of adhesive.

.3 Minimum overlap from a felt to another will be 100 mm (4’’). Be careful to position membrane plies free of wrinkles, tears, air pockets or angles. At each change of direction, overlap between plies will be 915 mm (36’’).

.4 Defects appearing as evident during these various operations will be immediately corrected.

.5 Extend felts up to top of cant strip.

.6 Once built-up membrane and flashing completed, cold apply a layer of bitumen at the rate of about 6 gallons/ square (10’’ x 10’’), followed by neat and clean gravel surfacing as per specifications.

.7 Ensure cast waterproofing layer shows no shortages. If need be, sweep gravel off defective area and cast waterproofing material again.

.8 At end of each working day, seal edges of unfinished membrane. Remove waterproofing system before resuming work.

.2 Flexible flashing application:

.1 Extend flashing at least 150 mm (6'') horizontally over waterproofing membrane. Extend flashing at least 300 mm upwards over vertical surfaces. Attach flashing at centre distance of 200 mm (8 ") and vertical flashing through locking tab. Flexible flashing membrane will be composed of a fold of vulcanized rubber membrane, cold adhered, at rate of approximately 1 gallon/ 25 $ft^2$. Allow solvent to evaporate between 15 to 20 minutes depending on temperature.

.2 Make sure that flexible flashing is in close contact with adhesive to prevent formation of wrinkles or folds. On vertical plane (wall flashing only) of flashing membrane: secure flexible flashing with counterflashing (locking tab) attached mechanically every 305 mm (linear 12'').

.3 Connecting joints: horizontal base of flexible flashing will be secured with a 150 mm (6'') wide nylon membrane strip adhered with sealant recommended by manufacturer. Ensure to completely cover the membrane so as to make it invisible to the naked eye. Apply center to center. Flexible flashing will then be covered with a metal counterflashing, as specified.

.4 Vertical overlap of flexible flashings will be secured with nylon membrane strip of the same type as 150 mm (6'') horizontal connecting joints adhered with sealant.

.3 Gravel surfacing:

.1 Inspect entire area to ensure no wrinkles, buckles or fishmouths exist.

.2 Apply bitumen and gravel surfacing only after placement of roofing felts and membrane flashings.

.3 Aggregates must be dry, frost free.

.4 Protective liquid membrane :

.1 Where existing elastomeric bitumen membrane will remain in place and exposed, or as indicated in drawings and details, install protective liquid membrane, as recommended by manufacturer.

.2 All bilayer membrane overlap joints must be reinforced using a 10 cm (4 in) polyester fabric with a liquid membrane base layer. Apply base layer on all surfaces at a rate of 16 mils or 1 gal/100 ft2 (wet product). Embed polyester fabric in coating so that it covers the roof surface over 10 cm (4 in) and rises at least 20 cm (8 in) above it. Adjacent pieces should overlap by at least 10 cm (4 in). Brush to ensure it adheres and get rid of all voids.

.3 Apply a second liquid membrane base layer at a rate of 24 mils or 1.5 gal./100 ft2 (wet product) over polyester fabric and at least 5 cm (2 in.) over fabric extremities in each direction.

.4 Regular part: apply liquid membrane base layer at a rate of 32 mils or 2 gal/100 ft2 (wet product) over roof surface, including flashings. Leave base layer to cure for at least 24 hrs, then apply liquid membrane finish coat at a rate of 16 mils or 1.5 gal/100 ft2 (wet product). Do not let anyone walk over a finished roof surface except when absolutely necessary and only when curing is complete.

.5 Use required primer if base layer is not covered with a finish coat in the following 48 hours. If this time period is exceeded, apply primer at a rate of 300 to 400 ft2/gal.

## 3.11 WALKWAYS

.1 Install rubber panels that constitute circulation paths in accordance with manufacturer's instructions and according to indications provided by waterproofing membrane manufacturer.

## 3.12 FIELD QUALITY CONTROL

.1 Inspection:

.1 Inspection and testing of BUR application will be carried out by testing laboratory designated by Departmental Representative.

