

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM E96/E96M-14, Water Vapor Transmission of Materials.
  - .2 ASTM E2178-13, Air Permeance of Building Materials.
- .2 Canadian Roofing Contractors Association (CRCA)
  - .1 CRCA Roofing Specifications Manual – current edition.
- .3 CSA Group (CSA)
  - .1 CSA A123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.
  - .2 CSA A123.23-15, Polymer-Modified Bitumen Sheet, Prefabricated and Reinforced.
  - .3 CSA B272-93, Prefabricated Self-Sealing Roof Vent Flashings.
- .4 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

**1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide roofing components data sheets describing materials' physical properties; include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide WHMIS SDS in accordance with Section 01 35 29- Health and Safety Requirements, and indicate VOC content for products used in Work.
    - .1 Primers.
- .3 Provide shop drawings:
  - .1 Indicate flashing and tapered insulation details.
  - .2 Indicate layout for tapered insulation.
  - .3 Provide wind uplift calculations.
- .4 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .5 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

**1.3 FIRE PROTECTION**

- .1 Fire Extinguishers:

- .1 Maintain one cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle,
- .2 ULC labelled for A, B, and C class protection.
- .3 Size 4.5 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.

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

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 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 rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
  - .4 Remove only in quantities required for same day use.
  - .5 Where climatic conditions warrant, store membrane rolls in heated enclosures prior to use, as recommended by manufacturer; remove only in quantities required for same day use.
  - .6 Place plywood runways over completed Work to enable movement of material and other traffic.
  - .7 Store sealants within manufacturer's recommended temperature range..
  - .8 Store insulation protected from deleterious materials.
  - .9 Store materials on pallets or dunnage.
  - .10 Cover materials not currently in use with opaque covers.

#### **1.5 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Do not install roofing when temperature remains below -18°C for torch application.
  - .2 Minimum temperature for adhesives and self-adhesive products in accordance with manufacturer's recommendations.
- .2 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.

### **Part 2 Products**

#### **2.1 PERFORMANCE CRITERIA**

- .1 Compatibility between components of roofing system is essential. 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.

## **2.2 VAPOUR RETARDER**

- .1 Self-adhesive vapour barrier membrane: SBS modified bitumen laminated to woven polyethylene facer.
  - .1 Bottom face: Covered with release film.
  - .2 Thickness: Minimum 0.8 mm.
  - .3 Water vapour permeance (ASTM E96, Procedure B):  $< 2.5 \text{ ng/Pa} \cdot \text{s} \cdot \text{m}^2$ .
  - .4 Air permeability (ASTM E2178):  $< 0.001 \text{ L/s} \cdot \text{m}^2$ .
- .2 Primer: As recommended by vapour barrier manufacturer for substrate and application temperature.

## **2.3 POLYISOCYANURATE INSULATION**

- .1 Polyisocyanurate: CAN/ULC-S704, closed cell, glass-reinforced facers, thickness as indicated.
  - .1 Compressive strength: Type 2: 140 kPa (20 psi).
- .1 Adhesive: polyurethane-based, two-part, low-rise, for cold-adhered installation.

## **2.4 MEMBRANES**

- .1 Base sheet: to CSA A123.23, Type B, Grade 3.
  - .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, non-woven polyester reinforcement.
  - .2 Thickness: 3 mm.
  - .3 Nominal weight:  $3.6 \text{ kg/m}^2$ .
  - .4 Application: Heat-welded.
  - .5 Top and bottom surfaces: Thermofusible plastic film.
- .2 Cap sheet membrane: to CSA A123.23, Type B, Grade 1.
  - .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, non-woven polyester reinforcement, with 75 mm selvedge.
  - .2 Thickness: 4.0 mm.
  - .3 Nominal weight  $4.8 \text{ kg/m}^2$ .
  - .4 Application: Heat-welded.
  - .5 Top surface: Granules.
    - .1 Colour: As selected by Departmental Representative from manufacturer's standard range.
  - .6 Bottom surface: Thermofusible plastic film.

## **2.5 MEMBRANE FLASHING**

- .1 Base sheet membrane flashing: to CSA A123.23, polyester reinforced,  $3.6 \text{ kg/m}^2$ , self-adhering membrane with heat-fusible top face.
- .2 Cap sheet membrane flashing: to CSA A123.23, polyester reinforced,  $4.8 \text{ kg/m}^2$ , heat-welded membrane with heat-fusible film under face and granule-coated top face.

## **2.6 ACCESSORIES**

- .1 Vent stack flashing: To CSA B272, aluminum, 1100 alloy, 1.6 mm thick, insulated, EPDM grommet and base seals, bituminous painted deck flange.

