1 GENERAL

1.01 WORK INCLUDED

.1 This Section specifies requirements for supplying and applying interior waterproofing to the interior walls and base slabs of the tanks in the cast-in-place cistern.

1.02 RELATED WORK

.1 Cast-in-Place Concrete: Section 03 30 00

1.03 ENVIRONMENTAL REQUIREMENTS

.1 Maintain surfaces and ambient air temperatures 5°C minimum, for minimum period of 48 hours before, during and after waterproofing application.

1.04 QUALIFICATIONS

.1 Perform work under this Section by qualified applicators employing skilled tradesmen trained by the waterproofing manufacturer.

2 PRODUCTS

2.01 SHEET MEMBRANE WATERPROOFING

.1 Flexible fibre-reinforced, cementitious slurry consisting of a 2-component (liquid/solid) product suitable for positive and negative hydrostatic pressure applications. System to be CEM-KOTE FLEX ST by Gemite, Planiseal 89 by Mapei Corp., Maxseal by Drizoro, or approved equivalent.

3 EXECUTION

3.01 INSPECTION

.1 Examine surfaces to receive waterproofing to assure they are smooth, dry, sound and free of surface irregularities, voids, coatings or conditions that will adversely affect execution, permanence, or quality of work.

.2 Arrange site meetings with the Departmental Representative to accept surfaces, set up job application schedules and for co-ordination required for effective application of the waterproofing system.

3.02 APPLICATION STANDARDS

.1 Apply waterproofing materials in strict accordance with the manufacturer's written instructions.

.2 Have the manufacturer provide field inspection and advise required to execute effective application.

3.03 SURFACE PREPARATION

.1 Smooth surfaces to be light sandblasted, clean and free of all foreign material.

3.04 MIXING SLURRY COAT

.1 Use separate containers for measuring products and water by volume. Use only clean water with a temperature above 15°C.

3.05 APPLICATION

.1 General:
- .1 All interior surfaces of cistern/tank are to receive waterproofing.
- .2 Prepare corners, edges and joints with dry pack mix or backing and sealants as required.

.2 Walls:
- .1 Apply waterproofing in slurry mix in two (2) passes. Apply the second pass while first pass is still tacky.
- .2 Apply using stiff brush or stiff broom and work into every irregularity of the surface.
- .3 Uniformly apply slurry coatings in the quantities recommended by the manufacturer.

3.06 CURING

.1 Keep waterproofing applications moist for a minimum period of three (3) days after initial set.

.2 Provide forced air circulation during the curing period in enclosed areas.

3.07 CLEAN-UP

.1 Clean down adjacent surfaces affected by waterproofing materials as work progresses and upon completion of the work. Remove surplus materials and rubbish from the work.

3.08 REPAIR OF SURFACES

.1 Repair defective surfaces for acceptance by the Departmental Representative.

.2 Repair surfaces found defective during the warranty period as approved by the Departmental Representative.

.3 Repair leaks observed on walls and slabs of water holding tanks and conduits using approved polyurethane resin. Apply resin through injection ports installed at 150 mm centres. Following remediation work, remove injection ports and plug holes using approved epoxy bonder. Repeat remediation procedure as necessary to fix leaking areas to the satisfaction of the Departmental Representative. Repaint repaired surfaces to the approval of the Departmental Representative.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF WORK

.1 Supply and installation of sheet waterproofing membrane to exterior of cistern/tank.

1.02 RELATED WORK

.1 Cast-in-Place Concrete: Section 03 30 00

1.03 QUALITY ASSURANCE

.1 Membrane: applied by applicator trained and approved by manufacturer for application of its products.

.2 Applicators: minimum five (5) years proven experience.

.3 Notify the manufacturer's representative of work start-up by applicator.

.4 Manufacturer's representative:
- .1 Inspect substrate prior to commencement of work, during application of membrane and upon completion of work.
- .2 Provide technical assistance to applicator and assist where required in correct installation of membrane.

1.04 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit duplicate 300 x 300 mm samples of membrane waterproofing.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

.2 Store role materials in original packaging.

.3 Store adhesives and primers at temperatures of 5°C and above to facilitate handling.

.4 Keep solvent away from open flame or excessive heat.

.5 Protect rolls from direct sunlight until ready for use.

1.06 COORDINATION

.1 Maintain continuity of the waterproofing membrane throughout the work specified herein.

1.07 ENVIRONMENTAL PROTECTION

.1 Provide forced air circulation during installation and curing periods for enclosed applications.

1.08 WARRANTY

.1 Provide a warranty that explicitly states that the water-proofing membrane will stay in place and remain leakproof for two (2) years from the date of Substantial Performance.

.2 Provide a warranty that explicitly states waterproofing membrane will remain in a watertight condition and will not leak as a result of faulty materials for a period of five (5) years. Scope of warranty to include material required to return the membrane to a watertight condition.

2 PRODUCTS

2.01 MATERIALS

.1 Composite sheets comprised of rubberized asphalt integrally bonded to a film of high density cross laminated polyethylene, minimum 1.5 mm (60 mils) thick. The material must be suitable for application at low temperature.
  .1 Acceptable material: W.R. Grace Bituthene 3000, Nordshield waterproofing membrane, Bakor Elasto-Seal 2000 LT.
  .2 Primer: as recommended by the waterproofing manufacturer.
  .3 Mastic: as recommended by membrane manufacturer.
  .4 Adhesives: as recommended by membrane manufacturer.
  .5 Liquid membrane for detailing: as recommended by membrane manufacturer.
  .6 Protection board: semi-flexible board, compatible with waterproofing.
    .1 Acceptable products: Sealtight Vibraflex Waterproofing Protection Board - Type 150, Bakor 1/8" Asphalt Protection Board.

2.02 COMPATIBILITY

.1 Confirm all materials used are compatible.

.2 Provide proof of compatibility.

3 EXECUTION

3.01 GENERAL

.1 Install materials only in suitable weather, when there is no threat of precipitation, and in accordance with manufacturer's instructions.

3.02 PREPARATION

.1 Prime all surfaces to receive membrane waterproofing by means of roller or spray at a rate recommended by the manufacturer.

.2 Allow primer to dry adequately before proceeding with membrane. Avoid puddles.

.3 Treat only as much area as can be covered with membrane the same day. Primed surfaces not covered by waterproofing membrane during the same working day must be re-primed.

.4 Metal surfaces must be free of grease, oil dirt, loose paint, rust or other contaminants.

.5 Concrete surfaces to be smooth, clean, dry and free of foreign matter.

3.03 APPLICATION OF MEMBRANE

.1 Provide waterproofing to top/roof slab and exterior walls of cistern/tank.

.2 Do waterproofing work in accordance with membrane manufacturers printed application instructions, except where specified otherwise.

.3 Apply membrane fully adhered to surfaces as indicated.

.4 Lap membrane joints minimum 60 mm. Roll all seams continuously.

.5 Lap sheets minimum 100 mm at junction of horizontal and vertical surfaces.

.6 Install reinforcing strip of membrane waterproofing over all outside corners. Install reinforcing strips prior to field membrane application.

.7 Centre reinforcing strip of membrane waterproofing over non-working joints and cracks up to a maximum of 6 mm. Width of reinforcing strip as recommended by manufacturer.

.8 Notify the Departmental Representative of non-working joints over 6 mm and treat as directed.

.9 Apply liquid mastic to horizontal and vertical terminations.

.10 Seal daily terminations with mastic.

.11 Seal penetrations through membrane with liquid membrane and sheet membrane as recommended by manufacturer.

3.04 PROTECTION BOARD

.1 Confirm the membrane is undamaged before application of protection board.

.2 Apply protection board over entire surface of waterproofing membrane using compatible adhesive. Follow manufacturer's recommendations.

.3 Do not backfill until after the protection board is applied.

3.05 FIELD QUALITY CONTROL

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

3.06 CLEAN-UP

.1 Remove debris and surplus materials from site.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF WORK

.1 Supply and installation of polystyrene insulation where indicated on the Project Drawings.

1.02 REFERENCES

.1 ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.2 CGSB 71-GP-24M-AMEND, Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.

2 PRODUCTS

2.01 INSULATION

.1 Rigid board below grade: extruded, closed cell, cellular foamed polystyrene to CAN/ULC S701, Type 3, thickness indicated, shiplapped edges.

.1 Acceptable material: Styrofoam SM by Dow Chemical Canada Inc., Celfort 300 as manufactured by Owens Corning, Foundation Plus by TrueFoam.

