

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .3 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - .4 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - .5 ASTM E96/E96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian Standards Association (CSA)
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CSA B149.1-10, Natural Gas and Propane Installation Code.
 - .3 CSA B149.2-10 (R2015), Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S114-05, Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC S129-06, Standard Method of Test for Smoulder Resistance of Insulation (Basket Method).
 - .4 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.
 - .5 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .6 CAN/ULC S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

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, specifications, and data sheets.

.2 Submit two copies of WHMIS SDS - Safety Data Sheets. Indicate VOC's insulation products and adhesives.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.4 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials in manufacturer's original containers clearly labeled with manufacturer's name, product identification, safety information, net weight of contents and expiration date.

.2 Store material in a safe manner and where the temperatures are within range specified by manufacturer.

.3 Remove empty containers from site on a daily basis.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.5 PROJECT CONDITIONS

.1 Maintain environmental conditions of temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

Part 2 Products

2.1 BOARD INSULATION

.1 Extruded polystyrene (XPS): To CAN/ULC S701, Type 4, closed cell rigid board.

.1 Compressive strength (ASTM D1621): Minimum 210 kPa.

.2 Thermal resistance (ASTM C518): RSI 0.88/25 mm.

.3 Edges: square.

.4 Thickness: As indicated on Drawings.

2.2 SUB-GRADE PERIMETER INSULATION

.1 Board insulation: CAN/ULC S701, Type 4, extruded polystyrene (XPS), closed cell rigid board.

.1 Compressive strength (ASTM D1621): Minimum 240 kPa.

.2 Thermal resistance (ASTM C518): RSI 0.88/25 mm.

.3 Water absorption (ASTM D2842): Maximum 0.7% by volume.

- .4 Water vapour permeance (ASTM E96): Maximum 45 ng/Pa•s•m² (0.8 perms).
- .5 Thickness: As indicated on Drawings.

2.3 BATT INSULATION

- .1 Batt insulation for interior partitions: To CAN/ULC S702, Type 1; semi-rigid mineral wool batt insulation.
 - .1 Non-combustibility (CAN/ULC S114): Pass.
 - .2 Surface burning characteristics (CAN/ULC S102):
 - .1 Flame spread: 0.
 - .2 Smoke developed: 0.
 - .3 Density (ASTM C167): 40 kg/m³.
 - .4 Smoulder resistance (CAN/ULC S129): 0.09%.
 - .5 Acoustical performance (ASTM C423): NRC 1.05 at 75 mm thickness.
- .2 Batt insulation for exterior walls: To CAN/ULC S702, Type 1; semi-rigid mineral wool batt insulation.
 - .1 Non-combustibility (CAN/ULC S114): Pass.
 - .2 Surface burning characteristics (CAN/ULC S102):
 - .1 Flame spread: 0.
 - .2 Smoke developed: 0.
 - .3 Density (ASTM C167): 32 kg/m³.
 - .4 Thermal resistance (ASTM C518): R14 at 89 mm (3-1/2 inch) thickness.

2.4 ADHESIVE

- .1 Adhesive (for polystyrene): To CGSB 71-GP-24.

2.5 ACCESSORIES

- .1 Insulation fasteners: Screw and plate style.
 - .1 Screws: Case-hardened steel, #14 gauge, length sufficient to penetrate substrate 19 mm (3/4 inch).
 - .2 Plates: Polypropylene or galvanized steel, minimum 44 mm diameter, low profile.
- .2 Insulation clips: Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .3 Attic eaves venting baffles: Waxed cardboard ventilation baffles, purpose-made, to allow air ventilation and to prevent insulation displacement by wind through soffit vents.
- .4 Nails: To CSA B111, galvanized steel, length to suit insulation plus 25 mm.
- .5 Staples: 12 mm minimum leg.