.2 Costs of inspections and tests will be paid by Departmental Representative.

## 3.13 CLEANING

.1 Clean work in accordance with Section 01 74 11 - Cleaning.

.2 Clean to Departmental Representative's approval, soiled surfaces, spatters, and damage caused by work of this Section.

.3 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

.4 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Collect, package and store partly used or unused containers of asphalt, sealing compounds, primers and roofing felts for recycling, and return to recycler in accordance with Waste Management Plan.

.2 Plan and coordinate insulation work to minimize generation waste.

.3 Give preference to suppliers who take back mineral fibre insulation waste for reuse or recycling.

.4 Place used hazardous sealant tubes, adhesive containers and materials defined as hazardous or toxic in designated containers.

.5 Clearly label location of salvaged material's storage areas and provide barriers and security devices.

.6 Ensure emptied containers are sealed and stored safely.

.7 Divert unused aggregate materials from landfill to local quarry or facility for reuse as reviewed by Departmental Representative.

.8 Unused coating material must be disposed of at official hazardous material collections site as reviewed by Departmental Representative.

.9 Unused adhesive, sealant and materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.10 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

.11 Dispose of unused sealant material at official hazardous material collections site approved by Departmental Representative.

.12 Dispose of unused asphalt material at official hazardous material collections site approved by Departmental Representative.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 07 51 00 – Built-up Bituminous Roofing

### 1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A 591/A591M-98, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.

.2 ASTM A 653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-Alloy-Coated (Galvannealed) by Hot-Dip Process

.2 Canadian Roofing Contractors Association (CRCA)

.1 Roofing Specifications Manual 2011 (work quality).

### 1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures .

.2 Product Data:

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Samples:

.1 Submit 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

## Part 2 Products

### 2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: 0.46 mm thickness, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

### 2.2 PREFINISHED STEEL SHEET

.1 VOC content in surface claddings and in products for refinishing prefinished metals sheets must not be greater than 250 g/L.

.2 For work in the present Section, it is possible to use superficial cladding as well as retouching products containing no airborne solvents, formaldehyde,

halogenated solvent, mercury, lead, cadmium, hexavalent chromium and their components.

.3 Prefinished steel with factory applied silicone modified polyester.

.1 Class F1S.

.2 Colour: selected by Departmental Representative from manufacturer's standard range.

.3 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.

.4 Coating thickness: not less than 25 micrometres.

.5 Resistance to accelerated weathering for chalk rating of 8 , colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:

.1 Outdoor exposure period 1000 hours.

.2 Humidity resistance exposure period 1000 hours.

## 2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32

.4 Sealants: Section 07 92 00 – Joint Sealants

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.6 Fasteners: of same material as sheet metal.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.

.9 Fasteners: Use only screws with an acceptable rust-protection coating.

.10 When work pierces the membrane, use only screw-type fasteners.

## 2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.

.2 Staple joints unless otherwise indicated.

.3 Form corner joints with 25 mm overlap.

.4 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.

.5 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

.6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.7 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

**2.5 METAL FLASHINGS**

.1 Form flashings, copings and fascias to profiles indicated.

**2.6 REGLETS AND CAP FLASHINGS**

.1 Form metal cap flashing of sheet metal to be built-in concrete masonry work for base flashings as detailed in accordance with CRCA FL series details, FL .

## 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 INSTALLATION**

.1 Install sheet metal work as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using standing seams forming tight fit over hook strips, as detailed.

.5 Lock end joints and caulk with sealant.

.6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.7 Insert metal flashing into reglets under cap flashing to form weather tight junction.

.8 Seal the inside of the reglets and the counter flashings with waterproofing products.

