

**1. General**

**1.1 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials to Site in their original wrappings with labels intact and store in areas directed by Contract Administrator.
- .2 Store insulation on raised platforms and protect with waterproof covers. Prevent exposure of insulation to UV exposure.
- .3 Store materials inside buildings for 24 hours prior to installation.

**2. Products**

**2.1 MATERIALS**

- .1 New North/South Stud Cavity Wall Insulation: Semi-rigid Glass Fibre boards, Owens Corning #701, un-faced, 16" width, R-4.2 / inch
- .2 Existing North/South Stud Cavity Wall Insulation at access points: Glass fibre batt insulation, CSA A101-M, 17.5 kg/cu.m. (1.1 pcf) density.
- .3 North/South Vestibule Floors (Phase 3 only): CAN/ULC S701 Type 4, extruded polystyrene board insulation, minimum compressive strength of 170 kPa (25 psi) at 10% deformation or yield; square edges; unfaced, Styrofoam Cavitymate Ultra by Dow Chemical of Canada Ltd.
- .4 Adhesive: Compatible to and as recommended by manufacturer of insulating materials.

**3. Execution**

**3.1 PREPARATION**

- .1 Ensure that surfaces to receive adhesive or insulation are dry, firm, straight, and free from loose material, projections, ice, frost, slick, grease, oil or other matter detrimental to bond of the adhesive or uniform bedding of the insulation.
- .2 Maintain surface and ambient temperatures during application and curing of adhesive at a temperature recommended by the manufacturer of the type of adhesive used.

**3.2 Installation - General**

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces as indicated on Drawings.
- .2 Fit insulation tight to electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other projections or openings.

- .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation panels free from ripped backs or chipped or broken edges.
- .4 Install materials in accordance with manufacturer's instructions.
- .5 Do not cover insulation until it has been reviewed by Contract Administrator.

### **3.3 Installation - Insulation**

- .1 Apply adhesives to substrate at rate recommended by manufacturer.
- .2 Fix insulation clip type fasteners on substrate, 2 per 600 mm x 1200 mm (24" x 48") board minimum. Impale insulation board on insulation clips, butting all joints firmly together and secure with washers, cut off spindles 3 mm (1/8") beyond washer.
- .3 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm (6") wide 6 mil polyethylene strip over joint using compatible adhesive prior to application of insulation.
- .4 Provide flexible insulation of equivalent thickness and thermal insulation to fit areas where application of rigid insulation is not possible to provide continuous coverage.
- .5 Installation - Batt Or Roll Insulation
  - .1 Fit batt between framing and press firmly into place. Butt tightly at joints, free of gaps.
  - .2 Insulate behind pipes, ducts, electric conduits and outlets or junction boxes. Cut insulation to fit around and behind obstructions and non-standard spaces.

**END OF SECTION**

## **Part 1 General**

### **1.1 INTENT**

- .1 This section specifies requirements for sprayed polyurethane foam, primarily intended for use as thermal insulation.

### **1.2 WORK INCLUDED**

- .1 Spray-application of polyurethane foam for thermal insulation .

### **1.3 REFERENCES**

- .1 ULC S705.1-01 “Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification (Replaces CGSB 51.23-92)
- .2 ULC S705.2-02 “Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Installation (Replaces CGSB 51.39-92)
- .3 Installer site reference guides “Sprayed Polyurethane Foam – Certified Installer – Level I Manual”, “Sprayed Polyurethane Foam – Certified Installer – Level II Manual”, “Sprayed Polyurethane Foam – Certified Installer – Level III Manual”, “Sprayed Polyurethane Foam – Certified Installer – Level IV Manual”, “Sprayed Polyurethane Foam – Certified Installer – Level V Manual”, distributed by the Canadian Urethane Foam Contractors Association Inc.

### **1.4 SYSTEM DESCRIPTION**

Materials of this section shall provide continuity of thermal insulation at building enclosure in conjunction with other thermal materials as shown.

### **1.5 SYSTEM DESCRIPTION**

- .1 Provide two 300 mm x 300 mm samples of finished product to Contract Administrator.
- .2 Provide the CCMC Evaluation Report and the manufacturer’s documentation confirming material has been evaluated and conforms to the requirements of the CAN/ULC S705.1-01 Material Standard.

- .3 Submit proof of License of the Contractor by CUFCA (Canadian Urethane Foam Contractors Association Inc.) prior to commencing the work. Licensing is required by CAN/ULC S705.2-02 Installation Standard.
- .4 Manufacturers installation instructions: indicate preparation, installation requirements and techniques, product storage and handling criteria, and limitations of the material.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Materials are to be delivered in original containers and packaged with appropriate MSDS and labels.
- .2 The material is to be stored in a safe manner as recommended by the manufacturer, as required by the CAN/ULC S705.2-02 Installation Standard.
- .3 Containers shall be marked as required by the CAN/ULC S705.1-01 Material standard. The "use before" date shall be included on the drum label.
- .4 Empty isocyanate containers are to be decontaminated or removed from site on a daily basis.