- .6 Tape: As recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 GENERAL

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 type A chimneys and CSA B149.1 and CSA B149.2 type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Departmental Representative in writing of defects.
- .2 Verify substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.
- .3 Verify acoustic and firestop sealants required at stud framing [concrete masonry unit wall] junctions with adjacent building components or at mechanical and electrical conduit and duct penetrations are installed.
- .4 Confirm that mechanical, electrical and telecommunications service lines in walls and ceilings, and floors to be insulated have been inspected.

3.4 BOARD INSULATION INSTALLATION

- .1 Apply adhesive to polystyrene insulation board in accordance with manufacturer's recommendations.
- .2 Embed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.

- .3 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 PERIMETER FOUNDATION INSULATION

- .1 Exterior application: extend boards to minimum depth as indicated.

3.6 BATT INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2 Install acoustic insulation where indicated to maintain sound attenuation of separation in building elements and spaces.
- .3 Place acoustic batts between studs ensuring friction fit, free of sags, folds, voids, or open joints that may let sound pass through.
- .4 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .5 Do not compress insulation excessively to fit voids.
- .6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.7 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-14, Standard Methods of Fire 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-S705.1-01, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification. Includes Amendment 1.2.
 - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.2 ACTION AND INFORMATIONAL 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 polyurethane foam sprayed insulation; include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Test Reports:
 - .1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

- .1 Mock-up:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up, 10 m² minimum, of sprayed insulation including one inside corner and one outside corner, and window openings.
 - .3 Mock-up may be part of finished work.
 - .4 Allow for review of mock-up by Departmental Representative before proceeding with sprayed insulation work.

- .2 Health and Safety Requirements: worker protection:
 - .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .2 Workers must not eat, drink or smoke while applying foam insulation.

1.4 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

- .1 Insulation: spray polyurethane to CAN/ULC-S705.1.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that conditions of substrate are acceptable for sprayed insulation application 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 APPLICATION

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.
- .2 Use primer where recommended by manufacturer.
- .3 Apply sprayed foam insulation in thickness as indicated, in maximum 50 mm lifts.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.
- .3 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's product literature and datasheets. Include product characteristics, performance criteria, physical size, and limitations.
- .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS).

1.3 MOCK-UPS

- .1 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
- .2 Mock-up will be used to judge workmanship, substrate preparation, and material application.
- .3 Allow for inspection of mock-up by Departmental Representative before proceeding with vapour barrier work.
- .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SHEET VAPOUR BARRIER

- .1 Vapour barrier: Polyethylene film to CAN/CGSB-51.34.
 - .1 Thickness:
 - .1 Wall and ceiling assemblies: 0.15 mm (6 mil).
 - .2 Under concrete slabs: 0.38 mm (15 mil).

2.2 ACCESSORIES

- .1 Joint sealing tape: Air-resistant pressure-sensitive adhesive tape, type recommended by vapour barrier manufacturer, minimum 50 mm wide for lap joints and perimeter seals, minimum 25 mm wide elsewhere.

- .2 Sealant: Compatible with vapour retarder materials, recommended by vapour retarder manufacturer. Refer to Section 07 92 00 - Joint Sealants.
- .3 Staples: Minimum 6 mm leg.
- .4 Moulded box vapour barrier: Factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of vapour barrier.
- .2 Install sheet vapour retarder on warm side of exterior wall assemblies to form continuous vapour barrier.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour barrier to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour barrier.

- .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C920-14, Elastomeric Joint Sealants.
 - .2 ASTM D412-06a (2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - .3 ASTM D570-98(2010)e1, Standard Test Method for Water Absorption of Plastics.
 - .4 ASTM D1970/D1970M-13, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .5 ASTM E96/E96M-13, Water Vapor Transmission of Materials.
 - .6 ASTM E154/E154M-08a(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .7 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.
 - .8 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-56M-1985, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

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, specifications and datasheet. Include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS Safety Data Sheets.
- .3 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .2 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Mock-Up:

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical exterior wall panel, minimum 2 metres wide, incorporating window frame and sill, insulation, junction with roof system; illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of finished work.
- .5 Allow for review of mock-up by Departmental Representative before proceeding with air barrier Work.