2.02 ADHESIVE

.1 Adhesive (for polystyrene): to CGSB 71-GP-24M, type and class as approved by the board manufacturer. Adhesive to have adequate early and permanent bond, tensile strength necessary for application, and service temperature between high and low temperatures that it will be subjected to.

2.03 ACCESSORIES

.1 Tape: as recommended by manufacturer.

3 EXECUTION

3.01 PERIMETER FOUNDATION INSULATION

.1 Exterior application - Underground reservoir: install boards vertically against walls and horizontally on top of tanks, as detailed.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C356-10, Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
- .2 ASTM C591 13, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .3 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- .4 ASTM C665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .5 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .6 ASTM C1104/C1104M-13a, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- .7 ASTM C1320-10(2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .8 ASTM D1621-16, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- .9 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .10 ASTM E84-16, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .11 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
- .12 ASTM E136-16a, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 71-GP-24M-AMEND-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA)
.1 NFPA (Fire) 220, Standard on Types of Building Construction, 2015 Edition.

.5 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
.3 CAN/ULC S604-16, Standard for Factory Built Type A Chimneys.
.4 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.5 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings.
.6 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.03 ACTION AND INFORMATION 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 board insulation and 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. Indicate VOC's during application and curing.

.3 Certificates:
.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports:
.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.5 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.04 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 Delivery and Acceptance Requirements: 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 specified materials from distortion, deterioration, wetting, or damage.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 INSULATION

.1 Foundation Wall Insulation: Extruded polystyrene (XPS) to CAN/ULC S701 and meeting or exceeding following minimum requirements:
.1 CAN/ULC S701 Type 4.
.2 Thermal Resistance: RSI 0.87/25 mm minimum.
.3 Edges: ship-lapped.
.4 Size: 610 mm x 2440 mm x thickness as indicated on Drawings.
.5 Compressive Strength: minimum 170 kPa at 10% deformation in accordance with ASTM D1621.
.6 Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842.

.2 Wall Insulation: unfaced preformed rigid mineral wool insulation, to CAN/ULC S702 Type 1, and meeting or exceeding following minimum requirements:

.1 Recycled Option: supply fiber with minimum 75% recycled content.
.2 ASTM C665: non-corrosive, Type I.
.3 ASTM C795: Pass.
.4 ASTM C612: Type IA, IB, IVA.
.5 ASTM E136: non-combustible as defined per NFPA(Fire)220.
.6 CAN/ULC S114: Compliant.
.7 ASTM E96: 50 Perms as tested.
.8 CAN/ULC S102: Flame Spread 0, Smoke Developed 5.
.9 ASTM C1104: absorbs ≤0.03% by volume.
.10 ASTM C356: Linear Shrinkage <2% 650°C.
.11 ASTM E518 ("k" @ 24°C): 4.5 pcf density,≥0.23 BTU.in/hr.sq.ft.°F.

2.02 ADHESIVE

.1 Insulation Adhesive: synthetic rubber-based insulation adhesive compatible with polystyrene insulation; suitable for application in temperature down to 12°C, as recommended by insulation manufacturer, suitable for conditions and substrates.

2.03 ACCESSORIES

.1 Protection Board: asphalt-impregnated fibreboard: 13 mm thickness.

.2 Perimeter Insulation Flashings: Coordinate supply of end closures and flashings for perimeter insulation system with Section 07 62 00 – Sheet Metal Flashing and Trim.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for board insulation application in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied. Proceeding with work means acceptance of conditions.

3.02 INSTALLATION

.1 Install insulation materials in accordance with manufacturer's printed installation instructions, technical datasheets, details and guide specifications.

.2 Install insulation after building substrate materials are dry.

.3 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.4 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4 S604 type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.

.6 Use only insulation boards free from chipped or broken edges that are dry, and unsoiled and that has not been left exposed at any time to ice and snow.

.7 Use largest possible dimensions to reduce number of joints.

.8 Offset both vertical and horizontal joints in multiple layer applications.

.9 Do not enclose insulation until it has been reviewed by Departmental Representative.

.10 Install rigid insulation to maintain continuous thermal insulation, vapour barrier and air tightness for building spaces and elements.

.11 Saw-cut and trim insulation neatly to fit spaces. Butt edges and ends tight. Fit insulation tight against mechanical, electrical and other items protruding plane of insulation. Fill voids with foamed-in-place insulation compatible with installed insulation; refer to Section 07 21 19 - Foamed-in-Place Insulation.

.12 Follow the instructions for use of materials of insulation and accessory manufacturers.

.13 Install insulation horizontally. Offset vertical joints minimum 300 mm.

.14 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150 mm wide strip of primary vapour membrane over expansion and control joints using compatible adhesive.

3.03 PERIMETER FOUNDATION WALL INSULATION

.1 Install board insulation to vertical surfaces with adhesive applied in accordance with manufacturer's written instructions, and as follows:
- .1 Exterior Application: Extend boards as indicated on Drawings, installed on exterior face of perimeter foundation wall. Concrete faced board to be used at upper course of insulation where exposed above grade.
- .2 Apply adhesive to the substrate by the "dab" method not less than 10 mm x 20 mm size at 150 mm centres. Bed the insulation in the adhesive before the adhesive loses its tack or skins over.
- .3 Install cement board as indicated, adhesively bonded.
- .4 Protect below grade installations from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

3.04 STUD WALL INSULATION

.1 Install insulation between framing members, structural components and other items snug and tight.

.2 Cut and trim insulation neatly to fit spaces. Use insulation free from ripped or damaged back and edges.

.3 Do not compress insulation to fit into spaces.

.4 Install insulation where indicated in accordance with ASTM C1320.

.5 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.6 Fill stud space of exterior framed walls with insulation full depth of stud.

.7 Hold insulation in position with clips, wires or as recommended by manufacturer when insulation is installed in horizontal locations.

.8 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with local Construction/Demolition Waste Management regulations.

3.06 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by work of this Section.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 09 21 16 – Gypsum Board Assemblies.

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C167-09, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
- .2 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .3 ASTM C665-12, Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .4 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .5 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC S102-10, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
- .3 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings.

1.03 ACTION AND INFORMATION 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 blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports:
.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.04 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 Delivery and Acceptance Requirements: 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 Store and protect specified materials from getting wet and from damage or deterioration.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 WALL INSULATION (SOUND ATTENUATION BLANKET)

.1 Fibrous mineral wool insulation for rated and non-rated partition wall assemblies: Un-faced, preformed mineral wool fibrous insulation in accordance with CAN/ULC S702 Type 1, and meeting or exceeding following minimum requirements:
.1 ASTM C612 Type: IVA.
.2 Thermal Resistance: nominal RSI of ≥0.67/25 mm.
.3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S114.
.4 CAN/ULC S102 test results:
.1 Flame spread index = 0.
.2 Smoke developed index = 0.
.5 CAN/ULC S114: non-combustible.

.6 CAN/ULC S115: passes.
.7 CAN/ULC S129: smoulder Resistance - 0.01%.
.8 ASTM C1104: moisture sorption – 0.04%.
.9 ASTM C1338: determination of fungi resistance - passed.
.10 Density to ASTM C303: 72 kg/m^3.

2.02 ACCESSORIES

.1 Insulation clips:
.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, self-adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

.2 Nails: galvanized steel, length to suit insulation plus 25 mm, to ASTM F1667.

.3 Staples: galvanized, 12 mm minimum leg.

.4 Tape: as recommended by manufacturer.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for blanket insulation application in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied. Proceeding with work means acceptance of conditions.

3.02 INSULATION INSTALLATION

.1 Install batts between framing members, structural components and other items snug and tight.

.2 Cut and trim batts neatly to fit spaces. Use batts free from ripped or damaged back and edges.

.3 Do not compress insulation to fit into spaces.

.4 Install batt insulation where indicated with continuous vapour retarder on the warm side of the insulation in accordance with ASTM C1320.

.5 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.6 Fill stud space of exterior framed walls with insulation full depth of stud only where no insulation/vapour retardant indicated on exterior face of stud walls.

.7 Hold insulation in position with clips, wires or as recommended by manufacturer when insulation is installed in horizontal locations.

.8 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 07 27 00.01 - Air Barriers and Vapour Retarders.

1.02 REFERENCES

.1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

.3 South Coast Air Quality Management District (SCAQMD), California State
  .1 SCAQMD Rule 1113-06, Architectural Coatings.

.4 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 S705.1-15, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification.
  .4 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.

