1 GENERAL

1.01 RELATED REQUIREMENTS

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

.2 Section 06 18 00 – Glue Laminated Construction.

.3 Section 07 13 52 - Modified Bituminous Sheet Waterproofing.

.4 Section 07 21 13 – Board Insulation.

.5 Section 07 27 00.01 – Air Barriers and Vapour Retarders.

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

.7 Section 07 42 29 – Ceramic Walls Panels.

.8 Section 07 42 43 – Composite Wall Panels.

.9 Section 07 52 00 – Modified Bituminous Membrane Roofing.

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

.11 Section 07 61 00 – Sheet Metal Roofing.

.12 Section 08 11 00 – Metal Doors and Frames.

.13 Section 08 42 29 – Automatic Entrances.

.14 Section 08 44 13 – Glazed Aluminum Framing Systems.

.15 Section 08 63 25 – Fixed-Curb Metal-Framed Skylights.

1.02 REFERENCES

.1 ASTM International Inc.
- .1 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- .2 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
- .3 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.
- .4 ASTM E779-10 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- .5 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.

1.03 DEFINITIONS

.1 Air Barrier: Air Barriers are systems of materials designed and constructed to control airflow between conditioned and unconditioned spaces.

.2 Air / Vapour Barrier: Systems of materials exhibiting both low air leakage (airtight) and low Vapour Permeance (vapour impermeable) levels, and functioning as a combined Air Barrier and Vapour Retarder.

.3 Enclosure: The enclosure is the boundary or barrier separating the interior of a building from the outside environment; it may also serve to separate conditioned from unconditioned space. Note: 'Enclosure' may also be referred to as 'envelope' or 'shell' in the Contract Documents and has the same meaning for the purposes of this Contract.

.4 Vapour Permeance: The moisture transmission rate of a material is referred to as its 'permeability'. This number is not dependent on the material's thickness. Its 'permeance', however, is dependent on thickness much like the R-value in heat transmission. Dividing the 'permeability' of a material by its thickness gives the material's 'permeance'.

.5 Vapour Permeance Classes:
.1 Vapour impermeable: 5.72 ng/Pa·s·m^2 or less.
.2 Vapour semi-impermeable: 57.21 ng/Pa·s·m^2 or less, and greater than 5.72 ng/Pa·s·m^2.
.3 Vapour semi-permeable: 572.14 ng/Pa·s·m^2 or less, and greater than 57.21 ng/Pa·s·m^2.
.4 Vapour permeable: Greater than 572.14 ng/Pa·s·m^2.

.6 Vapour Retarder (vapour diffusion retarder): The element that is designed and installed in an assembly to retard the movement of water by vapour diffusion.

1.04 PERFORMANCE CRITERIA

.1 Minimum Air Barrier Performance:
  .1 The building enclosure shall be constructed with a continuous Air Barrier system to control air leakage into, or out of, the conditioned space. An Air Barrier system shall also be provided for interior partitions between the conditioned space and a space designed to maintain temperature or humidity levels that differ from those in the conditioned space by more than 50% of the difference between the conditioned space and the design ambient conditions.
  .2 The installed Air Barrier system shall meet the following minimum requirements:
    .1 Airtight: The installed Air Barrier system shall not exceed the following maximum air leakage rates:
      .1 Air Barrier materials in accordance with ASTM D2178: 0.020 L/(m^2·s) @ 75Pa ΔP (0.072 m^3/m^2·h).
      .2 Assemblies comprising the Enclosure in accordance with ASTM E283: 0.200 L/(m^2·s) @ 75Pa ΔP (0.720 m^3/m^2·h).
      .3 Enclosures in accordance with ASTM E779: 2.000 L/(m^2·s) @ 75 Pa ΔP (7.200 m^3/m2·h).
    .2 Continuity: The Air Barrier system shall be continuous across construction, control and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.
      .1 The Air Barrier system shall be continuous at the following connections:
        .1 Roof / wall connections, wall / foundation connections, wall / window connections, wall / door connections, soffit connections, corner details, and connections between different exterior wall systems.
        .2 Connect the roof waterproofing membrane system to the Air Barrier at the walls.
    .3 Structural integrity: The Air Barrier system shall resist peak wind loads, stack pressure effects, or sustained pressurization loads without exhibiting signs of detachment, rupturing, or creep load failure.

.1 The Air Barrier shall be able to resist a minimum air pressure difference of ± 2.0 kPa without tearing, rupturing or breaking away from its fastening.

.4 Durability: The Air Barrier system must be able to perform its intended function, be compatible with adjoining materials, and resistant to the mechanisms of deterioration that can be reasonably expected given the nature, function and exposure of the materials, over the life of the building envelope.

.5 Compatibility: The physical characteristics, chemical properties, and application methods of the building materials that comprise the Air Barrier system shall be compatible.