## **2.7 SEALERS**

- .1 Caulking: Elastomeric polyurethane sealant, refer to Section 07 92 00 - Joint Sealants.

## **Part 3 Execution**

### **3.1 QUALITY OF WORK**

- .1 Perform roofing work in accordance with CRCA recommendations.
- .2 Fit interface of the walls and roof assemblies with durable rigid material providing connection point for continuity of air barrier.
- .3 Assembly, component and material connections will be made in consideration of appropriate design loads.

### **3.2 EXAMINATION OF ROOF DECKS**

- .1 Verification of Conditions:
  - .1 Inspect deck conditions including construction joints, HVAC ports to determine readiness to proceed.
- .2 Evaluation and Assessment: 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 Plywood and lumber nailer plates have been installed as indicated.
- .3 Do not install roofing materials during rain or snowfall.

### **3.3 PROTECTION OF IN-PLACE CONDITIONS**

- .1 Cover walls, walks, sloped roofs, and adjacent work where materials to be hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rainwater off roof and away from face of building until roof drains or hoppers installed and connected.
- .5 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
- .6 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.

### **3.4 PREPARATION**

- .1 Degranulate surface of existing membranes over 300 mm width around area of curb for mechanical exhaust port.

### **3.5 VAPOUR RETARDER**

- .1 Apply deck primer to substrate at the rate recommended by manufacturer.
- .2 Install self-adhering vapour retarder in accordance with manufacturer's instructions.
- .3 Lap sides minimum 75 mm and ends minimum 150 mm.
- .4 Apply pressure over whole surface of vapour retarder membrane to effect full adhesion to substrate.

### **3.6 CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION**

- .1 Insulation: fully adhered, adhesive application:
  - .1 Adhere insulation to vapour barrier membrane using two-part polyurethane adhesive.
  - .2 Place boards in parallel rows with joints staggered between layers, and in firm contact with one another.
  - .3 Cut end pieces to suit.
  - .4 Apply adhesive at rates recommended for local wind uplift, particularly recommendations for corners and perimeter.
- .2 Base sheet application:
  - .1 Prime curb substrate.
  - .2 Unroll and apply self-adhered base sheet onto substrate.
  - .3 Apply pressure with roller over whole surface of membrane to effect full adhesion to substrate.
  - .4 Lap field sheets minimum 150 mm.
  - .5 Apply membrane free of blisters, fishmouths, and wrinkles.
- .3 Cap sheet application:
  - .1 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.
  - .2 Lap field surface 300 mm minimum. Offset joints in cap sheet from those in base sheet.
  - .3 Apply membrane free of blisters, fishmouths, and wrinkles.
  - .4 Perform membrane application in accordance with manufacturer's recommendations.
- .4 Flashings:
  - .1 Perform work in accordance with manufacturer's recommendations.
  - .2 Install cap sheet flashing at perimeters, expansion joints, roof-to-wall junctions, roof dividers, roof curbs, and penetrations.
  - .3 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
  - .4 Install base and cap sheet onto substrate in 1 metre wide strips.
  - .5 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal.
  - .6 Lap flashing cap sheet to membrane cap sheet minimum 150 mm and torch weld. Fully embed granules of field membranes below flashing membrane lap.

- .7 Provide 75 mm minimum side lap and seal.
- .8 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.
- .5 Roof penetrations:
  - .1 Install roof drain pans, vent stack covers and other roof penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.

### **3.7 CLEANING**

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.

**END OF SECTION**

## **Part 1 General**

### **1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM A792/A792M-10 (2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .3 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Roofing Contractors Association (CRCA)
  - .1 Roofing Specifications Manual, current edition.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Safety Data Sheets (SDS).
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 Architectural Sheet Metal Manual, 2012.

### **1.2 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 datasheets; and include product characteristics, performance criteria, physical size, finishes, and limitations.
  - .2 Submit WHMIS SDS - Safety Data Sheets for products used on the project.
- .3 Samples:
  - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes, and colours.

### **1.3 DELIVERY, STORAGE, AND HANDLING**

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

## **Part 2            Products**

### **2.1                SHEET METAL MATERIALS**

- .1        Zinc coated steel sheet: ASTM A653/A653M, 0.60 mm (24 gauge) base metal thickness, commercial quality, with G90/Z275 designation zinc coating.
- .2        Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 50 with AZ50 coating, smooth surface.
- .3        Pre-finish sheet metal with factory applied silicone modified polyester.
  - .1            Colour: As selected by Departmental Representative from manufacturer's standard range.