1.03 ACTION AND INFORMATION 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 and include product characteristics, performance criteria, physical size, finish and limitations.
  .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
.2 Submit test reports in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and replacement procedures at end of lifecycle.
.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3-days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.04 QUALITY ASSURANCE

.1 Applicators to conform to CUFCA Quality Assurance Program.

.2 Qualifications:
.1 Installer: Use company that is a member of and licensed by CUFCA, and committing trained and certified installers to the project in accordance with CAN/ULC S705.2 and CUFCA requirements.
.2 Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section.

.3 Cooperate and coordinate with the requirements of other units of work specified in other specification sections.

.4 Health and Safety Requirements: worker protection:
.1 Protect workers to CAN/ULC S705.2 and manufacturer's recommendations.
.2 Workers must wear gloves, dust masks, long sleeved clothing, and eye protection when applying foam insulation.
.3 Workers must not eat, drink or smoke while applying foam insulation.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

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

1.06 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-hour 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.

2 PRODUCTS

2.01 MATERIALS

.1 Foamed-in-place insulation: Class 1, single-component polyurethane foam conforming to CAN/ULC S710.1, with flame spread rating of 20 and smoke developed 25. Must be ozone friendly and containing no fluorocarbons. Density of (20.8 to 28.8 kg/cu.m.) (1.3 to 1.8 lbs./cu.ft.) and minimum (RSI-value of 0.79 per 25 mm) (R-value of 4.5 per 1") thickness. VOC limit is 250 g/L. (Classified as Special Purpose Contact Adhesive).

.2 Primers: in accordance with manufacturer's recommendations for surface conditions.
.1 VOC limit to SCAQMD Rule 1113.

.3 Thermal Barrier: spray-applied fire-retardant overcoat meeting applicable requirements of the NBC for thermal barrier of foamed plastic.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets, and details.

3.02 PREPARATION

.1 Clean spaces that are to receive insulation, of dirt, dust, grease, loose material or other foreign matter that may inhibit adhesion.

.2 Provide sufficient ventilation during and until insulation has cured, to ensure safe working conditions. Introduce fresh air and exhaust air continuously during the 24-hour period after application.

.3 Protect adjacent surfaces from overspray and dusting.

.4 Prior to application, slightly moisten surfaces to which foam in place insulation is being applied, to accelerate curing.

.5 Temporarily brace frames as may be required to prevent possible bowing of frames due to over expansion of the foam in place insulation.

3.03 GENERAL APPLICATION REQUIREMENTS

.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.

3.04 EXTERIOR DOOR FRAMES AND LOUVERS

.1 Install foam in place insulation around all exterior window frames to maintain continuity of the thermal barrier, after air barrier has been installed and sealed to windows.

.2 Ensure that foam completely fills spaces, without voids, and that foam is continuous at corners.

3.05 PROTRUSIONS THROUGH AIR SEAL

.1 Install foam in place insulation around all protrusions through the exterior building envelope to achieve and maintain continuity of air/vapour seal.

3.06 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
  .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.4 Cut back excess foam in place insulation once cured, flush with surrounding surfaces, or recess back for application of sealant as specified in Section 07 92 00.

.5 Upon completion of foam-in-place insulation work, clean adjacent surfaces of overspray and dusting.

.6 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 21 13 - Board Insulation.

.3 Section 07 31 29 – Wood Shingles and Shakes.

1.02 REFERENCES

.1 ASTM International Inc.
- .1 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
- .2 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- .3 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- .4 ASTM D1970/D1970M-17, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .5 ASTM D5034-09(2013), Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
- .6 ASTM E84-16, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
- .8 ASTM E1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- .9 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

.2 American Association of Textile Chemists & Colorists (AATCC)
- .1 AATCC TM127:2014, Water Resistance: Hydrostatic Pressure Test.

.3 International Code Council (ICC) Evaluation Services (ES)
- .1 ICC-ES AC38 Acceptance Criteria for Water-resistive Barriers, 2015.
- .2 ICC-ES AC58 Acceptance Criteria for Adhesive Anchors in Masonry Elements, 2015.

.4 Air Barrier Association of America (ABAA) / National Air Barrier Association (NABA)
.1 ABAA Section 072761 Self-Adhered Sheet Air Barrier.

.5 Sealant Waterproofing and Restoration Institute (SWRI)
.1 Sealants: The Professionals' Guide, 2013.

.6 Underwriters Laboratories of Canada(ulc)
.1 CAN/ULC 741-08, Standard for Air Barrier Materials – Specification.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meeting:
.1 Convene one week before commencing work of this specification section.
.2 Arrange for manufacturer’s factory-trained agent to be on site at beginning of installation to provide training and supervision of personnel who will install membrane. Agent shall also provide frequent inspection visits thereafter to assure quality and competence of membrane installations.

1.04 ACTION AND INFORMATION 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, and include product characteristics, performance criteria, physical size, finish, and limitations.
.2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.
.3 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Samples:
.1 Provide duplicate 200 mm x 200 mm samples of membrane adhered to all project substrates, including adjoining membranes specified in other Sections.

.4 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and replacement procedures at end of lifecycle.
.4 Manufacturer's Field Reports: submit manufacturer's written reports within 3-days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.05 QUALITY ASSURANCE

.1 Mock-Up:
.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
.2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window and frame and sill, insulation, building corner condition, and 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 review of mock up by Departmental Representative before proceeding with air/vapour barrier Work. Accepted mock-up will demonstrate minimum standard of quality required for this project.

.2 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.

1.06 DELIVERY, STORAGE AND HANDLING

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

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

.3 Avoid spillage: immediately notify Departmental Representative if spillage occurs and start clean up procedures.

.4 Clean spills and leave area as it was prior to spill.

1.07 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

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

.3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.08 SEQUENCING

.1 Sequence work in accordance with Construction Progress Schedule.

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

.3 Overlap (shingle) materials to direct water down and away from the structure.

1.09 WARRANTY

.1 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

2 PRODUCTS

2.01 SINGLE SOURCE

.1 Single Source Requirement: for each product specified, supply from a single manufacturer of that product.
  .1 Systems shall be compatible with adjacent systems, and capable of effective overlap and tie-ins achieving continuous vapour retarder and air barrier performance.

2.02 VAPOUR-PERMEABLE WATER-RESISTIVE AIR BARRIER

.1 Substrate:
  .1 Walls: Exterior Grade Douglas Fir or Pine Plywood, to Section 06 10 00.
  .2 Metal Roofing: Nail Laminated Timber (NLT) & Plywood Structural Diaphragm.

.2 Self-Adhered Vapour-Permeable Water-Resistive Air Barrier: self-adhering reinforced modified polyolefin tri-laminate sheet air barrier membrane for wall construction, specifically designed to be water-resistant and vapour-permeable. Adhesive backing to be protected with 3-piece release film. Membrane shall meet or exceed the following minimum physical properties and tested values:
  .1 Thickness: 0.58 mm.
  .2 Minimum Application Temperature: -7°C.
  .3 Service Temperature: -40°C to +82°C.
  .4 Air Permeance @75Pa, to CAN/ULC S741: ≤0.0147 L/s.m.^{2}.
  .5 Air leakage, to ASTM E2357: Pass.
  .6 Air Leakage Rate, to CAN/ULC S741: Classification A1.
  .7 Water Resistance, to AATCC TM127: Pass.
  .8 Low Temperature Flexibility, to ICC-ES AC38/3.3.4: Pass.
  .9 Peel-Adhesion of Unprimed Wood, to ICC-ES AC38, and AAMA 711: Pass.
  .10 Nail Seal Ability, to ASTM D1970 Modified: Pass.
  .11 Water Vapour Permeance, to ASTM E96, Method A: 1658 ng/Pa.m^2.s.
  .12 Tensile Strength, dry, to ASTM D882: ≥182 N MD, ≥129 N CD.
  .13 Average Breaking Force, dry, to ASTM D5034: ≥565 N MD, ≥405 N CD.
  .14 Accelerated Aging, to ICC-ES AC48: Pass.
  .15 Cycling and Elongation, to ICC-ES AC48: Pass.

.16 Flame Spread Index, to ASTM E84: 0, Class A.
.17 Smoke Developed, to ASTM E84: 105, Class A.
.18 NFPA 285 standard fire test method in various wall assemblies: Complies.