1.3 DELIVERY, STORAGE, AND HANDLING

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove waste materials in accordance with Section 01 74 19 –Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.5 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Maintain temperature and humidity recommended by material manufacturers before, during, and after installation.

1.6 SEQUENCING

- .1 Sequence work to permit installation of materials in conjunction with related materials and seals.

Part 2 Products

2.1 SHEET MATERIALS

- .1 Air/Vapour barrier: Self-adhering air barrier membrane, SBS modified bitumen laminated to thermoplastic film, to ASTM E2357, vapour impermeable.
 - .1 Physical properties:
 - .1 Thickness: 1.0 mm.
 - .2 Air leakage at 75 Pa (ASTM E2178): < 0.02 L/s·m² (0.0002 cfm/m²).
 - .3 Tensile strength (ASTM D412): Minimum 2.4 MPa.
 - .4 Water vapour permeance (ASTM E96): 2.8 ng/s·m²·Pa (0.05 perms).

- .5 Water absorption (ASTM D570): Maximum 0.1%.
- .6 Low temperature flexibility (CGSB 37-GP-56M): -30°C.
- .7 Elongation (ASTM D412): Minimum 200%.
- .8 Puncture resistance (ASTM E154): Minimum 178 N (40 lb-f).
- .9 Nail sealability (ASTM D1970): Pass.
- .2 Acceptable products:
 - .1 Blueskin SA/Blueskin SA LT.
 - .2 ProtectoWrap PW 100/40.
 - .3 Soprema Sopraseal Stick 1100T.
 - .4 WR Meadows Air-Shield.
- .2 Air barrier: Polyolefin sheet air barrier membrane, non-perforated, vapour permeable.
 - .1 Acceptable products:
 - .1 Dow Weathermate.
 - .2 DuPont Tyvek.
 - .3 Owens Corning TruWrap.
 - .4 TYPAR Building Wrap.
 - .2 Fasteners for polyolefin air barrier: Plastic-capped staples or nails; rust resistant.
 - .3 Tape: As recommended by weather barrier manufacturer.
- .3 Sealant: To ASTM C920, elastomeric polymer sealant to maintain weather-tight conditions.

2.2 PRIMER

- .1 Primer: As recommended by air barrier manufacturer and appropriate to application conditions.

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 surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous, and in compliance with air/vapour barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to Departmental Representative.
- .4 Do not start work until deficiencies have been corrected.

3.3 PREPARATION

- .1 Remove loose or foreign matter that might impair adhesion of materials.
- .2 Ensure substrates are clean of oil or excess dust; open joints filled; and concrete surfaces free of large voids, spalled areas, or sharp protrusions.
- .3 Ensure substrates are free of surface moisture prior to application of self-adhesive membrane and primer.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces in accordance with manufacturer's instructions.

3.4 INSTALLATION - GENERAL

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Install air barriers in a continuous fashion with no gaps.
- .3 Lap and seal joints in accordance with manufacturer's recommendations.
- .4 Position lap seal over firm bearing.
- .5 Apply sealant within recommended application temperature range.
 - .1 Consult manufacturer when sealant cannot be applied within recommended temperature range.
- .6 Where bridging of gaps (over 12 mm) occurs in the supporting substrate, provide minimum 0.72 mm (22 gauge) thick galvanized sheet metal or purpose-made reinforced backup sheet as recommended by membrane manufacturer.
- .7 At inside and outside corners, provide extra layer of membrane extending 200 mm each side of corner.
- .8 At wall-to-roof transitions, co-ordinate transition to maintain continuity of wall membrane with roof air barrier membrane.
- .9 At penetrations through air barrier membrane at structural members, ductwork, piping, conduits, and similar penetrations where an acceptable "flange" is not provided, seal penetrations with backup rod/membrane and elastomeric liquid air barrier coating compatible with self-adhesive membrane.
- .10 Incorporate allowance for deflection of structure below roof beam locations, provide looped butyl membrane, mechanically fastened and sealed to air membrane and substrate.
- .11 Seal air barrier membrane to wind break flange of window frames. Prior to installing window frame, wrap rough opening and extend air barrier membrane 200 mm beyond onto adjacent sheathing or wood buck of exterior wall. Fill void space between rough opening and window frame with low-expanding foam insulation and caulk to air barrier return.
- .12 Return air barrier membrane into pressed-steel door frame rough openings, fill void space between rough opening and frame with low-expanding foam insulation, and caulk to air barrier return.