.2 Minimum Vapour Retarder Performance:

.1 The Vapour Retarder shall retard the passage of moisture as it diffuses through the assembly of materials of the Enclosure.

.2 At above-grade walls, provide a combined Air / Vapour Barrier system at the warm side of the insulation. Both insulation and Air / Vapour Barrier shall be installed in full contact with each other at the exterior of the structure.

.3 Combinations of vapour semi-impermeable or vapour impermeable membranes, films, sheets or wall coverings shall not be installed on both sides (interior and exterior facings) of an Enclosure, in order to facilitate drying in at least one direction.

.4 Vinyl wall coverings, polyethylene vapour barriers, foil-faced batt insulation or reflective radiant barrier foil insulation shall not be installed on the interior of Enclosures.

.5 Vapour management of combined Air-Vapour Barrier Membranes: Water Vapour Permeance shall be 5.72 ng/Pa·s·m^2 or less, before and after aging.

1.05 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Select products to be compatible with adjoining membranes previously installed under related Sections

.2 Select products from a single manufacturer, or products that are compatible from different manufacturers.

.3 Coordination between all installers of each component of vapour and air retarder system is required; ensure continuity of system and that junctions between the various components are effectively sealed.

.4 Verify with manufacturers and all trades involved with installation procedures of building products incorporated into air barrier and vapour retarder elements including, but not limited to, various membranes, coating and sealants as well as continuity with roofing systems.

.2 Pre-installation Meeting:

.1 Convene one week before commencing work at building enclosure (shell).

.2 Arrange for manufacturer(s)' factory-trained agent(s) to be on site at beginning of installation(s) to provide training and supervision of personnel who will install membrane. Agent(s) shall also provide inspection visits thereafter to assure quality and competence of membrane installations.

1.06 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 are compatible with one another and with products previously installed under the Work of other 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.

1.07 QUALITY ASSURANCE

.1 Qualifications:
.1 Applicator: company specializing in performing work of required with minimum 5-years' documented experience with installation of air and vapour membrane systems.
.1 Completed installation must be approved by the material manufacturer.
.2 Applicator: company:
.1 Currently licensed by National Air Barrier Association, Canadian Urethane Foam Contractor's Association, or national certifying organization.
.2 Must maintain their license throughout the duration of the project.

.2 Mock-Up:
.1 Construct mock-ups 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.

.3 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.

1.08 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.

1.10 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.

1.11 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.

1.12 WARRANTY

.1 For sealant and sheet materials, the 12-month warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.

.2 Warranty: include coverage of installed sealant and membranes materials that:
.1 Fail to achieve air tight and watertight seal.
.2 Exhibit loss of adhesion or cohesion.
.3 Do not cure.

2 PRODUCTS

2.01 MATERIALS

.1 Provide materials identified in individual technical sections as required to maintain continuity of air barrier and vapour retardance at building enclosure.

.2 Refer to Related Requirements.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturers' printed installation instructions, technical datasheets, and transition 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.

3.03 FIELD QUALITY CONTROL

.1 At adhered membrane application locations, perform pull-off tests on applied membrane 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 addition to Contract Price.

.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.
.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 required.

.3 The Departmental Representative shall inspect installed membrane for continuity of air barrier and vapour membrane prior to placement of insulation or other covering materials, systems or assemblies.

.4 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 03 35 00 – Concrete Finishing.

.2 Section 07 21 13 – Board Insulation.

1.02 REFERENCES

.1 ASTM International Inc.
- .1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
- .2 ASTM C1583/C1583M-13, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
- .3 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- .4 ASTM D5147/D5147M-14, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet
- .5 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

.2 Canada Green Building Council (CaGBC)
- .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.

.3 Underwriters Laboratories' of Canada (ULC)
- .1 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one-week prior to beginning waterproofing Work, with waterproofing 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.

1.04 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:
- .1 Provide two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit membrane manufacturer’s standard details that will be utilized for this project, indicate changes that must be made to make the details project specific for review by the DEPARTMENTAL Representative.
- .3 Provide two copies of WHMIS MSDS in accordance with Section 01 35 43 - Environmental Procedures, and indicate VOC content for:
  - .1 Primers.
  - .2 Asphalt.
  - .3 Sealers.
  - .4 Filter fabric.

.3 Provide shop drawings and indicate:
- .1 Flashing and control joints details.

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

.5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of membrane with specification requirements.

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

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

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

.9 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:

.1 Submit LEED submittal forms for Credit MR 4 – Recycled Content. Indicate the following:

.1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.

.2 Submit Product data indicating percentage by weight of post-consumer and post-industrial recycled content. Include a statement indicating costs for each Product having recycled content. Provide completed forms in accordance with Section 01 35 21.

.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:

.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

1.05 QUALITY ASSURANCE

.1 Installer Qualifications: Engage experienced installer acceptable to the membrane manufacturer with a minimum of 3 years' experience who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance.