2.03 VARIABLE VAPOUR-PERMEABLE VAPOUR RETARDER (INTERIOR APPLICATION)

.1 Vapour Retarder: instead of conventional polyurethane sheet, supply and install low-VOC variable vapour-permeable vapour retarder film; polyimide (nylon) or polyethylene copolymer membrane with polypropylene fleece and polypropylene non-woven fabric reinforcement; meeting or exceeding the following minimum requirements:
.1 Thickness: 0.05 mm.
.2 High moisture-variable diffusion resistance in any climate spanning range of more than 100 times:
.1 S_d-value: 0.25 m to above 25 m.
.2 G-value: 1.25 to above 125 MN·s/g.
.3 Vapour permeance: <0.13 to above 13.
.3 Fire Resistance: Class A, to ASTM E84.
.1 flame spread = 0; smoke developed ≤ 35.
.4 Vapour Permeance, to ASTM E96, Method A: similar to 10 ng/s•m^2•Pa ± .5 ng/s•m^2•Pa.
.5 Air Permeance, to ASTM E2178: similar to 0.025 L/s•m^2 @ 75 Pa.
.6 Performance: marketed as “smart” or “intelligent” vapour retarders in that vapour permeance of material responds to ambient humidity conditions, permitting greater vapour diffusion under higher humidity levels (summer) and lower vapour diffusion under lower humidity levels(winter).

2.04 UNDER-SLAB VAPOUR RETARDER

.1 Vapour Retarder for installation under concrete slabs shall meet or exceed the requirements of ASTM E1745, Class A, minimum 0.38 mm thick.

.2 Accessories: Provide the manufacturer's recommended seam tape and accessories as required for a complete installation.

2.05 FOAMED-IN-PLACE INSULATION AND JOINT SEALANTS

.1 Foam-in-place insulation: to Section 07 21 19 – Foamed-in-Place Insulation.

.2 Joint Sealants: to Section 07 92 00 - Joint Sealants.

.3 Primers: as recommended by manufacturer for substrate and conditions.

2.06 ACCESSORIES

.1 Membrane Tape and Sealants: structural adhesive sealants and tape for variable vapour-permeable vapour retarder membrane capable of permanently sealing joints without losing bond or adhesion over time.

.2 Thinners and cleaners: as recommended by air barrier membrane manufacturer.

.3 Attachments: hot dipped galvanized steel bars and anchors.

.4 Transition Membranes: Manufacturer’s recommended reinforced self-adhesive, compatible with adjacent air and vapour membranes, self-adhering sheet waterproofing and wall materials specified in this Section.

.5 Through-wall flashing membrane (self-adhering) shall be manufactured by Self-Adhered Vapour-Permeable Water-Resistive Air Barrier manufacturer; an SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film.

.6 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.

.7 Self-Adhered membranes for door and louver sill pan flashings shall be manufactured by Self-Adhered Vapour-Permeable Water-Resistive Air Barrier manufacturer; an SBS modified bitumen, self-adhering sheet membrane which is integrally laminated to a polyethylene film.

.8 Self-adhering membrane for all window jambs, headers, door openings, inside and outside corners, and other transitions shall be pre-cut Window & Door Flashing manufactured by Self-Adhered Vapour-Permeable Water-Resistive Air Barrier manufacturer; a self-adhering reinforced modified polyolefin tri-laminate sheet air barrier membrane for wall construction, specifically designed to be water resistant and vapour permeable.

.9 Adhesive Primers and Adhesives: all primers and adhesives shall be manufactured by the air barrier system manufacturer and compatible with systems installed:
.1 Adhesive Primer for primary self-adhering water resistive air barrier membrane, self-adhering transition membrane and SBS modified bitumen membranes at all temperatures; synthetic rubber based adhesive, quick setting.
.2 Adhesive with low-VOC content for self-adhering membranes at all temperatures; synthetic rubber based adhesive, quick setting.
.3 Primer for self-adhering membranes at temperatures above -4°C; polymer emulsion based adhesive, quick setting.

.10 Penetration and Termination Sealants: all penetration and termination sealants shall be manufactured by the air barrier system manufacturer and compatible with systems installed.
.1 Termination Sealant shall be moisture cure, medium modulus polymer modified sealing compound.
.2 Termination sealant shall be a non-sag, non-staining, one-component, high performance thermoplastic sealant.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets, guide specifications and details.

3.02 GENERAL

.1 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

.2 Work shall meet or exceed the requirements of ABAA Section 072761 Self-Adhered Sheet Air Barrier, latest edition.

3.03 EXAMINATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.

.3 Report unsatisfactory conditions to Departmental Representative in writing.

.4 Do not start work until deficiencies have been corrected.
.1 Beginning of Work implies acceptance of conditions.

3.04 ENVIRONMENTAL REQUIREMENTS

.1 All membrane shall be installed at surface and ambient temperature of 5 degrees C or above, in dry weather conditions.

.2 For applications below 5 degrees C consult membrane manufacturer's technical representative for instructions and, obtain Departmental Representative's approval before proceeding with Work.

.3 Do not install during rain or inclement weather. Do not install materials over frost covered or wet surfaces.

.4 Store material above 50°F (10°C) prior to installation.

.5 Cut manageable lengths and lay out material in the sun prior to installation.

.6 Use a manufacturer-approved primer/adhesive to aid in adhesion.

3.05 SUBSTRATE CONDITIONS

.1 Appropriate substrate conditions are critical to obtain proper adhesion; ensure surfaces are ready for product installation and are in accordance with manufacturer’s installation guideline.

.2 Do not install until substrate conditions are in accordance with this installation guideline.

.3 Substrate must be continuous and secure.

.4 Mechanical fasteners used to secure substrate shall be set flush with substrate and secured into solid backing.

.5 Adjacent or multiple pipe penetrations through sheathing should be sufficiently spaced apart, typically 100-150 mm, to allow proper detailing of individual pipes.

.6 Wood substrates shall have an average moisture content not in excess of 12%.

3.06 PREPARATION

.1 Ensure all required preparatory work is complete prior to applying air barrier assembly products.

.2 Surfaces shall be sound, dry to touch, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, and other contaminants.

.3 Repair or replace products that are not installed to create a continuous and secure substrate.

.4 Protect adjacent surfaces to prevent spillage and overspray.

.5 Cap and protect exposed back-up walls against wet weather conditions during and after application.

.6 Ensure metal closures are free of sharp edges and burrs.

.7 Prime all substrate surfaces to receive adhesive and sealants.

.8 Prime all substrate surfaces to receive self-adhesive air barrier membrane products and accessories.

3.07 VARIABLE VAPOUR-PERMEABLE VAPOUR RETARDER

.1 Install at interior side of exterior walls over wood stud and cavity insulation assembly prior to application of gypsum board.

.2 Verify that services are installed and have been accepted by the Departmental Representative and Authorities Having Jurisdiction prior to installation of vapour retarder.

.3 Install sheet vapour retarder on warm side of exterior wall assembly prior to installation of gypsum board in accordance with manufacturer’s written installation instructions.

.4 Use sheets of largest practical size to minimize joints.

.5 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.

.6 Openings:
.1 Cut sheet vapour barrier to form openings and lap and seal to window and door frames in accordance with good building envelope practice.

.7 Seal perimeter of sheet vapour retarder 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 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
.4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.

.8 Seal lap joints of sheet vapour retarder 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 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
.5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
.6 At overlap joints, reinforce joint seal by sticking strips of adhesive tape at right angles to overlap every 30 cm.

.9 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
.1 Install moulded box vapour retarder:
.2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.08 VAPOUR-PERMEABLE WATER-RESISTIVE AIR BARRIER

.1 Locations:
.1 Walls: install over sheathing.
.1 Coordinate with Section 06 20 00.

.2 Sheathing: Exterior Grade Douglas Fir or Pine Plywood.

.2 Application of Substrate Adhesive Primer:
.1 Required Adhesive Primer for SBS Modified Self-Adhered Membranes:
.1 For the application of SBS modified self-adhered window sill pan flashings, through-wall flashings and other applications of SBS modified self-adhered transition membranes, the substrate shall be conditioned with applicable primer.
.2 Apply primer at rate recommended by manufacturer to all areas to receive SBS modified self-adhering sheet membrane by roller and allow to dry.
.3 Primed surfaces not covered by self-adhering membrane or self-adhering through-wall flashing membrane during the same working day shall be re-primed.
.2 Adhesive Primer for Primary Water Resistive Air Barrier Membrane:
.1 Adhesive prime all substrate surfaces with adhesive primer.

.3 To the extent practicable, pre-cut membrane to manageable lengths each day.