## **1.7 ENVIRONMENTAL CONDITIONS**

- .1 Apply spray polyurethane foam when chemical, atmospheric and cavity/surface temperatures are within the limitations required by the CAN/ULC S705.2-02 Installation Standard and as recommended by the manufacturer.

## **1.8 SEQUENCING AND SCHEDULING**

- .1 Co-ordinate this work with the work of all sections referencing this work.
- .2 All foam insulation closures and substrates shall be completed and secure before the work of this section commences.

## **1.9 WARRANTY**

- .1 The work under this section shall be warranted by the contractor against defects in workmanship or material for a period of two years from date of substantial completion.
- .2 Promptly rectify, at the contractors expense, defects or deficiencies that become apparent during the warranty period.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Sprayed polyurethane foam material, when tested, shall meet the requirements of CAN/ULC S705.1-01 Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density, Material- Specification.
- .2 A copy of an Evaluation Report (such as the CCMC Evaluation Report) or copies of the test reports from an SCC (Standards Council of Canada) accredited testing laboratory, for each physical property, indicating that the product meets the requirements of ULC S705.1-01 shall be made available upon request. A copy of either the evaluation report or the test reports shall be on file at the CUFCA office.
- .3 Material containers shall be labeled with the Evaluation Report number of the evaluation agency.
- .4 Design RSI value as indicated in test report; minimum RSI/25 mm: 1.05 (R6/inch).
- .5 Products that meet the preceding requirements:
  - BASF Walltite
  - Demilec / Cornell Heatlok 0240 / Airmetic 0223
  - PFSI Polar Foam 7300

### **2.2 EQUIPMENT**

- .1 The equipment used to spray the polyurethane foam material shall be in accordance with ULC S705.2-02 and the equipment manufacturer's recommendations for specific type of application.
- .2 Equipment settings are to be recorded on the Daily Work Record as required by the CAN/ULC S705.2-02 Installation standard.
- .3 Each proportioner unit to supply only one spray gun.

## **Part 3 Execution**

### **3.1 EQUIPMENT**

- .1 Verify that surfaces and conditions are suitable to accept work as outlined in this section.
- .2 Prior to commencement of work report in writing to the Contract Administrator any defects in surfaces or conditions that may adversely affect the performance of products installed under this section.

- .3 Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

### **3.2 PREPARATION**

#### **.1 PROTECTION**

- .1 Mask and cover adjacent areas to protect from over spray.
- .2 Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
- .3 Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
- .4 Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

#### **.2 SURFACE PREPARATION**

- .1 Surfaces to receive foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
- .2 Ensure that all work by other trades that may penetrate through the thermal insulation is in place and complete.
- .3 Ensure that surface preparation and any primers required conform to the manufacturers instructions.

### **3.3 APPLICATION**

- .1 Spray-application of polyurethane foam shall be performed in accordance with CAN/ULC S705.2-02 and the manufacturers instructions.
- .2 Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the CAN/ULC S705.2 Installation standard.
- .3 Do not install spray polyurethane foam within 75mm of heat emitting devices such as light fixtures and chimneys.
- .4 Finished surface of foam insulation to be free of voids and imbedded foreign objects.
- .5 Remove masking materials and over spray from adjacent areas immediately after

- .6 foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
- .7 Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.

**END OF SECTION**

## **Part 1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 08900 : Aluminum Curtain Walls
- .2 Appendix A : Testing Curtain Wall and Air Barrier Membrane System

### **1.2 QUALITY ASSURANCE**

- .1 Installers: skilled mechanics having minimum five (5) years experience in the Work specified and having an understanding of the design principles of air barrier.
- .2 Installation: maintain continuity of air barrier at interface with adjacent construction and where Work of other Sections project through the air barriers. Allow for expansion and contraction and linear movement of these items.
- .3 Pre-installation meeting: before commencing the Work of this Section, arrange a Site meeting attended by the Contractor of this Section, the Contract Administrator, and the material Manufacturers' qualified representative. Discuss surface conditions, application procedures, suitability of materials and alternative recommendations.

### **1.3 SUBMITTALS**

- .1 Samples: two (2) 150 mm x 150 mm samples of sheet air barriers.