.2 Obtain primary waterproofing materials from single manufacturer and/or ensure materials ordered and supplied are compatible with one another.

.3 Coordination between all installers of each component of membrane is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

1.06 FIRE PROTECTION

.1 Fire Extinguishers:
  .1 Maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each torch. Respect all safety measures described in manufacturer's technical data sheets. Do not place torches near combustible or flammable products.
  .2 ULC labelled for A, B and C class protection.

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

1.07 DELIVERY, STORAGE, AND HANDLING

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

.2 Store rolls of felt and membrane in upright position.
  .1 Store membrane rolls with salvage edge up.

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

.4 Place plywood runways over completed Work to enable movement of material and other traffic.

.5 Store sealants at +5 degrees C minimum.

.6 Store insulation protected from daylight and weather and deleterious materials.

.7 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

.8 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.

.9 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 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
  .2 Fold up metal banding, flatten and place in designated area for recycling.

1.08 SITE CONDITIONS

.1 Ambient Conditions:
  .1 Do not install waterproofing when temperature remains below manufacturers' printed recommendations.
  .2 Minimum temperature for solvent based adhesive is 5 degrees C.

.2 Install waterproofing on substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into waterproofing system.

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 PERFORMANCE CRITERIA

.1 Waterproofing System: capable of resisting moisture/water under pressure and preventing moisture migration to interior.

.2 Compatibility between components of waterproofing system is essential. Provide written declaration to DEPARTMENTAL Representative stating that materials and components, as assembled in system, meet this requirement.

2.02 THERMOFUSIBLE WATERPROOFING SYSTEM

.1 Primer: blend of SBS-modified bitumen, fast-evaporating solvents and adhesive additives, as recommended by membrane manufacturer as published on printed data sheets, specifications and brochures for site conditions and application.

.2 Waterproofing Membrane: non-woven polyester reinforcement and SBS modified bitumen with thermofusible plastic film on both faces, and meeting or exceeding the following minimum physical properties and performance characteristics:
  .1 Minimum total thickness of membrane: 3.0 mm.
  .2 Tensile strength: MD = 25 kN/m – XD = 16 kN/m to ASTM D5147.

.3 Ultimate elongation: MD = 60% – XD = 65% to ASTM D5147.
.4 Cold bending: minimum -30 degrees C.
.5 Water vapour permeability: <0.004 perms.
.6 Puncture Resistance: >400 N.

2.03 ACCESSORIES

.1 Termination Sealant, Waterproofing Mastic, Trowel Grade Waterproofing Mastic, Fabric Reinforcement: compatible with waterproofing system and recommended by manufacturer as published on printed data sheets, specifications and brochures.

.2 Reinforcement and crack treatment membrane: compatible with waterproofing membrane and recommended by manufacturer as published on printed data sheets, specifications and brochures for application.

.3 Protection board: asphalt-impregnated fibreboard, thickness 13 mm.

.4 Insulation: as specified in Section 07 21 13 – Board Insulation.

.5 Securement bars: shall be continuous 3 mm x 25 mm wide (1/8” x 1”) stainless steel, predrilled for screw attachment to concrete substrate. Provide stainless steel fasteners purpose-made for concrete substrates.

.6 Waterstop Grout (cold joints): fibre-reinforced, crystalline waterproofing grout, NSF 61 certified, pH:12, compressive strength to ASTM C109 24 MPa @ 24 hours or better, minimum pull off strength to ASTM C1583: 400 psi.

.7 Provide other accessories as required and recommended by waterproofing system manufacturer as published on printed data sheets, specifications and brochures for a complete, waterproof system.

3 EXECUTION

3.01 EXAMINATION AND PREPARATION OF SURFACES

.1 Do not proceed with work until conditions are in accordance with manufacturer's instructions.

.2 Ensure surfaces are smooth, dry, clean and free of ice and debris as per manufacturer's recommendations.

.3 Do not install materials in conditions of snow or rain.

.4 Cure concrete a minimum of 14-days, adhesion test is recommended before membrane application.

.5 Verify the compatibility of membrane components with curing compounds, coatings, or other materials which are already installed on the surfaces to be treated.

.6 Report cracks over 3 mm wide to DEPARTMENTAL Representative. Fill crack with waterproofing mastic. Apply 150 mm wide strip of membrane centered over crack.

3.02 METHOD OF EXECUTION

.1 Perform Work on a continuous basis as surface and weather conditions allow.

.2 Protect adjoining surfaces against damage that could result from the waterproofing installation.

3.04 PRIMER APPLICATION

.1 Apply primer coating at the rate of 0.15 to 0.20 l/m2 where heat-welded membrane is applied. Application rate may vary depending on surface condition.

3.05 THERMOFUSIBLE WATERPROOFING MEMBRANE INSTALLATION

.1 Align the first roll of membrane to a previously drawn chalk line.