.4 Install multiple courses in shingle fashion at overlaps to properly shed water and avoid reverse laps. Use a non-metallic roller to apply membrane firmly and evenly to substrate; blind nail within lap to be covered to hold in place during cold weather applications.

.5 Seal inside and outside corners of sheathing boards with a strip of self-adhering vapour permeable membrane extending a minimum of 75 mm on either side of the corner detail.
.1 For inside corners, pre-treat the corner with a continuous 13 mm bead of termination sealant.
.2 Prime surfaces where appropriate due to surface conditions, to achieve surface adhesion as per manufacturers' instructions and allow to dry.
.3 Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all side laps and 75 mm overlap at all end laps of membrane.
.4 Roll all laps and membrane with a counter top roller to ensure seal.

.6 Tie-in at the interface of dissimilar materials with self-adhered air barrier transition membrane.
- .1 Prime surfaces and allow to dry.
- .2 Align and position self-adhering transition membrane, remove protective film and press firmly into place. Provide minimum 75 mm lap to all substrates.
- .3 Ensure minimum 50 mm overlap at all side laps and 75 mm overlap at all end laps of membrane.
- .4 Roll all laps and membrane with a non-metallic countertop roller to ensure seal.

.7 Place specified SBS modified self-adhered louver sill pan flashing membrane across louver sills. Pre-treat inside corners with a bead of termination sealant. Install louver sill pan membrane and end dam terminations, seal cuts and terminations with termination sealant per louver manufacturers instructions and ASTM E2112.
- .1 Wrap head and jamb of rough openings with specified self-adhered water resistive air barrier transition membrane as detailed.
- .2 Extend specified self-adhered water resistive air barrier membrane into rough window openings sufficient to provide a connection to interior vapour retarder.
- .3 Prime surfaces where appropriate to achieve surface adhesion as per manufacturers' instructions and allow to dry.
- .4 Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all side laps and 75 mm overlap at all end laps of membrane.
- .5 Roll all laps and membrane with a counter top roller to ensure seal.

.8 Apply through-wall flashing membrane along the base of masonry veneer walls and over lintels as detailed.
- .1 Apply adhesive primer to surfaces and allow to dry, press membrane firmly into place, over lap minimum 50 mm at all side and end laps. Promptly roll all laps and membrane to ensure the seal.
- .2 Applications shall form a continuous flashing membrane and shall extend up a minimum of 200 mm up the back-up wall.
- .3 Seal the top edge of the membrane where it meets the substrate using termination sealant. Trowel-apply a feathered edge to seal termination to shed water.

.4 Install through-wall flashing membrane and extend 13 mm from outside edge of veneer. Provide “end dam” flashing.

.9 Apply self-adhering water resistive air barrier membrane complete and continuous to substrate in an overlapping shingle fashion and in accordance with manufacturer's recommendations and written instructions. Stagger all vertical joints.
.1 Prime surfaces and allow to dry.
.2 Align and position self-adhering membrane to substrate, remove top panel of protective release film and press firmly into place.
.3 Ensure alignment, hold membrane in place to avoid wrinkles and sequentially remove remaining panels of protective film and press firmly into place.
.4 Ensure minimum 75 mm overlap at all end and 50 mm side laps of subsequent membrane applications.
.5 Apply pressure roller to all membrane surfaces, laps and flashings with a counter top roller or ‘J-roller’ to ensure appropriate surface adhesion.
.6 At the end of each days work seal the top edge of the membrane where it meets the substrate with termination sealant. Apply to a feathered edge to seal termination and shed water.

.10 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary water resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with specified termination sealant.

3.09 UNDER-SLAB VAPOUR RETARDER

.1 Prepare surfaces in accordance with the manufacturer's printed instructions.

.2 Install Vapour Retarder under the slab.

.3 Continuous Vapour Retarder shall be installed around underground ducts in accordance with the Sheet Metal and Air Conditioning Contractors' National Association's (SMACNA) construction standards. Coordinate Work with other trades.

.4 Installation shall be in accordance with the manufacturer's printed instructions, and the requirements of ASTM E1643.

.5 Unroll the Vapour Retarder with the longest dimension parallel with the direction of the pour.

.6 Lap the Vapour Retarder over footings and seal to foundation walls.

.7 Overlap joints 152 mm and seal with the manufacturer's seam tape.

.8 Seal all penetrations (including pipes) with the manufacturer's pipe boot.

.9 No penetration of the Vapour Retarder will be allowed, except for permanent utilities, unless approved in writing by Departmental Representative. Seal all penetrations as recommended by the manufacturer.

.10 Repair damaged areas by cutting patches of Vapour Retarder, overlapping the damaged area 152 mm, and taping all four sides with tape.

3.10 FIELD QUALITY CONTROL

.1 Make notification when sections of Work are complete to allow review prior to covering air barrier systems.

.2 At fully adhered air-vapour barrier membrane application locations, perform pull-off tests on applied sheet membrane air-vapour barrier material to ensure adequate adhesion of the membrane to the substrate using equipment specifically design for that purpose. Pull-off adhesion shall be ≥15 psi to ASTM D4541 or ASTM D7234 depending on substrate (modified, 100 mm wood puck). Ensure that adhesion test results meet these criteria before Work by other trades proceeds. Re-do work as required to ensure adequate adhesion.

.1 Perform at least one test randomly per every 25 m^2 as directed by Departmental Representative; repair test areas at no extra cost to Departmental Representative.

.3 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of work in handling, installing, applying, protecting, and cleaning products, and submit Manufacturer's Field Reports to Departmental Representative.

.2 Provide manufacturer's field services consisting of attendance of pre-installation meeting, product use recommendations, and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.4 Departmental Representative shall review installed membranes for continuity of membrane installation prior to placement of insulation.

.5 Schedule site visits to review work at each stage and before covering.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.12 PROTECTION OF WORK

.1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

.4 Cover membranes within thirty days of installation

.5 Damp substrates shall not be inhibited from drying out. Do not expose the backside of the substrate to moisture or rain.

.6 Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed air barrier installations.

.7 Drying time varies depending on temperature and relative humidity. At a temperature of 20 degrees C and 50% RH, protect the work against wet weather conditions for a minimum of 24-hours; Departmental Representative with manufacturer for other weather conditions.

.8 Cover with permanent cladding systems within 90 days of membrane installation.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 06 20 00 - Finish Carpentry.

.3 Section 07 27 00.01 - Air Barriers and Vapour Retarders.

.4 Section 07 62 00 - Sheet Metal Flashing and Trim.

.5 Section 07 92 00 - Joint Sealants.

1.02 REFERENCES

.1 Air Barrier Association of America (ABAA)

.2 ASTM International (ASTM)

.1 ASTM C695-15, Standard Test Method for Compressive Strength of Carbon and Graphite.

.2 ASTM D1777-96(2015), Standard Test Method for Thickness of Textile Materials.

.3 ASTM D1922-15, Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.

.4 ASTM D3462/D3462M-16, Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.

.5 ASTM D4533/D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.6 ASTM D5053-03(2015), Standard Test Method for Colorfastness of Crocking of Leather.

.7 ASTM D5261-10, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

.8 ASTM E84-16, Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.

.10 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.

.11 ASTM E283-04(2012), Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.12 ASTM E2178-13 Standard Test Method for Air Permeance of Building Materials.
.13 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
.14 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 CSA Group (CSA)
.1 CSA O118.2-08(R2013), Eastern White Cedar Shingles.
.2 CAN/CSA O141-05 (R2014), Softwood Lumber.

.4 Cedar Shake and Shingle Bureau (CSSB)
.1 CSSB-2013, Cedar Shake and Shingle Grading Rules.
.2 CSSB Exterior and Interior Wall Manual for Sidewall Application Details, March 2015.

.5 Maritime Lumber Bureau (MLB) Grading Agency.

.6 National Lumber Grades Authority (NLGA)
.1 NLGA Standard Grading Rules for Canadian Lumber (2014 Edition).

.7 National Research Council Canada (NRC)
.1 National Building Code of Canada 2010 (NBC).

.8 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC S102-11, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.

1.03 DEFINITIONS

.1 Shingle: tapered slice of wood sawn from block with taper in direction of grain or axial direction.

1.04 ACTION AND INFORMATION 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 wood shingles and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Include information on preservation and restoration of shingles.