### **1.4 SAMPLE INSTALLATION**

- .1 Provide a one building module representative sample installation on-site at location directed by the Contract Administrator. Include a sample of the condition of the barrier edge at concrete and at metal showing typical fastenings, a barrier to barrier joint and a deflection provision. Modify or replace sample installations as directed to obtain approval. Accepted sample installation shall form the standard for remaining Work and may form part of the Work.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials in factory wrapped rolls with labels indicating Manufacturer and trade name, material type, thickness, roll width and area.
- .2 Protect materials from direct exposure to sunlight and physical damage.

### **1.6 COORDINATION**

- .1 Coordinate installation of sheet air-vapour barrier with Work of other Sections to achieve an air and vapour tight building envelope.



## Part 2 Products

### 2.1 MATERIALS

- .1 Air/vapour barrier membrane: 1 mm thick modified bituminous composite sheet, Perm-A-Barrier by W.R. Grace Co. of Canada Ltd., Blueskin SA by Bakor Inc., Air-Shield by WP Meadows, or Sopraseal Stick 1100 by Soprema, complete with primer, mastic and liquid membrane as required.

## Part 3 Execution

### 3.1 INSTALLATION - AIR/VAPOUR BARRIER MEMBRANE

- .1 Install the membrane in strict accordance with the Manufacturer's written instructions and the representative's on-site instructions.
- .2 Ensure complete coverage of and adhesion to all substrate to receive the air/vapour barrier membrane, including all wall protrusions. Extend membrane 150 mm below sill plates at foundation walls. Cooperate with other Sections to ensure continuity of the barrier.
- .3 Apply the membrane to primed substrate in 2400 mm lengths or as recommended by the membrane Manufacturer.
- .4 Apply membrane so that horizontal joints overlap with the upper sheet over the lower sheet, shingle style. Lap all horizontal joints minimum 50 mm all side joints minimum 64 mm and all end joints minimum 150 mm. Stagger vertical joints to avoid four way joints.
- .5 Apply a trowelled head of mastic to all terminations of the membrane at the end of a day's Work and at membrane terminations.
- .6 Reinforce all inside and outside corners with a continuous 300 mm wide sheet membrane prior to installing the air/vapour barrier.
- .7 Fill gaps and joints with liquid membrane and reinforce with a continuous 300 mm wide sheet membrane prior to installing the air/vapour barrier.
- .8 Use liquid membrane at all protrusions and difficult detail areas and provide a minimum 64 mm overlap with the sheet membrane.
- .9 Apply air/vapour barrier so that the exterior wall is air tight, with air tight junctures at openings, penetrations and edges.
- .10 Inspect air/vapour barrier for continuity immediately prior to installation of insulation. Do not cover the air/vapour barrier until it has been inspected the Contract Administrator.
- .11 Repair punctures, rips and tears with pieces of membrane completely adhered to the damaged membrane.
- .12 Where punctures and tears are extensive, replace entire damaged section.
- .13 Install membrane over doors, windows and other openings to exterior walls.

- .14 At openings, extend membrane 200 mm beyond jambs, heads and sills.
- .15 Use mastic or fixing bars to adhere membrane to windows, doors etc. to maintain continuity of the barrier.

### **3.2 INSPECTION**

- .1 Do not cover any portion of the air-vapour barrier until it has been inspected by the Contract Administrator or by an Inspector.

**END OF SECTION**

**Part 1            General**

**1.1                SYSTEM DESCRIPTION**

- .1      Concrete Deck: 2 ply SBS modified bituminous sheet roofing work, including but not limited to following:
  - .1      Concrete deck.
  - .2      Vapour barrier.
  - .3      Roof insulation.
  - .4      Tapered insulation
  - .5      Insulation overlayment.
  - .6      Base sheet membrane.
  - .7      Cap sheet membrane.
  - .8      Base and cap sheet flashings.

**1.2                SUBMITTALS**

- .1      Shop Drawings: Reviewed and signed by manufacturer's technical representative, showing method of installation and layout of each layer, fastening and flashings at edges, flashing of protrusions and penetrations, connection to air barrier in wall, details of insulation, tapered insulation layouts and vapour barrier.
- .2      Maintenance Data: Provide necessary maintenance data and repair instructions, recommendations for periodic inspections, care and maintenance. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.