.9 For works which pierce the membrane, fixtures shall not be removed unless the holes are immediately sealed with appropriate waterproofing sealant for membranes.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 07 51 00 – Built-up Bituminous Roofing

.2 Section 07 62 00 – Sheet Metal Flashing and Trim

### 1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM C919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 ASTM C 920, Elastomeric Joint Sealants, Type 5, Grade NS, Class 25, use T, NT, M, G, A and O.
- .3 ASTM D 412, Standard Test Methods for Vulcanized Kubber and Thermoplastic Elastomers-tension.
- .4 ASTM C 717, Standard terminology of Building Seals and Sealants.
- .5 ASTM C 719, Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
- .6 ASTM C 1193, Standard Guide for Use of Joint Sealants.
- .7 ASTM C 661-98, Standard Test Method for indentation hardness of Elastomeric type sealants by means of a durometer.
- .8 ASTM C 679-03, Standard Test Method for Tack Free time of Elastomeric Sealants
- .9 ASTM C 1248-04, Standard Test Method for Staining of Porous Substrate by joint sealant.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Polymerized Chemically

.3 Department of Justice Canada (Jus)

- .1 Canadian Environmental Protection Act, 1999 (CEPA).

.4 General Services Administration (GSA) - Federal Specifications (FS)

- .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

.6 Transport Canada (TC)

- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

## 1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's product to describe.

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions to include installation instructions for each product used.

## 1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 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.

## 1.5 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.4 Depth of Sealant:

.1 Minimum depth 6 mm, maximum depth 13 mm. Depth of sealant must be 50% of joint for joints of 13 to 25 mm.

.5 Bonding Surfaces;

.1 To be as follows; sealant to bond to only two (2) surfaces, surfaces to be separated by bond breaker or back-up material, each surface to be 6 mm min. to 13 mm max. in width.

## 1.6 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

.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 Environment:

.1 Do not proceed with installation of joint sealants under the following conditions:

.1 Ambient temperature and temperature of substrate exceed manufacturer specified limits or if temperature is les than 4.4°C.

.2 Substrate is humid.

# Part 2 Products

## 2.1 SEALANT MATERIALS

.1 Where sealants are qualified with primers use only these primers.

## 2.2 SEALANT MATERIAL DESIGNATIONS

.1 Silicones, one part: Conform to CAN/CGSB-19.13-M87

.1 Properties:

.1 Maximum tension: 0.70 MPa , ASTM D412

.2 Stretch: 1600% max, AASTM D412

.3 Joint movement:

.1 Expansion +100%

.2 Compression -50%

.3 ASTM C719

.4 Shore-hardness A: 15, ASTM C661

.5 Flow, sag or slump in 76 mm joint: None, ASTM C679

.6 Staining: None, ASTM C1248

.2 Colour to be selected by Departmental Representative.

.2 Preformed Compressible and Non-Compressible back-up materials.

.1 Polyethylene, Urethane, or Neoprene.
  .1 Extruded closed cell foam backer rod.
  .2 Size: oversize 30 to 50 %.
.2 Neoprene or Butyl Rubber.
  .1 Round solid rod, Shore A hardness 70.
.3 High Density Foam.
  .1 Extruded close polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/$m^3$ density, or neoprene foam backer, size as recommended by manufacturer.
.4 Bond Breaker Tape.
  .1 Polyethylene bond breaker tape which will not bond to sealant.

**2.3 JOINT CLEANER**

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

.2 Primer: as recommended by manufacturer.

## Part 3 Execution

**3.1 PROTECTION**

.1 Protect installed Work of other trades from staining or contamination.

**3.2 SURFACE PREPARATION**

.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 matter 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.

.6 Protect cleaned surfaces. Reclean contaminated surfaces, as well as surfaces cleaned more than 2 hours before application of primer or sealant.

**3.3 PRIMING**

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

.3 Avoid excess application so as to minimize wiping of excess.

.4 Apply or wipe primer with clean, soft lint-free cloth. Use each part of the cloth once.

.5 Protect primed surfaces. Reclean and reprime contaminated surfaces, as well as surfaces where working time of primer has been exceeded before application of sealant.

## 3.4 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.

## 3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

.2 Do not exceed pot life or working time.

## 3.6 APPLICATION

.1 Sealant

.1 Apply sealant 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.
.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, 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.

.2 Application Nozzle

.1 Provide custom nozzles as required to achieve acceptable bead sizes and profiles.

.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 Cleanup

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

**END OF SECTION**