1.05 QUALITY ASSURANCE

.1 Mock-ups:
  .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
    .1 Construct 1200 mm x 1200 mm mock-up where directed by Departmental Representative.
    .2 For testing to determine compliance with performance requirements.
      .1 Perform tests as follows:
    .3 Allow 24 hours for inspection of mock-up before proceeding with work.
    .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.
      .1 Approved mock-up may remain as part of finished work.

.2 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.06 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 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
  .1 Exercise care to avoid damage during unloading and storing.
  .2 Store materials protected from the weather, off ground or indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .3 Store and protect shingles from damage, nicks, scratches, and blemishes.
  .4 Replace defective or damaged materials with new.
  .5 Remove only in quantities required for same day use.

1.07 UNUSED MATERIALS

.1 Unused shingles remain property of Departmental Representative.

.2 Return unused shingles to Departmental Representative. Retain packaging or rewrap shingles to form complete bundles.

.3 Label packages to identify product, quantity and manufacturer/supplier.

.4 Deliver and store in location designated by Departmental Representative.

1.08 WARRANTY

.1 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

2 PRODUCTS

2.01 MATERIALS

.1 Eastern White Cedar: kiln-dried, cedar shingle roofing, to CSA O118.2, Eastern White Cedar Shingles, FSC certified.
  .1 Grade: #1 Grade, to NLGA Standard Grading Rules for Canadian Lumber, graded by Maritime Lumber Bureau.
    .1 100% heartwood, 100% clear, and 100% edge grain.
    .2 457 mm lengths.
  .2 Moisture Content: kiln dried (seasoned) to 10-12% moisture content; confirm moisture content, and provide testing results to Departmental Representative prior to installation.

.2 Trim boards and other lumber (e.g., mouldings, facia and trim), as required for a complete installation:
  .1 Eastern White Cedar, to CSA 0141, East White Cedar (N), kiln dried (seasoned) to 10-12% moisture content, #1 Grade, to NLGA Standard Grading Rules for Canadian Lumber, graded by Maritime Lumber Bureau. Confirm moisture content and provide testing results to Departmental Representative prior to application.
  .2 Surface: surfaced one side and two edges (S1S2E).
  .3 Texture: smooth.

.3 Accessories:
.1 Fasteners: to ASTM F1667, Type 316 stainless steel, sized as required.
.1 Trim boards and other lumber: Type 316 stainless steel fasteners, suitable for fastening strapping to structural backup wall.
.2 Shingle installation: Type 316 stainless steel splitless ring shanked nails with minimum 0.6 cm flat head.

2.02 VENTILATING GRID SYSTEM (DRAINAGE PLAIN)

.1 Ventilating Grid: Rigid, flat 1220 mm x 2440 mm engineered plastic grid panels with 6 mm long stand-off dimples for an overall panel thickness of 13 mm. Weight per panel shall be approximately 3.6 kg (113 g lb/.09 sq.m.). Vertical load capacity: ≥3629 kg/.09 sq.m.. Ventilating grid shall be purpose-made to provide drainage and ventilation space in building assemblies (e.g., roof, wall, under slab, etc.).

.2 Ventilating grid manufacturer’s insect-resistant venting J-trim end closures made from PVC, with vent holes punched in bottom of trough for drainage and ventilation.

.3 Accessories: manufacturer’s supplied or recommended stainless steel fasteners suitable for job conditions and substrates.

2.03 WEATHER BARRIER SYSTEM (AIR-BARRIER)

.1 Weather Barrier (air barrier): in accordance with the requirements of Section 07 27 00.01 - Air Barriers and Vapour Retarders.

2.04 SHEATHING

.1 Sheathing: in accordance with Section 06 10 00 – Rough Carpentry: FSC Certified, Douglas Fir or Pine Exterior Grade Plywood.

2.05 AUXILIARY PRODUCTS

.1 Joint Sealants: to Section 07 92 00 - Joint Sealants.

.2 Sheet Metal Flashing and Trim: to Section 07 62 00 – Sheet Metal Flashing and Trim: pre-painted Galvalume™, colour to match adjacent materials, or as otherwise selected by Departmental Representative from manufacturer’s full range.

.3 Insulation: to Section 07 21 13 - Board Insulation: Cavity Wall Insulation.

2.06 FABRICATION

.1 Mill mouldings, facia, and trim to shapes as approved by Departmental Representative, and in accordance with Architectural Woodwork Standards (AWS), Premium Grade.

.2 Fabricate items rigid, plumb and square, as detailed, with tight, bevelled, hairline joints. Sand work smooth, set all nails and screws.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.
  .1 Visually inspect substrate in presence of Departmental Representative.
  .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 COMPLIANCE

.1 Comply with manufacturers’ printed installation instructions, technical datasheets, and standard and job specific details for each product and assembly specified.

.2 Work shall meet or exceed the recommendations of CSSB Exterior and Interior Wall Manual for Sidewall Application Details.

3.03 COORDINATION

.1 Coordinate and cooperate with the work of other trades as required to maintain construction schedule.

3.04 PREPARATION

.1 Install sheet metal flashings as required for proper drainage prior to installation of weather barrier materials. Weather barrier system shall overlap flashing for continuity of drainage and water flow management.

.2 Ensure protrusions that may penetrate water resistive barrier membrane are removed before beginning installation.

.3 Clean surfaces ready to receive materials.

3.05 WEATHER BARRIER SYSTEM (AIR-BARRIER)

.1 Weather Barrier (air barrier): installation shall be in accordance with the requirements of Section 07 27 00.01 - Air Barriers and Vapour Retarders.

3.06 VENTILATING GRID SYSTEM (DRAINAGE PLAIN)

.1 General: the gap (space between back of cladding and face of weather barrier) created by the ventilating grid system shall be minimum 25 mm.

.2 Confirm that weather barrier system has been fully installed and reviewed by Departmental Representative.

.3 Install grid system manufacturer’s insect-resistant venting J-trim at the bottom edge of base of walls, straight and true to line. Fasten in place as recommended by manufacturer.

.4 Install ventilating grid, working from edges and openings using an uncut side of ventilating grid as a starter whenever possible to provide adequate support for terminal ends and edges of cedar roof shingles. Ensure approximately 13 mm gap between sheets to allow for expansion.

.5 Cut ventilating grid sheets as required to suit during installation.

.6 Fasten to substrate through weather barrier using recommended fasteners; fasten through pre-formed attachment holes located at every 4th grid interstation..

3.07 APPLICATION

.1 Do wood shingle work in accordance with National Building Code of Canada (NBC) and CSA O118.2, Appendix B, except where indicated or specified otherwise.

.2 Install shingle siding to CSSB Exterior and Interior Wall Manual for Sidewall Application Details.

.3 Install shingles over ventilated rainscreen substrate.

.4 Space shingles from 6 to 10 mm.

.5 Stagger joints minimum of 40 mm in succeeding courses. Ensure that in any 3 courses no two joints are in alignment.

.6 Use two nails per shingle. Space nails 20 mm from edge and 40 mm above butt line of following course.

.7 Drive nails flush but do not crush shingles.

3.08 WALL SIDING SHINGLES AND SHAKES

.1 Underlayment: ventilated rainscreen system over weather barrier over sheathing.

.2 Install horizontally and fasten to sheathing with Type 316 stainless steel splitless ring shanked nails with minimum 0.6 cm flat head. Lap edges 75 mm.

.3 Install shingles using single course method to ensure double thickness at any given point. At external corners alternate overlap.

3.09 MOULDING, FASCIA AND TRIM INSTALLATION

.1 Installation standard and quality level: to Architectural Woodwork Standards (AWS), Premium Grade.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

.4 Fastening:
.1 Position items of finished carpentry work accurately,

level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Blind-nail to solid wood backing; fasteners shall penetrate 32 mm into backing.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposa.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by work of this Section.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 31 29 – Wood Shingles and Shakes.

1.02 REFERENCES

.1 The Aluminum Association Inc. (AAI)
- .1 AAI ASM35-2000 Specifications for Aluminum Sheet Aluminum Work in Building Construction.
- .2 AAI DAF45 03, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A653/A653M 15e1, 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 B209M-14, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric)
- .4 ASTM D4586-07(2012) e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .5 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 Canadian Roofing Contractors Association (CRCA)
- .1 Roofing Specifications Manual 2012.

.4 Canadian Standards Association (CSA International)
- .1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 Sheet Aluminum and Air Conditioning Contractors' National Association (SMACNA)
- .1 SMACNA Architectural Sheet Aluminum Manual, 7th Edition.

1.03 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.

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

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
.2 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3, FIELD QUALITY CONTROL.