**1.3                QUALITY ASSURANCE**

- .1      Perform work using skilled and experienced roofing mechanics fully conversant with standards, methods and techniques required for installation of roofing system specified herein. Ensure roofer is qualified and approved by membrane manufacturer.
- .2      Conform to Canadian Roof Contractor's Association (CRCA) Specification Manual as amended to date of this Specification, as applicable, except where indicated or specified otherwise.
- .3      Pre-installation meeting: Two weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the Site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Contract Administrator of the date and time of the meeting.
- .4      Manufacturer's Site inspection: Have the manufacturer's technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit Manufacturer's inspection reports and verification that the work of this Section is correctly installed.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver and store materials in dry location, in original containers with Manufacturer's wrappers and seals intact.
- .2 Keep membrane materials dry, stored in rolls standing on end, selvage edge up, elevated from contact with moisture, at temperatures not less than 5°C or more than 49°C. Handle rolls with care to avoid crushing, puncturing or other damage. Ensure selvage edge is not damaged during handling and banding strips are removed before application of membrane. Do not use wet or damp membrane.
- .3 Do not expose insulation and sheathing to wet weather. Store and handle insulation to prevent broken edges and corners, punctures, indentations or other damage. Remove damaged insulation from Site.
- .4 Protect sheet metal materials from bending and scratching.
- .5 Store adhesive, sealants and primers between 15°C and 26°C, or restore to temperature ranges before use.
- .6 Store combustible materials away from heat and open flames.

#### **1.5 WARRANTY**

- .1 Provide membrane Manufacturer's ten year non-prorated material, labour and workmanship warranty, commencing from date of Substantial Performance, covering defects and deficiencies and weathertightness of complete roof and flashing system.

### **Part 2 Products**

#### **2.1 MATERIALS - ROOF AND FLASHING**

- .1 Roofing and Flashing Base Sheet Membrane: CGSB 37-GP-56M, Type 2, Class C, Grade 1 or 2, minimum 3.0 mm ( $\frac{1}{8}$ " thick, non-woven polyester reinforcement and thermofusible elastomeric asphalt, thermofusible plastic film top and bottom face, applied by torching only, Sopralene Flam 180 by Soprema Waterproofing Inc., ModifiedPlus NP180P/P by Bakor Inc., or Torchflex TP-180-FF-Base by IKO Industries Ltd.
- .2 Roofing and Flashing Cap Sheet Membrane: CGSB 37-GP-56M, Type 1, Class A, Grade 2, minimum 3.5 mm (0.138") thick, non-woven 250 g/m<sup>2</sup> polyester reinforcement and thermofusible elastomeric asphalt, coloured ceramic or mineral granules top face and thermofusible plastic film bottom face, applied by torching only, Sopralene Flam 250Gr by Soprema Waterproofing Inc., ModifiedPlus NP250gT4 by Bakor Inc., or Torchflex TP-250-Cap by IKO Industries Ltd. Standard colour ceramic or mineral granules.
- .3 Parapet and Flashing Base Sheet Membrane: CGSB 37-GP-56M, Type 1, Class A, Grade 2, minimum 2.5 mm (0.098") thick, non-woven 180 g/m<sup>2</sup> polyester reinforcement and thermofusible plastic film top face and self-adhesive bottom face, Sopralene Flam Stick by Soprema Waterproofing Inc., or IKO Armourbond Flash.
- .4 Roof Walkways: CGSB 37-GP-56M, Type 1, Class A, Grade 2, be minimum 3.5 mm (0.138") thick, non-woven 250 g/m<sup>2</sup> polyester reinforcement and thermofusible

elastomeric asphalt, coloured ceramic or mineral granules top face and thermofusible plastic film bottom face, and be applied by torching only, Sopralene Flam 250Gr by Soprema Waterproofing Inc., or ModifiedPlus NP250gT4 by Bakor Inc., or Torchflex TP-250-Cap by IKO Industries Ltd. Standard colour ceramic or mineral granules.

## **2.2 MATERIALS - INSULATION**

- .1 Roof Insulation: CAN/ULC S-701 Type 3, expanded, extruded polystyrene board insulation, ship lapped edges, unfaced, Deckmate Plus by Dow Chemical Canada Inc.
- .2 Tapered Insulation: CAN/ULC S701, Type 2; CFC and HCFC free, unfaced expanded polystyrene insulation, maximum length and width, square edge, taper cut to provide slopes indicated, on computer controlled machine, and sequence packed with detailed installation instruction, or hand-shaven as required, minimum 13 mm(<sup>1</sup>/<sub>2</sub>" ) thick.
- .3 Insulation Overlayment: 6 mm (<sup>1</sup>/<sub>4</sub>" ) thick board, mineral filled asphalt core between glass fiber facers, Re-Cover Board by Bakor, Sopraboard by Soprema or Protectoboard by IKO.
- .4 Insulation adhesive: As recommended by insulation manufacturer.