- .13 Maintain air barrier membrane continuity at mechanical penetrations. Return air barrier membrane into rough openings, fill void space with foam insulation, and caulk to air membrane with foam rod and caulking. At galvanized ductwork and louvres, provide suitable galvanized metal or aluminum flange around perimeter of duct or louvre for mechanical fastening and sealing of air barrier membrane.
- .14 Apply insulation as soon as possible after air barrier is installed. Do not leave applied air barrier exposed for longer than recommended by manufacturer.

3.5 INSTALLATION - SELF-ADHERING SHEET AIR/VAPOUR BARRIER

- .1 Install self-adhering sheet air barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- .2 Remove release paper as membrane is applied.
- .3 Apply pressure with roller over surface of membrane while installing.
- .4 Ensure installed self-adhered membrane is free of wrinkles, fish mouths, and bubbles.

3.6 INSTALLATION - POLYOLEFIN SHEET AIR BARRIER

- .1 Install polyolefin sheet air barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- .2 Start polyolefin sheet installation at a building corner, leaving 150-300 mm (6-12 inches) extended beyond corner to overlap.
- .3 Install polyolefin sheet horizontally, starting at the lower portion of the wall surface. Maintain sheet plumb and level.
- .4 Extend bottom roll edge over sill plate interface 75 mm (3 inches) minimum. Seal polyolefin sheet with sealant or tape. Shingle polyolefin sheet over back edge of through-wall flashings and seal with sealant or tape.
- .5 Overlap subsequent layers minimum 150 mm (6 inches) horizontally, in a shingled manner.
- .6 Attach polyolefin sheet to studs through exterior sheathing. Secure using polyolefin sheet manufacturer's recommended fasteners, spaced 300-450 mm (12-18 inches) vertically on center along stud line, and maximum 600 mm (24 inches) on center horizontally.
- .7 Seal seams of polyolefin sheet with seam tape at vertical and horizontal overlapping seams.

3.7 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.

3.8 PROTECTION OF WORK

- .1 Do not permit adjacent work to damage work of this section.

- .2 Ensure finished work is protected from climatic conditions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C1186-08 (2016), Standard Specification for Flat Fiber-Cement Sheets.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999 (R2008).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

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 cementitious materials; include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Indicate dimensions, wall openings, head, jamb, sill and mullion detail, materials and finish, anchor details, compliance with design criteria and requirements of related work.
- .4 Samples:
 - .1 Submit duplicate 300 mm x full width samples of wall panels and trim, representative of materials, profiles, 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 and 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 in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect products from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.4 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 Labour Canada.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Design composite building panel wall to provide for thermal movement of component materials caused by ambient temperature range of -40° to 35°C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .2 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- .3 Design members to withstand dead load and wind loads as calculated in accordance with NBC and applicable Municipal and Provincial regulations, to maximum allowable deflection of 1/180 of span.
- .4 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principles".
- .5 Provide minimum thermal resistance of RSI 2.97 calculated with design wind loads.
- .6 Design wall system to accommodate specified erection tolerances of structure.
- .7 Maintain following installation tolerances:
 - .1 Maximum variation from plane or location shown on approved shop drawings: 10 mm/m of length and up to 20 mm/100 m maximum.
 - .2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

2.2 MATERIALS

- .1 Cementitious Board: to ASTM C1186, Type A, Grade II, engineered for climate conditions of place of installation, thickness as indicated.
 - .1 Burning characteristics to CAN/ULC S102:
 - .1 Flame spread: 0.
 - .2 Smoke developed: 5.