1.04 QUALITY ASSURANCE

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and DEPARTMENTAL Representative to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building trades.
.4 Review manufacturer's installation instructions and warranty requirements.

.2 General: Fabricate and install sheet metal flashing and trim in accordance with SMACNA Architectural Sheet Metal Manual, and to the CRCA Roofing Specifications Manual.

.3 Sheet Metal Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

.4 Aluminum Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

1.05 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 SHEET METAL MATERIALS

.1 (General Use) Aluminum-zinc alloy (55% Al / 45% Zn) coated steel sheet: to ASTM A792/A792M, commercial quality, grade 37 with AZ180 coating, extra smooth surface, chemically treated (passivated) for unpainted finish and coated both sides with factory-applied clear organic resin coating, 0.55 mm minimum base metal thickness.

.2 (Flashing in direct contact with concrete or masonry substrates) Hot dip galvanized steel sheet (pre-finished): Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
.1 Class: F1S-Finished one side (manufacturer's standard prime finish on unexposed face).
.2 Thickness: minimum 0.55 mm base metal thickness.
.3 Surface: regular spangle.
.4 Corrosion-Resistant Coating: Hot dip galvanized steel sheet, to ASTM A653/A653M with Z275 designation zinc coating.
.5 Manufacturer’s Coil Coating System: silicone modified polyester (SMP) system, applied over a zinc phosphate pre-treatment, and high-performance, flexible primer.

.3 At aluminum window and door framing locations, formed aluminum flashing: Tension levelled, commercial quality aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 5005-H14 and as follows:

.1 Thickness: minimum 1.2 mm.
.2 Aluminum finish: match window framing finish.
.3 Unexposed aluminum: Mill finish.

.4 Form flashing, coping, and fascia to profiles indicated or as required to achieve the design intent illustrated on the Drawings.

2.02 FINISHES

.1 Colours shall be selected by Departmental Representative from manufacturer's full range, except as follows:
.1 Aluminum window flashing: match window framing finish.
.1 Appearance and properties of anodized finishes shall be Aluminum Association Architectural Class 1.

2.03 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Roofing Cement: to ASTM D4586, asphalt-based, asbestos free.

.3 Sealants: as indicated in Section 07 92 00 – Joint Sealants.

.4 Fasteners: of same material as sheet metal, to ASTM F1667, as recommended by sheet metal manufacturer; aluminum-zinc alloy galvanized or aluminum as required. Finish of exposed parts to match material being fastened.

.5 Washers: of same material as sheet metal, 1 mm thick with rubber packing.

.6 Solder: to ASTM B32, alloy composition Sn.
.1 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.7 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

.8 Metal Accessories: Provide non-corrosive sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work. Accessories shall match or be compatible with material being installed; size and thickness as required.

.9 Touch up paint: as recommended by prefinished material manufacturer.

2.04 FABRICATION

.1 Galvanized (zinc or aluminum-zinc as specified) sheet steel: Fabricate in accordance with SMACNA Architectural Sheet Metal Manual.

.2 Aluminum flashing (mill finished, pre-finished or anodized as specified) and other sheet aluminum work: Fabricate in accordance with AAI Aluminum Sheet Metal Work in Building Construction. Back-paint aluminum flashing in contact with concrete or masonry, or dissimilar metal, with bituminous paint prior to installation.

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

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

.5 Make flashings of prefinished metal for cap flashings as specified above for flashings adjacent to roofing at roof edges and area dividers, and where exposed to view from ground or an interior public area.

.6 Make flashings for other locations of hot dip galvanized metal, Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating, as follows:
.1 Use 0.61 mm metal core thickness except where otherwise specified.
.2 Use 0.84 mm metal core thickness for concealed fastening strips.
.3 Use material of thickness specified for other applications, and as indicated.

.7 All straight run joints shall be S-Lock in roof flashings.

.8 Make joints to allow for thermal movement, space S Lock joints at 1500 mm maximum centers.

.9 Make flashings for building into masonry and concrete so that joints can be lapped 100 mm or more.

.10 Strengthen free edges of metal flashings by folding to form a 13 mm hem.

.11 Make flashings to curbs, walls, and parapets a minimum of 100 mm high, where possible.

.12 Where curb mounted roof penetrations are not required, provide premanufactured flashing sleeves and collars for all pipes and conduit extending through the roof, meeting roofing manufacturer’s warranty requirements.

.13 Make joints for corners and intersections with standing seams except where exposed of pre finished metal when seams shall be flat locked.

.14 All bends machine made. Form sections square, true, and accurate to size, free from distortion and other defects detrimental to appearance or performance.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

.1 Install sheet metal flashing and trim in accordance with applicable CRCA 'FL' series details, and as indicated.

.2 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

.3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Departmental Representative. This includes curbs for roof mounted items.

.4 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Departmental Representative.

.5 Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible and set units true to line and level.

.6 Install work with laps, joints, and seams that are watertight and weatherproof.

.7 Install exposed sheet metal work that is without oil canning, buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weatherproof performance.

.8 Install surface mounted reglets true and level, and caulk top of reglet with sealant. Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.9 Install pans where shown around items projecting through roof membrane.

.10 Insert metal flashing into reglets or under cap flashing as indicated to form weather tight junction.

.11 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.

.12 Roof Edge Flashing: Secure metal flashing at roof edges at a maximum of 610 mm o.c.

.13 Expansion Provisions:
- .1 Provide for the thermal expansion of exposed sheet metal Work.
- .2 Space movement joints at maximum of 3050 mm, with no joints allowed within 610 mm of a corner or intersection.
- .3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in the work cannot be used or are not sufficiently weatherproof and waterproof.

.14 Sealed Joints:
- .1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant.
- .2 Fill joint with sealant and form metal to conceal sealant completely.

.3 Use joint adhesive for non-moving joints specified.

.15 Lock Seams:
.1 Fabricate non-moving seams in sheet metal with flat lock seams.

.16 Separations:
.1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with bituminous paint or other permanent separation as recommended by the manufacturer.
.2 Underlayment: Install a slip-sheet of No. 15 perforated asphalt saturated felt and a course of polyethylene underlayment where installing sheet metal directly on cementitious or wood substrates. Secure in place and lap joints minimum 100 mm.
.3 Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.

.17 Counter Flashing:
.1 Coordinate installation of counter flashing with installation of assemblies being protected by counter flashing.
.2 Secure in a waterproof manner.
.3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

.18 Flashing and metal closures: where flashing and metal closures overlap at any point in a system, ensure that flashing and closures are shingled over top lower sheet(s) and not behind, so that water is directed, and drains, to the exterior.

.19 Install pans, where shown around items projecting through roof membrane.

3.03 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.04 CLEANING

.1 Proceed in accordance with Section 01 74 11 - 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

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 09 21 16 – Gypsum Board Assemblies.

1.02 REFERENCES

.1 Firestop Contractors International Association (FCIA)
  .1 FCIA Firestop Manual of Practice - 6th Edition (MOP).
  .2 FM 4991, Standard for the Approval of Firestop Contractors, 2013.

.2 International Firestop Council (IFC)
  .1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Agency (NFPA)
  .1 NFPA (Fire) 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.

.5 Underwriter's Laboratories of Canada (ULC)
  .1 ULC Guide No. 40 U19, Firestop Systems; ULC Category Code Number XHEZC.
  .2 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
  .3 CAN/ULC S102-11, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.
  .4 CAN/ULC S114-05, Standard Method of Test for Determination of Non Combustibility in Building Materials.
  .5 CAN/ULC S115-11, Standard Method of Fire Tests of Fire Stop Systems.
  .6 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings.
  .7 CAN/ULC S702.2-15, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.

1.03 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 non-combustible 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.

1.04 ACTION AND INFORMATION 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 and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.

.3 Samples:
.1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.

.4 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: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
  .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.05 QUALITY ASSURANCE

.1 Qualifications:
  .1 Installer:
    .1 Company or person specializing in fire stopping installations with and certified by manufacturer.
    .2 Company or person shall be a member in good standing of the Firestop Contractors International Association (FCIA).

.2 Use materials tested to CAN/ULC S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to authority having jurisdiction.

.3 Single Source Responsibility:
  .1 Obtain through penetration firestop and joint systems for each kind of penetration and construction condition indicated from a single source of manufacture and installation responsibility.

.2 To the extent possible, firestop and smokeseal products shall be supplied by a single manufacturer for entire Contract.