.2 Pre-strip inside and outside corners with a 300 mm wide strip of membrane centered over the corner. Install membrane in direct contact with substrate not leaving any voids under the membrane strip. Double lap outside corners.

.3 Weld membrane using a propane gas torch.

.4 Install subsequent rolls in the same manner and align with preceding roll with a side lap of minimum 75 mm. Overlap ends minimum 100 mm.

.5 Repair holes and tears in membrane with the appropriate membrane material. Repair must exceed the affected surface area by at least 100 mm.

.6 Prior to backfilling, it is recommended to protect waterproofing system with protection boards glued with specified mastic. Backfilling should commence immediately after installation of protection boards.

.7 The uppermost edge of the membrane is to be mechanically fastened to the concrete substrate using termination bars. The termination bar should surpass the top edge of the membrane.

.8 Apply mastic on the top edge of termination bar to prevent water accumulation and infiltration.

.9 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

3.06 PROTECTION BOARD AND INSULATION INSTALLATION

.1 Apply adhesive with spots 75 mm in diameter, every 300 mm. Bottom panel should be supported or mechanically fixed. On the top row of insulation, apply a continuous bead of adhesive 25 mm wide to the top leading edge of the panels to be glued. This bead will protect the adhesive spots during initial cure by limiting the flow of moisture behind the insulation in case of rain.

.2 Rigid Board Insulation Below Grade Application, in accordance with Section 07 21 13 – Board Insulation: Apply adhesive with spots 75 mm in diameter, every 300 mm. Bottom panel should be supported or mechanically fixed. On the top row of insulation, apply a continuous bead of adhesive 25 mm wide to the top leading edge of the panels to be glued. This bead will protect the adhesive spots during initial cure by limiting the flow of moisture behind the insulation in case of rain.

3.09 FIELD QUALITY CONTROL

.1 Perform pull-off tests on applied sheet membrane 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. Reapply membrane 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 Canada.

.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.

.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 required.

.3 The DEPARTMENTAL Representative shall inspect installed membrane for continuity of air barrier prior to placement of insulation.

3.10 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

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 03 30 00 – Cast-in-Place Concrete.

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 07 61 00 – Sheet Metal Roofing.

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 Canada Green Building Council (CaGBC)
.1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.

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

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

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

.6 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.

.6 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
.1 Submit LEED submittal forms for Credit MR 4 – Recycled Content in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

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 Cavity 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.

.3 Polyisocyanurate (Polyiso) Wall Insulation: Foil faced polyisocyanurate, preformed rigid board insulation in accordance with CAN/ULC S704 and as follows:
.1 Type: 1.
.2 Thermal Resistance: facing 2 having LTTR of RSI 1.05/25 mm minimum.

.3 Flamespread: classification of 500 or less in accordance with CAN/ULC S102.
.4 Edges: square.
.5 Size: manufacturers maximum standard x thickness as indicated on Drawings.

.4 Roof Insulation: high-density 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, II, III, 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): 6.0 pcf density,≥0.23 BTU.in/hr.sq.ft.°F.
.12 Fire resistant to temperatures above 1093°C.

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 Insulation Spindles: spindle type insulation anchors, perforated 50 x 50 mm Type 304 stainless steel base, 0.8 mm thick, spindle of 2.5 mm diameter Type 304 stainless steel, length to suit insulation, 25 mm diameter washers of self-locking type or speed clips.
.1 Anchor Adhesive: thermoplastic rubber high-strength, heavy-bodied adhesive, specifically formulated for adhering anchors for hanging insulation, meeting or exceeding the following minimum requirements:
.1 Shear strength: greater than 600 psi (AFG 01).

.2 Gun grade mastic.
.3 Compatible with substrate.

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

.3 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 to top of footing, 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 ROOF INSULATION

.1 Fit courses of insulation between ties and other confining obstructions; butt edges tightly in vertical and horizontal directions, and as follows:
.2 Mechanically install insulation with a tight fit to substrate materials, provide additional fasteners where uneven substrates cause air spaces behind insulation.
.3 Apply insulation fasteners using a minimum of 6-fasteners in 2-rows located near the centre of board along the narrow dimension and near the 3rd points along the long dimension; secure boards with 2-clips at the centre where both dimensions are less than 600 mm.
.4 Coordinate application of insulation with installation of girts, Z-bars and other connecting and structural components.
.5 Apply sheet membrane vapour retarder behind Z-bars prior to installation of insulation between Z-bars supporting cladding and roofing.
.6 Install insulation clips to substrates before sheet membrane vapour retarder (roof) or air barriers (walls) are applied.

3.05 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.

3.06 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 and Section 01 35 21 - LEED Requirements.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.07 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.

.4 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.

.5 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
.1 Submit LEED submittal forms for Credit MR 4 – Recycled Content in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

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 PARTITION 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 and Section 01 35 21 - LEED Requirements.
  .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 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

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

.3 Section 08 11 00 – Metal Doors and Frames.