- .2 Fasteners: Stainless steel, purpose made.
- .3 Furring: Refer to Section 06 10 00 – Rough Carpentry.
- .4 Building wrap: Refer to Section 07 27 00 – Weather Barriers.
- .5 Flashing: Refer to Section 07 62 00 – Sheet Metal Flashing and Trim.
- .6 Sealants: Exterior grade polyurethane joint sealant, permanently flexible, colour matched to siding.
- .7 Isolation coating: Alkali resistant.

2.3 FINISH OF PANELS

- .1 Colour coating: Factory finish, primed and painted.
 - .1 Colour: As selected by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that conditions of substrate are acceptable 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 INSTALLATION - GENERAL

- .1 Install cementitious siding and trim in accordance with manufacturer's written installation instructions.
- .2 Protect surface of metals in contact with concrete, mortar, plaster, or other cementitious surface with isolation coating.
- .3 Fabricate panels to fit around openings with gaps for expansion and contraction.
- .4 Install flashing behind joints, overlapping top course below joint, and extended up past top of course where joint is flashed.
- .5 Stagger field joints minimum 812 mm (32 inches).
- .6 Seal gaps with joint sealant.
- .7 Paint touch-up: Use colour-matched paint as supplied by siding manufacturer.
 - .1 Apply touch-up paint to cut edges.
 - .2 Touch-up nicks, scrapes, and nail heads in pre-finished siding.
 - .3 Touch-up nails after application.
 - .4 Use touch-up paint sparingly. If large areas require touch-up, replace damaged area with new pre-finished siding.

3.3 INSTALLATION – LAP SIDING

- .1 Starting: Install minimum 6 mm (1/4 inch) thick lath starter strip at bottom course of wall. Apply planks horizontally with minimum 32 mm (1-1/4 inches) wide laps at top. Install bottom edge of first plank overlapping starter strip.
- .2 Allow minimum vertical clearance between edge of siding and other material as recommended by siding manufacturer.
- .3 Align vertical joints of planks over furred-out framing members.
- .4 Maintain clearance between siding and adjacent finished grade.
- .5 Locate splices at least one stud cavity away from window and door openings.

3.4 INSTALLATION – TRIM

- .1 Install flashing around all wall openings.
- .2 Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 19 mm (3/4 inch) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- .3 Place fasteners minimum 19 mm (3/4 inch) and maximum 50 mm (2 inches) from side edge of trim board and minimum 25 mm (1 inch) from end. Fasten maximum 400 mm (16 inches) on center.
- .4 Maintain clearance between trim and adjacent finished grade.
- .5 Outside corner board: Attach trim with corrosion resistant finish nail 13 mm (1/2 inch) from edge, spaced 400 mm (16 inches) apart, weather cut each end spaced minimum 300 mm (12 inches) apart.
- .6 Allow 3 mm (1/8 inch) gap at trim and siding transitions.

3.5 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Alberta Roofing Contractors Association (ARCA)
 - .1 ARCA Standards Manual, current edition.
- .2 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 D523-14, Standard Test Method for Specular Gloss.
 - .3 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .4 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - .5 ASTM D1970/D1970M-14, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .6 ASTM D5601-94, Standard Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes.
 - .7 ASTM D5602/D5602M-11, Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens.
 - .8 ASTM E96/E96M-15, Standard Test Methods for Water Vapor Transmission of Materials.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sheet metal roofing and underlayment; include product characteristics, performance criteria, physical size, finishes, and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings sealed by structural engineer licensed in Alberta.
 - .2 Show arrangements of sheets and joints, types and locations of fasteners, and relationship of panels to structural frame.
 - .3 Indicate fastening requirements of metal panels to supporting substrate.
- .4 Samples:

- .1 Submit duplicate 50 x 50 mm samples of sheet metal material, illustrating metal thickness and finish.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect sheet metal roofing from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: To ASTM A653/A653M with minimum Z275 coating designation, commercial quality, smooth surface, prefinished,
 - .1 Base metal thickness 0.607 mm (24 gauge).
 - .2 Pre-finish steel with factory applied silicone modified polyester.
 - .1 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
 - .2 Coating thickness: Minimum 25 micrometres.
 - .3 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.
 - .4 Colour: As selected by Departmental Representative from manufacturer's standard range.