### **2.2                METAL FLASHINGS**

- .1        Form flashings, copings, and fascias to profiles indicated of minimum 0.60 mm (24 gauge) thick prefinished steel.

### **2.3                ACCESSORIES**

- .1        Isolation coating: Alkali resistant bituminous paint.
- .2        Plastic cement: to CAN/CGSB 37.5.
- .3        Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .4        Sealants: Refer also to Section 07 92 00.
  - .1            Sealing Tape: Polyisobutylene compound sealing tape with 100% solids and pressure sensitive release-paper backing. Provide non-toxic, non-staining permanent elastic tape.
  - .2            Elastomeric Sealant: Elastomeric polyurethane polymer sealant to ASTM C920, as required for watertight installation.
  - .3            Butyl Sealant: Single-component, solvent-release butyl rubber sealant to ASTM C1311, for use in joints with limited movement.
  - .4            Bituminous Coating: Cold-applied asphalt mastic, compounded for 0.4 mm (15-mil) dry film thickness per coat.
- .5        Cleats: Same material and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .6        Fasteners: Same material as sheet metal, to ASTM F1667, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .7        Washers: Same material as sheet metal, 1 mm thick with rubber packings.
- .8        Touch-up paint: as recommended by prefinished material manufacturer.

### **2.4                FABRICATION**

- .1        Fabricate metal flashings and other sheet metal work as indicated.
- .2        Form pieces in 2400 mm maximum lengths.
  - .1            Make allowance for expansion at joints.



- .3 Hem exposed edges on underside 12 mm.
  - .1 Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- .3 Verify roofing termination and base flashings are in place, sealed, and secure.

#### **3.2 PREPARATION**

- .1 Install starter and edge strips, and cleats before starting sheet metal installation.

#### **3.3 INSTALLATION**

- .1 Install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.
- .2 Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- .3 Fit flashings tightly in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
  - .1 Flash joints using S-joints forming tight fit over hook strips.
- .5 Lock end joints and caulk with sealant.

#### **3.4 CLEANING**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks, and stains.

**END OF SECTION**

## **Part 1           General**

### **1.1           REFERENCES**

- .1   ASTM International
  - .1    ASTM C612-10 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .2    ASTM E1966-07 (2011) - Standard Test Method for Fire-Resistive Joint Systems.
  - .3    ASTM E2174-14 – Standard Practice for On-Site Inspection of Installed Firestops.
  - .4    ASTM G21-15 - Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2   Firestop Contractors International Association (FCIA)
  - .1    FCIA Firestop Industry Manual of Practice, 5<sup>th</sup> Edition.
- .3   FM Global (FM)
  - .1    FM Approvals 4991 – Approval of Firestop Contractors.
- .4   Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1    Safety Data Sheets (SDS).
- .5   National Fire Protection Association (NFPA)
  - .1    NFPA 101 – Life Safety Code, 2012 Edition.
- .6   UL (formerly Underwriters Laboratories)
  - .1    UL 1479 – Standard for Fire Tests of Through-Penetration Firestops.
  - .2    UL 2079 – Standard for Tests for Fire Resistance of Building Joint Systems.
- .7   Underwriters Laboratories of Canada (ULC)
  - .1    CAN/ULC S101-14 – Standard Methods of Fire Endurance Tests of Building Construction and Materials.
  - .2    CAN/ULC S102-10 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3    CAN/ULC S115-11 - Fire Tests of Firestop Systems.

### **1.2           DEFINITIONS**

- .1   Fire Stop Material: Device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2   Single Component Fire Stop System: Fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3   Multiple Component Fire Stop System: Exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

- .4 Tightly Fitted (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): Penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
  - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

### **1.3 PERFORMANCE REQUIREMENTS**

- .1 Materials, accessories, and application procedures: Listed by ULC, cUL, or tested in accordance with CAN/ULC S115 to comply with applicable building code requirements.
- .2 Firestopping materials: To CAN/ULC S101, to achieve fire rating as noted on Drawings and ULC Design Number shown.

### **1.4 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. Include product characteristics, performance criteria, physical size, finish, and limitations.
  - .2 Submit two copies of WHMIS SDS - Safety Data Sheets.
- .3 Shop Drawings:
  - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings, and method of installation.
  - .2 Ensure construction details accurately reflect actual job conditions.
- .4 System Design Listings, including illustrations from a qualified testing and inspection agency as applicable for each firestop configuration.
- .5 Quality Assurance Submittals: Submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Certificates: Signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Manufacturer's Instructions: Including special handling criteria, installation sequence, and cleaning procedures.
- .6 Project Record Documentation: Supply documentation for each single application addressed. Identify each penetration and joint location on entire project. Provide at completion of project.
  - .1 Include the following for through-penetrations:
    - .1 Sequential location number.
    - .2 Project name.
    - .3 Installation date.
    - .4 Detailed description of penetration location.
    - .5 Tested System or Engineered Judgment Number.
    - .6 Type of assembly penetrated.
    - .7 Detailed description of size and type of penetrating item.