## **2.3 MATERIALS – METAL FLASHING**

- .1 Sheet Metal: Minimum 0.49 mm (26 ga) overall thickness, galvanized to ASTM A653 Z275 zinc coating, commercial quality sheet, stretcher levelled or temper rolled to stretcher level standard of flatness. Prepaint work in Baycoat Metallic series, colour to match metal cladding.
- .2 Aluminium Flashing And Trim Sheet Metal: Prefinished aluminium, 0.8 mm base metal thickness, colour to match aluminium panels.
- .3 Cleats and Starter Strips: Same as specified sheet metal, unless indicated otherwise, make cleats at least 38 mm (1 <sup>1</sup>/<sub>2</sub>" ) wide and interlocked with metal flashing.
- .4 Flashing Fasteners: CSA B111 Table 12, finished to match metal being fastened where exposed to view. Size and type to suit requirements.
- .5 Sealant: CAN/CGSB-19.13-M, Class M-2-25-B-N, one component polyurethane, or manufacturer's approved products.

## **2.4 MATERIALS - ACCESSORIES**

- .1 Asphalt primer: CGSB 37-GP-9Ma or as approved by manufacturer.
- .2 Asphalt: CSA A123.4-M; Type 2 or Type 3.
- .3 Vapour Retarder: CSA A123.3-M, No. 15 perforated, organic type felt.

### **Part 3 Execution**

#### **3.1 INSPECTION**

- .1 Report any defects or irregularities in roof deck detrimental to roof application. Do not proceed until corrected.
- .2 Allow concrete deck to cure for minimum thirty (30) days before placement of any roofing materials.
- .3 Check deck is properly installed in compliance with latest CRCA recommendations and specifications, with required slopes to attain positive drainage and drains are connected.
- .4 Ensure openings, walls and projections through deck are completed and affixed and reglets and nailing strips are in place prior to membrane installation. Cooperate with mechanical and/or electrical divisions as necessary.
- .5 Ensure deck substrate scheduled to receive roof system is smooth, dry, clean and free of sharp projections.

#### **3.2 PREPARATION**

- .1 Sweep roof surfaces clean, remove debris, water, dew, frost, snow, ice and foreign materials (oil/grease) which could impair work.
- .2 Do not use salt or calcium to remove ice or snow.
- .3 Do no roofing work during rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost, snow and similar detrimental conditions.

#### **3.3 PROTECTION**

- .1 Protect adjacent work, building and property, existing and completed portion of roof, from damage during roofing operations, including interior of building.
- .2 Hang tarpaulins to protect walls where hoisting is necessary. Locate kettles so smoke will not discolour building or adjacent buildings or enter air intakes. Keep masonry and finished surfaces clean and free of bitumen.
- .3 Use wood planks or minimum 9 mm ( $\frac{3}{8}$ " ) thick plywood sheathing in work areas and along work routes as required to prevent damage to sheathing and roofing.
- .4 Keep two foam or dry type fire extinguishers on roof within easy access of torching application and in any open flame location while roofing is in progress.
- .5 Verify no vent pipes venting flammable fumes (i.e. fuel storage tanks) are located in area of work.
- .6 Do not have gasoline or other flammable solvents on roof while torching.
- .7 Install temporary blocking and/or otherwise protect drains during roofing operations. Remove at completion of roofing work.
- .8 At conclusion of each day's work, seal exposed edges of roof insulation. Remove when resuming work.

**Phase 2**

- .9 Do not torch over or near flammable substrates such as fibreboard.

**3.4 COLD WEATHER APPLICATION**

- .1 Remove moisture from substrate before application of membrane.
- .2 Daily weather forecasts shall be followed to determine commencement of work or to anticipate possible suspension.
- .3 At temperatures below 10°C, store membrane material in warm and dry storage until ready to use. Bring out to work area only enough rolls for immediate use.
- .4 Unroll membrane and allow roll to relax in sunlight for 30 to 45 minutes before application. Reroll from both ends and apply in both directions.
- .5 Maintain mopping temperatures of asphalt at minimum 204°C. Limit mop strokes to 1200 mm (48") ahead of roll.
- .6 Before starting mop stroke, pull roll tightly against cooled asphalt, so as to eliminate any air pockets or voids that may have occurred during previous mop stroke.

**3.5 INSTALLATION**

- .1 General: Use only roofing equipment approved by manufacturer of roofing membrane system.

**3.6 INSTALLATION - PRIMER**

- .1 Prime concrete deck with asphalt primer in manner approved by primer manufacturer, at minimum rate of 0.50 l/m<sup>2</sup> (1 gal/300 ft<sup>2</sup>).
- .2 Apply primer to surfaces to which membrane or vapour barrier shall be adhered to directly. Allow primer to cure. Do not allow ponding.