2.2 DECK

- .1 Plywood: Refer to Section 06 10 53 – Miscellaneous Rough Carpentry.

2.3 ACCESSORIES

- .1 Trims: Same material as sheet metal roofing, including pre-formed gable caps, starter trim, and vented ridge cap.
- .2 Snow retention devices: As approved by sheet metal roofing manufacturer, double-pipe snow fence, with non-penetrating attachment clamps installed to standing seams.

- .1 Tubing: 6061-T6 aluminum extrusions to ASTM B221, 25.4 mm (1 inch) outer diameter, 19 mm (3/4 inch) inner diameter; complete with nylon end caps.
 - .2 Tubing couplers: Extruded aluminum, 19 mm exterior diameter, with rubber seals, and nylon end caps.
 - .3 Clamps: 6061-T6 alloy aluminum extrusions to ASTM B221; or aluminum castings to ASTM B85; complete with collars for retention of tubing.
 - .4 Set screws: 300 series stainless steel, 18-8 alloy, 9.5 mm diameter, with round nose point.
 - .5 Attachment bolts: 300 series stainless steel, 18-8 alloy, 10 mm diameter, with flat washers.
- .3 Underlayment: Self-adhered SBS rubber modified laminated to slip-resistant woven polyethylene film on top surface, release film on bottom surface.
- .1 Thickness: 1.0 mm.
 - .2 Maximum load (ASTM D1970): MD 11.3 kN/m; XD 15.4 kN/m.
 - .3 Elongation at break (ASTM D1970): MD 52%; XD 24%.
 - .4 Static puncture (ASTM D5602): 400 N.
 - .5 Peel strength (ASTM D903): 3000 N/m.
 - .6 Tear resistance (ASTM D5601): MD 375 N; XD 400 N.
 - .7 Cold bending (ASTM D1970): -30°C.
 - .8 Water vapour permeance (ASTM D1970): < 0.09 ng/Pa·s·m².
 - .9 Water transmission (ASTM E96): No wetness.
 - .10 Nail sealability (ASTM D1970): Pass.
- .4 Isolation coating: Alkali resistant bituminous paint.
- .5 Sealant: Asbestos-free sealant, tape or gun applied, compatible with systems materials, recommended by system manufacturer.
- .6 Fasteners: To ASME B18.6.3, same material as sheet steel, corrosion-resistant, with heads finished in same colour as roof panels; pull-out resistance to approval of engineer of record; length sufficient to extend minimum 13 mm (1/2 inch) beyond underside of roof sheathing.
- .1 Washers: Neoprene or EPDM.
- .7 Touch-up paint: As recommended by sheet metal roofing manufacturer.

2.4 FABRICATION

- .1 Form sheet metal to profile indicated.
- .2 Form individual pieces in full lengths to match roof length, without transverse seams.
- .3 Hem exposed edges on underside 12 mm, mitre and seal.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

- .5 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.
- .6 Protect metals against oxidization by back painting with isolation coating where indicated.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify conditions of substrate are acceptable for sheet metal roofing 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 INSTALLATION

- .1 Perform work in accordance with Alberta Roofing Contractors Association Standards Manual.
- .2 Install underlayment to manufacturer's instructions and recommendations.
 - .1 Secure in place and lap joints in direction of waterflow.
 - .1 Horizontal laps: Minimum 75 mm (3 inches).
 - .2 Vertical laps: Minimum 150 mm (6 inches).
 - .2 Seal laps with roofing cement, EPDM, or butyl sealant.
- .3 Flash roof penetrations with material matching roof panels and make watertight.
- .4 Form seams in shingled fashion and make watertight.