- .8 Size of opening.
- .9 Number of sides of assemblies addressed.
- .10 Hour rating achieved.
- .11 Installer's name.
- .2 Include the following for construction joints:
  - .1 Sequential location number.
  - .2 Project name.
  - .3 Installation date.
  - .4 Detailed description of construction joint location.
  - .5 Tested System or Engineered Judgment Number.
  - .6 Type of construction joint.
  - .7 Width of joint.
  - .8 Lineal footage of joint.
  - .9 Number of sides of assemblies addressed.
  - .10 Hour rating achieved.
  - .11 Installer's name.

## **1.5 QUALITY ASSURANCE**

- .1 Manufacturer: Company specializing in manufacture of Products specified in this Section, and FCIA Manufacturer Membership in good standing.
- .2 Contractor: Company specializing in performing the work of this section, and with at least one of the following qualifications:
  - .1 Approved in accordance with FM Standard 4991.
  - .2 FCIA Member in good standing.
  - .3 UL Approved Contractor.
  - .4 Licensed by the local authority having jurisdiction.
  - .5 Documented successful completion of at least five comparably scaled projects.
- .3 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.
- .4 Regulatory Requirements:
  - .1 Conform to applicable code for fire resistance ratings and surface burning characteristics.
  - .2 Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

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

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements, and with manufacturer's written instructions.
- .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC or cUL labels.
- .3 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .4 Replace defective or damaged materials with new.

## **1.7 SITE CONDITIONS**

- .1 Apply materials within temperature range recommended by manufacturer.
- .2 Maintain recommended temperature before, during, and for 72 hours after installation of materials.

## **1.8 SEQUENCING AND SCHEDULING**

- .1 Schedule installation of cast-in-place firestop devices after completion of floor formwork, metal form deck, or composite deck, but before placement of concrete.
- .2 Schedule installation of drop-in firestop devices after placement of concrete but before installation of pipe penetration.
- .3 Schedule installation of other firestopping materials after completion of penetrating item installation, but prior to covering or concealing of openings.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fire stopping and smoke seal systems: In accordance with CAN/ULC S115.
  - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke, and gases in compliance with requirements of CAN/ULC S115 and not to exceed opening sizes for which they are intended.
  - .2 Ensure firestopping system components are fully compatible with each other, with substrates, and with items penetrating the firestopping.
  - .3 Mould and mildew resistance to ASTM G21: 0 (Zero).
- .2 Service penetration assemblies: Systems tested to CAN/ULC S115.
- .3 Service penetration fire stop components: Certified by test laboratory to CAN/ULC S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: Elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork, and other mechanical items requiring sound and vibration control: Elastomeric seal.
- .7 Primers: To manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): Potable, clean, and free from injurious amounts of deleterious substances.
- .9 Insulation: Mineral wool fibre semi-rigid insulation to ASTM C612 – Type IVA, UL 2079, and ASTM E1966; minimum density 64 kg/m<sup>3</sup> (4 lbs/ft<sup>3</sup>).
- .10 Damming and backup materials, supports, and anchoring devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .11 Sealants for vertical joints: Non-sagging.

- .12 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this Section.
- .3 Proceed with installation only when unsatisfactory conditions have been corrected.

### **3.3 PREPARATION**

- .1 Ensure substrates and surfaces are clean, dry, and frost free.
- .2 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
- .3 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .4 Maintain insulation around pipes and ducts penetrating fire separation, without interruption to vapour barrier.
- .5 Mask and use drop cloths where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

### **3.4 INSTALLATION**

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

### **3.5 LABELLING**

- .1 Provide and install identification labels for each individual penetration with firestopping.
  - .1 Install labels in readily visible location, on both sides of penetrated assembly, with permanently bonding adhesive.
  - .2 Label to include:

- .1 Warning indicating that system is firestopping installation to be left undisturbed.
- .2 Installing Contractor name and contact information.
- .3 System designation of testing organization.
- .4 Installation date.
- .5 Manufacturer.