.4 Section 08 42 29 – Automatic Entrances.

.5 Section 08 44 13 – Glazed Aluminum Framing Systems.

.6 Section 08 63 25 – Fixed-Curb Metal-Framed Skylights.

1.02 REFERENCES

.1 Canada Green Building Council (CaGBC)
  .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.

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

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

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

.5 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.

.4 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
- .1 Submit LEED submittal forms for Credit MR 4 – Recycled Content in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
  - .1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.

.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

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 HOLLOW STEEL DOOR FRAMES

.1 Fill exterior hollow steel door frames 75% full with foam in place insulation prior to installation of frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction.

3.05 EXTERIOR WINDOW AND DOOR FRAMES

.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.

3.06 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.

3.07 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 and Section 01 35 21 - LEED Requirements.
  .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 03 30 00 – Cast-in-Place Concrete.

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 06 10 00 – Rough Carpentry.

.4 Section 07 21 13 - Board Insulation.

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

.6 Section 07 42 29 – Ceramic Wall Panels.

.7 Section 07 42 43 – Composite Wood Veneer Wall Panels.

.8 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.9 Section 07 61 00 – Sheet Metal Roofing.

.10 Section 08 63 25 - Fixed-Curb Metal-Framed Skylights.

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 Canada Green Building Council (CaGBC)
.1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.

.4 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.

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

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

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

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Compliance: refer to and comply with the requirements of Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

.2 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.

.5 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
- .1 Submit LEED submittal forms for Credit MR 4 – Recycled Content. Indicate the following:

.1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
.2 Submit Product data indicating percentage by weight of post-consumer and post-industrial recycled content. Include a statement indicating costs for each Product having recycled content. Provide completed forms in accordance with Section 01 35 21.

.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

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 HIGH TEMPERATURE ROOF UNDERLAYMENT (MEMBRANE WEATHERPROOFING)

.1 Refer to Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

.2 Substrate: Exterior Grade Douglas Fir or Pine Plywood, to Section 06 10 00.

.3 High Temperature Roof Underlayment: self-adhered composite membrane consisting of a high softening point, SBS rubberized asphalt compound integrally laminated to a cross-laminated polyethylene film with anti-slip coating. Membrane shall meet or exceed the following minimum physical properties and tested values:
  .1 Thickness: 1 mm.
  .2 Minimum Application Temperature: ≥5°C.
  .3 Elongation, to ASTM D412 Die C Modified, tested to ultimate failure of rubberized asphalt: 250%.
  .4 Minimum Tensile Strength, to ASTM D412: ≥4128 kN/M^2.
  .5 Flow @110°C, to ASTM D1970: None.
  .6 Adhesion to plywood, to ASTM D903: 850 N/m.
  .7 Flexibility at -43°C, to ASTM D1970: <0.004 cfm/ft^2.
  .8 Water Vapour Transmission, to ASTM E96: 2.8 ng/Pa.s.m^2.

2.03 VAPOUR-PERMEABLE WATER-RESISTIVE AIR BARRIER

.1 Refer to Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

.2 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.

.3 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.

2.04 VAPOUR-PERMEABLE WATER-RESISTIVE & UV-RESISTANT UNDERLAYMENT

.1 Refer to Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

.2 Substrate:
- .1 Exterior Grade Douglas Fir or Pine Plywood, to Section 06 10 00.

.3 Breathable, black, water-resistive UV-Resistant underlayment for open joint rain screen wall systems: Coated, spun-bonded Polyester, breathable membrane with a nominal weight of ≥270g/m², tested to DIN EN 13859-1 for 5,000 hours exposure with less than 5% reduction in tensile strength, water vapour transmission tested to ASTM E96, Method A, similar to 1537 ng/Pa/s/m². Roll size: ≥1.5m wide by ≥50 m long. The product shall be black on both sides with a UV-resistant coating on the exterior side.

.4 Auxiliary Materials:

.1 Black Detail Tape: ≥0.76 mm thick, 100 mm wide detail tape, single sided, as required to permanently seal vapour retarder membrane to itself and other surfaces and substrates and modified bitumen membranes.

.2 Black Seam Tape: single sided UV-resistant seam tape and double sided seam tape as required to permanently seal vertical and horizontal seams between layers of vapour retarder membrane.

.3 Black Self-adhered Membrane: underlayment manufacturer's recommended black self-adhesive membrane.

.4 Fasteners: Minimum 2.8 mm shank diameter corrosion-resistant steel or stainless steel nails having a minimum 9.5 mm head, or minimum 2 mm shank diameter corrosion-resistant steel or stainless steel screws or nails installed with a 25 mm caps, plate or washer.

.5 Manufacturer's recommended spray and brush applied adhesives.

2.05 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).

2.06 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.

2.07 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.