**3.7 BITUMEN**

- .1 Heat asphalt in accordance with manufacturer's directions. Never heat asphalt to or above Flash Point (FP) indicated by manufacturer, but in any case do not heat asphalt to or above 260°C.
- .2 Do not apply at temperature lower than EVT (Equiviscous Temperature). Restrain asphalt temperature at point of application to EVT plus/minus 15°C.
- .3 Do not heat and hold asphalt above Finish Blowing Temperature (FBT) for more than 4 hours.
- .4 Use heating kettles equipped with thermometers which continually show temperature of asphalt. Equip foreman with portable stem thermometer for checking temperature at point of application.
- .5 Roofing Asphalt: Type 2 for slopes up to 1:16 and Type 3 for slopes greater than 1:16.

**Phase 2**

**3.8 VAPOUR RETARDER**

- .1 General: Install vapour retarder full coverage and continuously, overlapped and sealed to adjacent air/vapour barrier at top of parapets and curbs to ensure continuity of building envelope.
- .2 Mop prime deck with uniform and continuous coating of asphalt. Roll felt in hot mopped asphalt, lapping each sheet 480 mm (19") over preceding sheet and mopping full 480 mm (19") under each lap leaving no area unmopped. Use 1.2 kg/m<sup>2</sup> (25 lb/sq) of asphalt per ply. Seal lap joints.

**3.9 INSTALLATION - INSULATION**

- .1 Before laying any insulation, inspect vapour barrier and repair damage, if any. Ensure surface is free of wrinkles, air pockets, fishmouths or tears.
- .2 Over vapour barrier apply full mopping of asphalt at minimum rate of 1.0 kg/m<sup>2</sup> (20 lb/sq) and embed insulation.
- .3 Lay roof insulation in hot asphalt. Bring each board into moderate contact with adjacent boards and do not force into place.
- .4 Cover entire area of base insulation with tapered insulation. Lay in accordance with manufacturer of tapered insulation's shop drawings, with joints staggered from insulation joints. Lay each layer in full mopping of hot asphalt. Tape joints in top layer of insulation.
- .5 Cover entire area of tapered insulation with overlayment. Stagger joints of lower overlayment to those of tapered insulation. Stagger joints upper overlayment to those of lower overlayment. Lay work in full mopping of asphalt.
- .6 Where insulation and overlayment abut irregular surface, scribe to profile thereof, elsewhere cut insulation square and neatly to provide plain butt joints at perimeter of insulation, at curbs and other vertical objects and surfaces.
- .7 Lay only as much roof insulation and overlayment that can be covered on same day with roofing membrane. At conclusion of day's work, seal exposed edges. Upon resumption of work, cut and remove sealed edges, square, neat and straight.
- .8 Reduce thickness of insulation at drains by 13 mm (1/2") for 1200 mm (48") square centred on each drain to ensure free flow to drain.
- .9 Keep insulation, tapered insulation and insulation overlay dry at all times.

**3.10 BASE SHEET MEMBRANE**

- .1 Ensure membrane substrate is rigid, dry, smooth, compatible, free of fins and sharp edges, and clean of debris and foreign matter and no moisture is present on substrate at time of application of membrane.
- .2 Start roofing application at lowest point of roof (edge or drain) to ensure water flows over laps of membrane. Proceed up slope at right angles to direction of flow.



- .3 Position and unroll membrane to achieve correct overlap and alignment with roof line. Re-roll one end minimum 3000 mm (10') and adhere to substrate. Complete application of remainder of sheet.
- .4 Torch weld base sheet membrane by sufficiently heating lower surface of membrane evenly across width of roll to melt lower surface and provide flow of bitumen. At same time unroll roofing membrane into melted bitumen. Keep checking adhesion to be certain asphalt is hot enough. Take care and inspect so heating is even across width to avoid skips or voids.
- .5 Lay base sheet with 75 mm (3") side laps and 150 mm (6") end laps.
- .6 Flow out bead shall be present at all locations along lap edges. Avoid excessive asphalt seepage. Maximum seepage allowed 6 mm ( $\frac{1}{4}$ ").
- .7 At walls and vertical surfaces, extend membrane minimum 50 mm (2") on vertical surface and nailed at 300 mm (12") on centres.

### **3.11 BASE SHEET FLASHINGS**

- .1 Apply base sheet flashing over dried and cured primer coat.
- .2 Pre-cut flashing in strips 1 m (39") wide to correct length to extend minimum 100 mm (4") onto field of roof, up vertical surface and over any fascia minimum 50 mm (2"). Side laps shall be 75 mm (3") and staggered minimum of 100 mm (4") with laps of base sheet. Dry fit pieces to proper size.
- .3 Provide base flashing reinforcements at stress points of roof, at inside and outside corners, vents, drains and mechanical units. Install as detailed on Drawings or follow membrane manufacturer's recommendations.
- .4 Provide base flashings at roof protrusions such as vents pipes, roof drains, mechanical equipment curbs. Install as detailed on Drawings.
- .5 Torch apply base sheet flashing directly on its support from bottom to top. Torch welding shall soften under side of base sheet without overheating, resulting in uniform adhesion over entire surface. Take precaution not to stretch membrane. When allowed by support, nail top edge of base sheet flashing 300 mm (12") oc.