.4 The manufacturer's direct technical representative (not distributor or agent) shall be on site during the initial installation of the firestop systems to provide training to the installer’s personnel in the proper product selection and installation procedures.

.5 Pre-Installation Meetings: convene pre-installation meeting one-week prior to beginning work of this Section, with contractor's representative and Departmental Representative to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Coordination with other building trades.
.4 Review manufacturer's installation instructions and warranty requirements.

.6 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.

1.06 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:
.1 Store materials 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.

2 PRODUCTS

2.01 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 and conforming to specified special requirements described in PART 3.
.2 Fire stop system ratings: as indicated.

.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 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.

.10 Sealants for vertical joints: non-sagging.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to air-vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.03 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.

3.04 SPECIAL REQUIREMENTS

.1 Location of special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:
  .1 Designed for re-entry, removable at: electrical and communications cable penetrations through partitions.
    .1 Use Prefabricated Firestop Sleeves or prefabricated Cable Pathways, as approved by Departmental Representative.

3.05 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Mechanical pipe insulation: certified fire stop system component.
  .1 Ensure pipe insulation installation precedes fire stopping.

3.06 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.2 Manufacturer's Field Services:
  .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposa.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.08 PROTECTION

.1 Protect installed products and components from damage during construction.

3.09 SCHEDULE

.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated floor slabs at penetrations.

.2 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 31 29 – Wood Shingles and Shakes.

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

.4 Section 09 21 16 – Gypsum Board Assemblies.

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C834 -14, Standard Specification for Latex Sealants.
- .2 ASTM C919 12, Standard Practice for Use of Sealants in Acoustical Applications.
- .3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
- .4 ASTM C1193-16, Standard Guide for Use of Joint Sealants.
- .5 ASTM C1330-02(2013) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- .6 ASTM C1521-13 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- .7 ASTM D2240-15, Standard Test Methods for Rubber Property, Durometer Hardness.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.03 COORDINATION

.1 Coordinate work of this specification section with interfacing and adjoining work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.04 ACTION AND INFORMATION 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 and 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.

.3 Manufacturer's Instructions:
.1 Submit instructions to include installation instructions for each product used.

1.05 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.

1.06 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 Delivery and Acceptance Requirements: 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, protected from the elements, in dry location and in accordance with manufacturer's recommendations.
.2 Store and protect joint sealants from damage.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.07 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 degrees 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 more than those 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.

1.08 ENVIRONMENTAL REQUIREMENTS

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

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

2 PRODUCTS

2.01 GENERAL

.1 Use materials as received from manufacturer without additives or adulteration. Use one manufacturer's product for each Type specified. Where sealant applications cross or contact each other, ensure compatibility, maintenance of physical properties and performance characteristics, and continuity of seal.

.2 Joint sealants and caulking shall be commercial-grade.

.3 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.4 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

.5 Unless otherwise specified, VOC content limits of sealants shall be in accordance with SCAQMD Rule 1168 and as follows:
- .1 Architectural Materials:
  - .1 Sealants: VOC content limit 250 g/L.
  - .2 Sealant Primers for Non-Porous Surfaces: VOC content limit 250 g/L.
  - .3 Sealant Primers for Porous Surfaces: VOC content limit 775 g/L.
- .2 All Other Applications:
  - .1 Sealants: VOC content limit 420 g/L.
  - .2 Sealant Primers: VOC content limit 750 g/L.

2.02 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants require primers for suitable adhesion to substrate, use manufacturer’s recommended primer.

2.03 SEALANT MATERIAL DESIGNATIONS

.1 Type S-1: Silicone Sealant; mould and mildew resistant.
- .1 To ASTM C920; type S; grade NS; class 100/50; use NT, M, G, and A.

.2 Type S-2: Silicone Sealant; general construction and air-seal sealant.

.1 To ASTM C920: type S; grade NS; class 50; use NT, M, G, A, and O.

.3 Type S-4: Acoustical Sealant; interior, non-hardening.
.1 To ASTM C834 Type P, Grade -18°C.

.4 Type S-5: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.
.1 To ASTM C920: type M; grade NS; class 50; use T, NT, M, A, and O.

.5 Type S-6: One-component polyurethane sealant; non-sag, for general construction.
.1 To ASTM C920: type S; grade NS; class 25; use NT, M, A, and O.

.6 Type S-7: Horizontal joint sealant; two-component, self-levelling.
.1 To ASTM C920: type M; grade P; class 25; use T, M, O.

.7 Type S-8: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.

.8 Type S-9: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.

.9 Type S-10: Exterior door thresholds and other Wet Areas: two-component, gun grade, slump-resistant elastomeric polyurethane sealant, specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency acceptance.

2.04 ACCESSORIES

.1 Preformed compressible and non compressible back up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.

.1 Rod Type Sealant Backings:
.1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi cellular material with a surface skin).
.2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
.4 Non adhering to sealant, to maintain two-sided adhesion across joint.
.2 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.
.3 Bond Breaker Tape.
.1 Polyethylene bond breaker tape which will not bond to sealant.

.2 Primer: Non-staining type as recommended by sealant manufacturer.

.3 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.05 SEALANT SELECTION

.1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location and conditions as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.

.2 Make sealant selections consistent with manufacturer’s recommendations.

.3 Clean and prime bonding surfaces prior to applying sealants.

.4 Use silicone general construction sealant Type S-2 for metal-to-metal joints where no other specific sealant type specified.

.5 Use acoustical sealant Type S-4 at acoustic-purposed joints, only where it will be fully concealed, and only where no constant or consistent air pressure difference will exist across the joint.

.6 Use multi component sealant type S-5 at masonry and concrete joints.

.7 Use one-component polyurethane general construction sealant Type S-6 at joints other than metal-to-metal where no other specific sealant type specified.

.8 Use control joint sealant S-9 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.9 Use wet area sealant S-10 for horizontal and vertical joints, and perimeter joints, at exterior door threshold plates, and other wet area applications. Use traffic grade (TG) at horizontal floor locations.

2.06 COLOURS

.1 Sealant colour: confirm sealant selections with Departmental Representative prior to ordering materials. Colours shall be selected by Departmental Representative from manufacture’s full range, and as follows:
  .1 Sealants at other locations to match colour of adjacent exposed material.
  .2 Where colour match choice is unclear, Departmental Representative will decide.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.
  .1 Visually inspect substrate in presence of DEPARTMENTAL Representative.
  .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.03 PRIMING

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

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

3.04 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.

3.05 MIXING

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

3.06 APPLICATION

.1 Sealant:
  .1 Apply sealant in accordance with manufacturer's written instructions.
  .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  .3 Apply sealant in continuous beads.
  .4 Apply sealant using gun with proper size nozzle.
  .5 Use sufficient pressure to fill voids and joints solid.
  .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  .8 Remove excess compound promptly as work progresses and upon completion.

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

3.07 FIELD ADHESION TESTING

.1 Field test joint sealant adhesion to substrates in the presence of Departmental Representative as follows:
  .1 Extent of Testing: test completed and cured sealant joints as follows:
    .1 Perform 10 tests for the first 300 m of joint length for each kind of sealant and joint substrate.
    .2 Perform 1 test for each 300 m of joint thereafter or 1 test per each floor per elevation.
  .2 Test Method: test joint sealants according to method A, Field-Applied Sealant Joint Hand Pull Tab, Appendix X1, ASTM C1193 or Method A, Tail Procedure, ASTM C1521.
    .1 For joints with dissimilar substrates, verify adhesion to each substrate separately. Extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  .3 Inspect tested joints and report on finding for the following requirements:

.1 Joint cavities filled and free of voids.
.2 Sealant dimensions and configurations comply with sealant manufacturer's data sheet and printed installation requirements.
.3 No adhesive or cohesive failure noted during pull tests per ASTM criteria. Include data on pull distance used to test each kind of product and joint substrate.

.4 Record tests results in a field-adhesion test log. Include dates when sealants were installed, name of worker responsible in each instance, test dates, test locations, whether joints were primed or not, adhesion results and percent elongations, sealant fill, sealant configuration and dimensions.

.5 Repair sealant test locations by applying new sealants following approved preparation and application procedures.

.2 Evaluation of Field Adhesion Test results:
.1 Sealants passing ASTM pull-tests and compliant with specifications will be considered satisfactory.
.2 Remove sealants that fail adhesion tests or do not meet specifications, and apply in accordance with approved preparation and application requirements.
.3 Retest re-applied sealants until test results are satisfactory and sealant application is compliant.

3.08 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 – Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.09 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