### **3.6 FIELD QUALITY CONTROL**

- .1 Section 01 45 00: Quality Control.
- .2 Inspections: Notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

### **3.7 CLEANING**

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Remove temporary dams after initial set of firestopping and smoke seal materials.
- .4 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- .5 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

### **3.8 SCHEDULE**

- .1 Fire stop and smoke seal at:
  - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
  - .2 Edge of floor slabs at curtain wall and precast concrete panels.
  - .3 Top of fire-resistance rated masonry and gypsum board partitions.
  - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
  - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
  - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
  - .7 Openings and sleeves installed for future use through fire separations.
  - .8 Around mechanical and electrical assemblies penetrating fire separations.
  - .9 Rigid ducts greater than 129 cm<sup>2</sup>: Fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

**END OF SECTION**

## **Part 1 General**

### **1.1 REFERENCES**

- .1 Architectural Aluminum Manufacturers Association (AAMA)
  - .1 AAMA 812-04 (2012), Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations.
- .2 ASTM International
  - .1 ASTM C719-14, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
  - .2 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
  - .3 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.
  - .4 ASTM C1016-14, Determination of Water Absorption of Sealant Backing (Joint Filler) Material.
  - .5 ASTM C1193-13, Standard Guide for Use of Sealants.
  - .6 ASTM C1330-02 (2013), Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
  - .7 ASTM D1623-09, Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
  - .8 ASTM D5249-10(2016), Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.
  - .9 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Safety Data Sheets (SDS).

### **1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants. Include product characteristics, performance criteria, physical size, finish and limitations.
  - .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 2 copies of WHMIS SDS for products used in project.
- .3 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.



### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for incorporation into manual.

### **1.4 QUALITY ASSURANCE**

- .1 Compatibility: Verify sealants used are compatible with their respective joint substrates.
- .2 Provide sealants with appropriate expansion and contraction properties for the joints being sealed.
- .3 Perform sealant application work to ASTM C1193.

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

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

### **1.6 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4°C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
  - .1 Proceed with installation of joint sealants only where joint widths are within range allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

### **1.7 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 Safety Data Sheets (SDS) acceptable to Health Canada.

- .2 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

## **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 that off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers, use only these primers.
- .4 Polyurethane Sealant: ASTM C920, multi component, Grade NS, Use NT, M, A and O; non-sag, chemical curing.
  - .1 Typical uses: exterior joints.
- .5 Elastomeric Polyurethane Sealant: ASTM C920, single component, Grade NS, Use NT, M, A and O; non-sag, moisture curing hybrid polyurethane.
  - .1 Typical uses: perimeter caulking of doors.
- .6 Spray foam sealant: one component polyurethane, closed cell, low pressure build foam, complying with AAMA 812.
  - .1 Uses: sealing rough openings of door and windows.
- .7 Acoustic and Smoke Sealant: ASTM C919, acoustic grade, single component, non-hardening, non-skinning.
  - .1 Typical use: Acoustic and smoke sealing of gypsum wall board partitions.
- .8 Fire-Resistive Sealant: ASTM E814, one part fire-stopping sealant.
  - .1 Typical uses: Penetrations in fire-rated floor and wall assemblies.
  - .2 Refer to Section 07 84 00 – Fire Stopping.
- .9 Butyl: ASTM C1311, single component, butyl rubber sealant.
  - .1 Typical uses: gutter and flashing sealing, roof vents.
- .10 Preformed compressible and non-compressible back-up materials:
  - .1 Polyethylene foam: Extruded closed cell round foam backer rod, to ASTM C1330 Type C, to ASTM D5249 Type 3.
    - .1 Compression recovery to ASTM D5249: Minimum 96%.
    - .2 Tensile strength to ASTM D1623: Minimum 200 kPa.
    - .3 Water absorption to ASTM C1016 Procedure B: Maximum 0.03 g/cm<sup>3</sup>.
    - .4 Size: oversize 30 to 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 that will not bond to sealant.

.11 Primer: As recommended by sealant manufacturer, where required, for adhesion of sealant to substrate.

## **2.2 JOINT CLEANER**

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

.2 Primer: in accordance with sealant manufacturer's written recommendations.

## **Part 3 Execution**

### **3.1 EXAMINATION**

.1 Verify conditions of substrates are acceptable for joint sealants installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

### **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 that 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 joint substrates as recommended by sealant manufacturer 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 accordance with sealant manufacturer's instructions.

### **3.6 APPLICATION**

- .1 Sealant:
  - .1 Mask edges of joint where irregular surface or sensitive joint border exists, to provide neat joint.
  - .2 Apply sealant in continuous beads.
  - .3 Apply sealant using gun with proper size nozzle.
  - .4 Use sufficient pressure to fill voids and joints solid.
  - .5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .6 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .7 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.

### **3.7 CLEANING**

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Clean adjacent surfaces immediately.
  - .3 Remove excess and droppings, using recommended cleaners as work progresses.
  - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

### **3.8 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**