### **3.12 CAP SHEET MEMBRANE**

- .1 Do not apply cap sheet until base sheet and flashing have been applied and show no sign of defects.
- .2 Plan cap sheet application so side and end laps are offset from those of base sheet minimum 300 mm (12") for side and 450 mm (18") for end laps. Mark chalk line, centred on base sheets, where first course is to start. Unroll 2 m to 3 m (6' to 9') of membrane and line it up to chalk lines or to selvage edge. If roll goes out of line by more than 13 mm ( $\frac{1}{2}$ "), cut and re-align. Re-roll from both ends and apply in both directions.
- .3 Lay cap sheet with 75 mm (3") side laps to cover selvage edge and 150 mm (6") end laps.
- .4 Commence application of cap sheet with 1 m (39") square of cap sheet centred on each drain and torched down.

- .5 Apply one ply of cap sheet granule side up. Position and unroll cap sheet to achieve correct overlap and alignment. Re-roll one end minimum 3000 mm (10') and adhere to substrate. Complete application of remainder of sheet. Torch weld by sufficiently heating lower surface of membrane evenly across width of roll to melt lower surface and provide flow of bitumen. At same time unroll roofing membrane into melted bitumen. Keep checking adhesion to be certain asphalt is hot enough. Take care and inspect so heating is even across width to avoid skips or voids. Install cap sheet in same direction as base sheet.
- .6 Flow out bead shall be present at all locations along lap edges. Avoid excessive asphalt seepage. Maximum seepage allowed 6 mm ( $\frac{1}{4}$ ").
- .7 Take great care to ensure asphalt does not spread out over exposed part of cap sheet.
- .8 Factory provided granules shall be applied to overflow bitumen at lap before bitumen cools to provide clean appearance.
- .9 Bevel "T" joints at end or head laps and repair fishmouths using torch heated trowel.
- .10 Cut out drain opening after drain clamps have been installed.

### **3.13 CAP SHEET FLASHINGS**

- .1 Pre-cut flashing in strips 1 m (39") wide to correct length to extend minimum 150 mm (6") onto field of roof, up vertical surface and over any fascia minimum 50 mm (2"). Side laps shall be 75 mm (3") and staggered minimum of 100 mm (4") with laps of base sheet. Dry fit pieces to proper size.
- .2 Using chalk line, lay out straight line on cap sheet surface, parallel to roof edge, 150 mm (6") inside roof from parapet wall.
- .3 Soften bitumen by heating mineral surface with torch. When granules start to sink into bitumen, stop torching with hot round nosed trowel, embed granules in bitumen from chalk line to edge of cap sheet.
- .4 Torch apply cap sheet completely covering base sheet, lapping edges to selvage. Torch welding shall soften under side of base sheet without overheating, resulting in uniform adhesion over entire surface. Press in firmly for proper adhesion. Continue by bonding upper portion to wall, taking precautions not to stretch membrane.
- .5 Anchor, with tin capped nails or roofing nails and disks or membrane manufacturer's recommended fasteners placed at top of flashing and driven into wood backing.
- .6 Flow out bead shall be present at all locations along lap edges. Avoid excessive asphalt seepage. Maximum seepage allowed 6 mm ( $\frac{1}{4}$ ").
- .7 Take great care to ensure asphalt does not spread out over exposed part of cap sheet flashing.
- .8 Factory provided granules shall be applied to overflow bitumen at lap before bitumen cools to provide clean appearance.

### 3.14 SHEET METAL WORK

- .1 Do not install metal flashings until membrane flashings have been reviewed by Contract Administrator.
- .2 Take delivery of pre-painted flashings supplied by others.
- .3 Prime metal flashings with asphalt primer.
- .4 Double back exposed edges at least 13 mm ( $\frac{1}{2}$ ") for appearance and stiffness.
- .5 Provide continuous starter strips to present true, leading edge. Anchor to backup to provide rigid, secure installation. Conceal fastening.
- .6 Counterflash modified bitumen flashings as indicated. Dovetail, mitre corners.
- .7 Use slip expansion seams. Make joints to permit thermal movement. Make surfaces free from buckling, warp, wave, dents, oil canning or other defects. Make corners square and surfaces straight and in true planes. Equally space joints in any one run of flashing to suit building module or window spacing and in all cases locate in consultation with Contract Administrator before installation commences. Space seams 2400 mm (8') or maximum or closer if indicated.
- .8 Obtain Contract Administrator's approval of exposed fastenings. If exposed screws or bolts are used, use lead or neoprene washers with them.
- .9 Close lock seams gently with wood block and mallet, apply sealant to joints.