3.3 SHEET METAL ROOFING

- .1 Form pre-finished steel to profile indicated.
- .2 Apply sheet metal roofing beginning at eaves, and at gable end downwind from prevailing wind. Loose lock pans to edge strips at eaves and gable rakes.
- .3 Mechanically attach sheet metal panels using screws attached in spacing and quantities indicated on engineer-stamped shop drawings.
- .4 Seal joints and laps with butyl sealant.
- .5 Install panels flat, straight, and square.
- .6 Install vented ridge cap.

3.4 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: Remove waste materials.

3.5 PROTECTION

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

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 D523-14, Standard Test Method for Specular Gloss.
 - .3 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .4 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 Standards Association (CSA)
 - .1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt.
 - .2 CSA HA Series-M1980, Standards for Aluminum and Aluminum Alloys.
- .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.

- .2 Waste Management and Disposal: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

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 sheet: Utility quality to CSA HA Series.
 - .1 Thickness: Minimum 0.81 mm (0.032 inch) for all items except:
 - .1 Continuous cleats: 1.27 mm (0.050 inch).
 - .2 Roof edge strips: 1.27 mm (0.050 inch).
 - .3 Fascias over 125 mm (5 inches) high: 1.27 mm (0.050 inch).
 - .4 Splash pans: 1.0 mm (0.040 inch).
 - .3 Pre-finish sheet metal with factory applied silicone modified polyester.
 - .1 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
 - .2 Coating thickness: Minimum 25 micrometres.
 - .3 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.
 - .4 Colour: As selected by Departmental Representative from manufacturer's standard range.

2.2 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 Epoxy Seam Sealer: Aluminum seam-cementing compound, 2-part, non-corrosive, as recommended by manufacturer for exterior non-moving joints.

- .5 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 Eavestrough hangers: Purpose-made for attachment of K-style gutters, aluminum, 1.5 mm (0.060 inch) minimum thickness, screw attachment, channeled or ribbed body.
- .7 Fasteners: Same material as sheet metal, to ASTM F1667, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .8 Washers: Same material as sheet metal, 1 mm thick with rubber packings.
- .9 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 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.

2.4 METAL FLASHINGS

- .1 Form flashings, copings, and fascias to profiles indicated of minimum 0.60 mm thick galvanized prefinished steel.

2.5 EAVESTROUGHS AND DOWNSPOUTS

- .1 Form eavestroughs and downspouts from prefinished aluminum sheet metal.
 - .1 Eavestroughs: K-style, 125 mm (5 inch) width.
 - .2 Downspouts: Rectangular, 75 x 100 mm (3 x 4 inches), corrugated.
- .2 Provide goosenecks, outlets, strainer baskets, and necessary fastenings.
- .3 Provide perforated metal debris shield.

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 EAVESTROUGHS AND DOWNSPOUTS

- .1 Install eavestroughs and secure to building at 450 mm on centre, with purpose-made eavestrough hangers.
 - .1 Slope eavestroughs evenly to downspouts.
 - .2 Provide endcaps at gutter ends.
 - .3 Seal joints watertight.
- .2 Install downspouts and provide goosenecks back to wall.
 - .1 Install downspouts, provide elbows and offsets, and secure downspouts to wall construction using downspout supports spaced maximum 1800 mm (6 feet) on center.
 - .2 Maximum distance of downspout support from top or bottom of downspout: 600 mm (24 inches).
 - .3 Provide 45° elbows at bottom of downspouts to direct water away from wall surface or foundation.
 - .4 Seal joints watertight.

3.5 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, 5th 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 Samples:
 - .1 Submit duplicate 200 x 200 mm samples showing actual fire stop material proposed for project.
- .6 Quality Assurance Submittals: Submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: In accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with

- specifications for specified performance characteristics and physical properties.
- .2 Certificates: Signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: Including special handling criteria, installation sequence, and cleaning procedures.
- .7 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 Contractor: Company specializing in performing the work of this section, with minimum 3 years of documented experience, 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.
- .2 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.
- .3 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.
- .4 Pre-Installation Meetings: Convene pre-installation meeting one week prior to beginning work of this Section, with Departmental Representative in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building sub-trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

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.
- .5 Waste Management and Disposal:
 - .1 Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

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 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/m³ (4 lbs/ft³).
- .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 Inspections to be in accordance with ASTM E2174 or other recognized standard.