2.08 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 window 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 & UV-RESISTANT UNDERLAYMENT

.1 Install system behind open joint cladding system in manner that hides substructure by covering support members using spray or brush applied adhesive, as well as applying to face of sheathing. Coordinate with Section 07 42 43 - Composite Wood Veneer Wall Panels.

.2 Penetrations:
.1 Seal all penetrations using a combination of Tapes, Self-adhered membranes and other compatible sealants and products. Ensure all laps and details allow water to flow to the exterior.
.2 Pipes and Conduit:
.1 Cut a piece of underlayment membrane to act as a skirt around counter flashed penetrations. Distance from penetration to edge of barrier skirt minimum 305 mm.
.2 Make four cuts to form a star shape and place over penetration snugly. Extend ears of material along vertical penetration and seal with Detail Tape.
.3 Tape top edge of skirt to wall using UV-Resistant Seam Seal Tape. Do not tape bottom edge at this times.
.3 Windows and Doors Already Installed:
.1 Ensure that the window installers have wrapped the opening with membrane (detail tape or similar) and have installed an apron piece of underlayment at the bottom of the window prior to installing the window.
.2 Place a piece of A underlayment below the window and apply the apron piece over it in shingle style.
.3 Install underlayment over the wall and window in shingle style.
.4 Cut the underlayment around the window being careful not to cut the window flange or membrane around the opening.
.5 Tape the underlayment to the window using UV-Resistant Seam Seal Tape.
.4 Openings for Windows and Doors to be installed after underlayment is installed:
.1 Install underlayment over the entire wall and openings in shingle style.
.2 Cut the underlayment horizontally along the head of the opening.
.3 At the top corners of the opening place a diagonal cut approximately 150 mm long to create a flap. Fold this flap upwards and use tape to keep it out of the way.
.4 Cut the underlayment down the middle of the opening approximately 2/3 the way down and tie this cut into each of the lower corners on a diagonal.

.5 Fold the underlayment into the opening, fasten and trim off excess.
.6 Install 100 mm wide detail tape as a flashing over the base of the opening, up the vertical sides at least50 mm and over the underlayment. If more than one width is needed ensure they are installed in shingle style.
.7 Install the window or door in accordance with the manufacturer's instructions.
.8 Starting with the sides, seal underlayment to window flange using UV-Resistant Seam Seal Tape, 50 mm wide Seam Seal Tape or 100 mm wide Detail Tape. Overlap the sill flashing by at least 50 mm.
.9 At the top of the window apply a head flashing using 100 mm wide Detail Tape. This is to be applied directly over the sheathing and onto the frame of the window to ensure drainage to the exterior. Cover this with the flap of underlayment installed previously.
.10 Tape all seams around the opening using UV-Resistant Seam Seal Tape or 100 mm wide Detail Tape.

.3 Installation Under Open Jointed Cladding as a Sheathing Membrane:
.1 Install underlayment directly to plywood sheathing with coated-side facing out, shingled and placed such that it forms a continuous membrane over the entire area, directly water down to the through-wall flashing.
.2 Starting at base of wall, unroll underlayment horizontally across wall. Extend 150 mm over starting corner.
.3 Fasten at top and bottom of roll within 50 mm of edge 300 mm on centre and at a maximum of 600 mm on centre in field.
.4 Shingle next layers of underlayment ensuring minimum 150 mm horizontal and minimum 300 mm vertical laps.
.5 If installed vertically, overlap vertical seams a minimum of 150 mm and apply UV-Resistant Seam Seal Tape to all vertical seams.
.6 Ensure underlayment is slipped under bottom edge of penetration skirt and shingled over taped top edge. Seal top and sides with 25 mm wide double sided Seam Tape.
.7 Ensure whole skirt assembly is flashed appropriately with metal.

.8 Do not place vertical laps above windows.
.9 In the field of the wall, apply UV-Resistant Seam Seal Tape to vertical laps only unless otherwise specified.
.10 For delayed installation of siding/masonry determine the amount of fasteners for wind exposure. Use cap nails or screws with washers.

3.09 VAPOUR-PERMEABLE WATER-RESISTIVE AIR BARRIER

.1 Locations:
.1 Walls: install over sheathing at ceramic tile, wood shingle, and board and batten wall assemblies.
.1 Coordinate with Section 06 20 00, Section 07 31 29, and Section 07 42 29.
.2 Sheathing: Exterior Grade Douglas Fir or Pine Plywood.
.2 Roofing: install over coverboard at wood deck.

.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 to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and 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 window sill pan flashing membrane across window sills. Pre-treat inside corners with a bead of termination sealant. Install window sill pan membrane and end dam terminations, seal cuts and terminations with termination sealant per window 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.

3.10 HIGH TEMPERATURE ROOF UNDERLAYMENT (MEMBRANE WEATHERPROOFING)

.1 Location: install under metal roof and drainage material and over sheathing at metal roof assemblies (Sheathing: Exterior Grade Douglas Fir or Pine Plywood).