### 3.15 ROOF WALKWAYS

- .1 Remove loosely embedded granules from cap sheet in areas to receive walkways. Prime cap sheet area to which roof walkways will be applied.
- .2 Apply walkways in 900 mm x 900 mm (36" x 36") sections spaced 25 mm (1") apart to prevent ponding of water. Ensure walkways do not hinder drainage patterns of roofing system.
- .3 Torch apply walkways membrane to roof cap sheet. Sufficient heat should be applied to melt lower surface of roof walkways membrane and provide flow of bitumen. At same time unroll membrane into melted bitumen. Ensure flow out bead is present at all locations along lap edges. Maximum seepage allowed 6 mm ( $\frac{1}{4}$ ".)
- .4 At roof perimeters and/or where indicated on Drawings, place precast concrete pavers spaced 13 mm ( $\frac{1}{2}$ ") apart on pedestals. Shim pavers level using pedestal Manufacturer's shimming system.

### 3.16 EXPANSION JOINTS

- .1 Expansion Joints: Construct expansion joints within roof construction in locations indicated on Drawings.

**3.17 FIELD QUALITY CONTROL**

- .1 Inspection: City may engage independent inspection company to inspect work of this Section. Give at least two (2) weeks notice of starting work and allow inspector free access. Inspection may include thermographic survey of completed roof.

**END OF SECTION**

## **Part 1 General**

### **1.1 WORK INCLUDED**

- .1 Phases 2: cap flashing at top of interior wall
- .2 Phase 3: Drip and head flashings for new curtain wall
- .3 Phase 3: Drip flashings for wall repair at north terrace

### **1.2 REFERENCE STANDARDS**

- .1 CRCA – “Canadian Roofing Contractors Association”.
- .2 ASTM A525 Sheet Steel, Zinc Coated, Galvanized by the Hot-Dip Process.
- .3 CGSB 37-GP-5M – “Sealing Compound, Rubber Asphalt”.

## **Part 2 Products**

### **2.1 SHEET METALS**

- .1 Cap Flashing – Phase 1 & 2: 24 gauge black anodized aluminum; mill finish; profile as indicated
- .2 Drip / Head Flashing – Phase 3: 24 gauge anodized aluminum; mill finish; profile as indicated; black for East & West curtain walls, clear anodized for North wall repairs
- .3 Reveal Strips: 16 gauge black anodized aluminum – mill finish; ½”d x 2”h

### **2.2 ACCESSORY MATERIALS AND COMPONENTS**

- .1 Fasteners: Aluminum screws;
- .2 Bituminous paint: acid and alkali resistant type; black colour.

### **2.3 FABRICATION**

- .1 Form sections square, true and accurate to size, free from distortion, and other defects detrimental to appearance or performance.
- .2 Backpaint flashing with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Field measure Site conditions prior to fabricating Work.

### **3.2 INSTALLATION**

- .1 Cap / drip flashing to be S-locked
- .2 Reveal strips to be butt-jointed

**END OF SECTION**

## Part 1 General

### 1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.

### 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 Canadian General Standards Board (CGSB)
  - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
  - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

### 1.3 SUBMITTALS

- .1 Submit product data and samples to Contract Administrator.
- .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 duplicate samples of each type of material and colour.
- .4 Cured samples of exposed sealants for each color where required to match adjacent material.

.5 Submit manufacturer's instructions to Contract Administrator.

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

#### **1.4 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.

#### **1.5 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.

#### **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.



## Part 2 Products

### 2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

### 2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Urethanes One Part.
  - .1 Self-Leveling to CAN/CGSB-19.13, Type 1, colour indicated..
- .2 Silicones One Part.
  - .1 To CAN/CGSB-19.13.
- .3 Butyl.
  - .1 To CGSB 19-GP-14M.
- .4 Preformed Compressible and Non-Compressible back-up materials.
  - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
    - .1 Extruded closed cell foam backer rod.
    - .2 Size: oversize 50 %.
  - .2 Neoprene or Butyl Rubber.
    - .1 Round solid rod, Shore A hardness 70.
  - .3 High Density Foam.
    - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup> 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.

#### **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.

#### **3.4 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.

#### **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 Curing.
    - .1 Cure sealants in accordance with sealant manufacturer's instructions.
    - .2 Do not cover up sealants until proper curing has taken place.
  - .3 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**