3.7 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 Remove temporary dams after initial set of fire stopping and smoke seal materials.

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 C834-10, Standard Specification for Latex Sealants.
 - .3 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .4 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.
 - .5 ASTM C1016-14, Determination of Water Absorption of Sealant Backing (Joint Filler) Material.
 - .6 ASTM C1193-13, Standard Guide for Use of Sealants.
 - .7 ASTM C1311-02, Standard Specification for Solvent Release Sealants.
 - .8 ASTM C1330-02 (2013), Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
 - .9 ASTM D1623-09, Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
 - .10 ASTM D5249-10(2016), Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.
 - .11 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .2 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
 - .3 CAN/CGSB 19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .4 CAN/CGSB 19.21-M87, Sealing and Bedding Compound, Acoustical.
 - .5 CAN/CGSB 19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .4 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 MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .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.
- .4 Perform acoustic sealant application work to ASTM C919.

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 Air/vapour barrier sealant and adhesive: To ASTM C920, Type S, Grade NS, Class 35, single component, low odour, moisture cure, medium modulus, low VOC.
 - .1 Adhesion to ASTM C719: $\pm 35\%$.
 - .2 Ultimate Elongation: 450 - 550%.
 - .3 Modulus, 100%: 275 - 345 kPa.

- .4 Shore A Hardness: 25 ± 5 .
- .5 Tensile Strength: 1034 – 1378 kPa.
- .6 Maximum VOC: 5 g/L.
- .5 Polyurethane Sealant: To CAN/CGSB 19.24, Type 2, Class B; and ASTM C920, Type M, Grade NS, Use NT, M, A and O; non-sag, multi component, chemical curing.
 - .1 Typical uses: Control joints in concrete floors (when no hard finish is specified), exterior joints, expansion joints, panel walls, perimeter windows.
- .6 Elastomeric Polyurethane Sealant: To CAN/CGSB 19.13, Type 2; and ASTM C920, Type S, Grade NS, Use NT, M, A and O; non-sag, single component, moisture curing hybrid polyurethane.
 - .1 Typical uses: Expansion and control joints, perimeter caulking of windows and doors.
- .7 Spray foam sealant: Spray applied polyurethane, closed cell, low pressure build foam, complying with AAMA 812.
- .8 Latex Sealant: To CAN/CGSB 19.17; and ASTM C834; single component, acrylic latex or siliconized acrylic latex.
 - .1 Typical uses: General purpose, acoustic sealing, window frame perimeters.
- .9 Acoustic Sealant: To CAN/CGSB 19.21 and ASTM C919, acoustic grade, single component, non-hardening, non-skinning.
 - .1 Typical uses: Acoustic sealing of gypsum wall board partitions, sealing of interior polyethylene air/vapour barrier.
- .10 Acoustic and Smoke Sealant: To CAN/CGSB 19.21 and ASTM C919, acoustic grade, single component, non-hardening, non-skinning.
 - .1 Typical use: Acoustic and smoke sealing of gypsum wall board partitions.
- .11 Fire-Resistive Sealant: To 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.
- .12 Silicone, one part: To CAN/CGSB 19.13; and ASTM C920, Type S, Grade NS; mildew resistant, single component, colour white unless otherwise specified.
 - .1 Typical uses: Around washroom fixtures, lavatories, janitor's sinks, and other wet areas.
- .13 Butyl: To CGSB 19-GP-14M and ASTM C1311, single component, butyl rubber sealant.
 - .1 Typical uses: gutter and flashing sealing, roof vents, metal panel joining, between base plates and slabs, bedding thresholds, secondary glazing seals.
- .14 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene foam: Extruded closed cell round foam backer rod, to ASTM C1330 Type C.

- .1 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/m³ 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.
- .15 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 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

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