.2 Ambient and surface temperature at time of installation shall be above 5°C to achieve optimum adhesion. Lower temperatures cause self-adhesive layer to lose adhesive quality.

.3 Adhesive-prime all substrate surfaces with adhesive primer.

.4 Apply High Temperature Roof Underlayment beginning at low point of deck and proceed in shingle fashion. Overlap at ends and sides a minimum of 65 mm. Cover entire roof deck.

.5 Roof Edge Application: Roll out and align manageable lengths of High Temperature Underlayment with the lower roof edge, pebbled film surfaced up. Slowly peel release paper away from membrane in 600 mm to 900 mm lengths. Press firmly in place while proceeding along roof edge. Overlap at ends and sides a minimum of 65 mm. When High Temperature Underlayment is folded over the roof edge, cover it by flashing, gutter or metal edge.

.6 Ridge and Valley Applications: Roll out and align manageable lengths of High Temperature Underlayment, pebbled film surface up. Slowly peel release paper or film away from membrane in 600mm to 900mm lengths. Press firmly in place beginning at centre of ridge or valley. Overlap at ends and sides a minimum of 65 mm. Apply in shingle fashion on valleys.

3.11 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.

3.12 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 Owner.

.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.

3.13 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 and Section 01 35 21 - LEED Requirements.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 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; consultant 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 05 50 00 - Metal Fabrications.

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 06 20 00 - Finish Carpentry.

.4 Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

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

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

.7 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 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
.1 Architectural Woodwork Quality Standards, Edition 2 (2014) plus all errata through April 29, 2016.

.4 Canada Green Building Council (CaGBC)
.1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.

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

.6 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.

.7 Forest Stewardship Council (FSC)
.1 FSC-STD-01-001(Version 4-0), FSC Principles and Criteria for Forest Stewardship.

.8 Maritime Lumber Bureau (MLB) Grading Agency.

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

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

.11 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.

.3 Shop Drawings:
.1 Submit drawings.
.2 Indicate details of flashing installation, transitions and connections to adjacent assemblies, window and door details.

.4 Samples:
.1 Submit duplicate full size shingles, of finish and profile specified.

.5 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

.3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

.4 Wood Certification: submit vendor's and manufacturer's Chain-of-Custody Certificate number for FSC certified wood.

1.05 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in shingle installations with 5-years' documented experience, and approved by manufacturer.

.2 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.

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

.4 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 Disposal and Section 01 35 21 - LEED Requirements.
- .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 21 13 – Board Insulation.

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

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

.1 Section 07 92 00 – Joint Sealants.

1.02 REFERENCES

.1 ASTM International
  .1 ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  .2 ASTM C 1186-08(2012), Standard Specification for Flat Fiber-Cement Sheets

.2 British Standards Institution (BSI)
  .1 BS EN 12467:2012 Fibre-cement flat sheets. Product specification and test methods.

.3 Canadian Standards Association (CSA)
  .1 CAN/CSA S136-12 - North American Specification for The Design of Cold-Formed Steel Structural Members

.4 Green Seal Environmental Standards (GS)
  .1 GS-11-11, Standard for Paints and Coatings.
  .2 GS-36-2013, Standard for Commercial Adhesives.

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

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

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  .1 SCAQMD Rule 1113-A2013, Architectural Coatings.
  .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.8 Underwriters Laboratories' of Canada (ULC)
.1 CAN/ULC-S102-10, Test for Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S114-05, Standard Method of Test for determination of Non-Combustibility in Building Materials.

.9 British-Adopted European Standard (BS EN)
.1 BS EN 14411:2016, Ceramic tiles. Definition, classification, characteristics, assessment and verification of constancy of performance and marking.

1.03 PRE-INSTALLATION MEETINGS

.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, cladding manufacturer and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart 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.

1.04 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature for cladding system materials, preparation and installation instructions, storage and handling requirements and technical datasheets, 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 for cementitious materials.

.3 Shop Drawings:
.1 Shop drawings: Submit drawings stamped and signed by professional engineer licensed to practice in Province of Prince Edward Island, Canada.

.2 Indicate dimensions and thickness of tile, fastening and anchoring methods, detail and location of joints and gaskets, thermal movement provision, wall openings, head, jamb and sill details, materials and finish, compliance with design criteria and requirements of related work.

.4 Samples:
.1 Samples for Initial Selection: Submit 2 complete sets of colour swatches representing manufacturer's full range of available colors, grain patterns, vein contrast and materials for each panel finish specified.
.2 Submit duplicate 300 x 300 mm samples of cladding system representative of materials, finishes and colours. Include clips, anchors, supports, fasteners, closures, and other accessories for assembly approval.

.5 Submit quality assurance submittals in accordance with Section 01 45 00 - Quality Control.
.1 Certificates: submit certificates signed by manufacturer certifying that cladding complies with specified performance characteristics and physical properties.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.6 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions and submit a complete list of recommended cleaning agents that will be required for on-going maintenance. Include information on substances and activities considered detrimental to finish and performance of wall system.

.7 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

1.05 QUALITY ASSURANCE

.1 Retain a Professional Engineer, registered in Province of Price Edward Island to design fabrication and erection of the composite wood veneer cladding assembly.

.2 Mock-ups: construct mock-ups in accordance with Section 01 45 00 - Quality Control and to requirements supplemented as follows:
- .1 Provide 3000 mm x 3000 mm mock-up including corner and opening application for evaluation of surface finishes and workmanship.
- .2 Provide one completely assembled wall area, as shown in the Construction Documents, installed with all related accessories, in composite configurations and representative of the design as shown on the Drawings.
- .3 Extent of mock-up shall be the same as that which will be provided in the final work.
- .4 Mock-up shall be installed simulating actual construction conditions, including actual structural supports and connections. Use means, methods and techniques proposed for final installation.
- .5 Locate mock-up in location as directed by the Departmental Representative.
- .6 Personnel assembling mock-up shall be the same personnel that will perform the actual work at the project site.
- .7 Approved mock-up may remain as part of finished work.

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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect tile from damage and from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

1.07 PROJECT CONDITIONS

.1 Site Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where materials outlined in this Section are indicated to fit walls and other construction.

.2 Establish dimensions and proceed with materials outlined in this Section where field measurements cannot be made without delaying the work; allow for site trimming and fitting.

.3 Ambient Conditions: Install materials outlined in this Section after completion of work by other Sections is complete, and all penetrations are watertight; to provide adequate dry, clean, level, and plumb surfaces for installation and adhesion.

1.08 COORDINATION

.1 Coordinate work with exterior wall erection, installation of sheathing and weather barrier, and installation of windows, doors, and adjacent assemblies and materials.

1.09 WARRANTY

.1 Submit manufacturer's product warranty.

.2 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 DESIGN REQUIREMENTS

.1 Design panel wall cladding and support system to allow for thermal movement of component materials caused by ambient temperature range of 60 degrees C without causing buckling, undue stress on fasteners or other detrimental effects.

.2 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to tile, supports or anchors, or racking of joints.

.3 Design members to withstand dead load and wind loads as calculated in accordance with National Building Code of Canada (NBC) and applicable Municipal/Territorial regulations, to maximum allowable deflection of 1/180 of span.

.4 Provide assembled system with cavity vented and drained to exterior in accordance with NRC "Rain Screen Principles".

.5 Design wall system to accommodate specified erection tolerances of structure.

.6 Tile to be supported by concealed fasteners into concealed substructure, all substructure materials painted matte black.

2.02 VENTILATED EXTERNAL WALL CLADDING SYSTEM

.1 Cladding Module: extruded ceramic façade tiles, meeting or exceeding requirements of BS EN 14411.
- .1 Dimensional Tolerance: Group A (Precision).
- .2 Reaction to Fire: A1, non-combustible.
- .3 Thermal Shock Resistance: Pass.
- .4 Freeze-Thaw Resistance: Pass.
- .5 Thickness: as determined by engineered, stamped shop drawings to suite module height and length, minimum 16 mm.
- .6 Module Length: as indicated.
- .7 Module Height: as indicated.
- .8 Face Texture: smooth.
- .9 Colour: as selected by Departmental Representative from manufacturer’s full range.

.2 Cladding fixing composed of:
  .1 Horizontal profiles with specific geometry made of aluminium alloy.
  .2 Stainless steel fixings for fastening the horizontal profiles to subframe (vertical profile).
  .3 Ancillary components: stainless steel spring or points of adhesive.
    .1 Spring: Type 304 Stainless Steel.
    .2 Adhesive: polymeric structural adhesive, free of isocyanides.

.3 Subframe composed of:
  .1 T-vertical profile made of aluminium alloy.
  .2 Brackets made of aluminium alloy.
  .3 Type 304 Stainless steel fixings between T-vertical profile and brackets.

2.03 ACCESSORY COMPONENTS

.1 Trim: Aluminum extrusions of Aluminum Association alloy AA 6063-T5 or AA 6060 to manufacturer's standard profiles.

.2 Fasteners: stainless steel, self-tapping, properties and size as recommended by manufacturer for service and substrate.

.3 Concealed anchorage: Back-mounted undercut clips, aluminum alloy, adhesive or spring connection.

.4 Isolation coating: alkali-resistant and UV-resistant coating.
  .1 Coating: VOC limit SCAQMD Rule 1113.

.5 Fasteners: Type 304 stainless steel, types and sizes as required to attach the various parts to each other and to wood stud structure.

2.04 AUXILIARY MATERIALS

.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.

.4 Metal Fabrications: to Section 05 50 00 and as recommended by panel manufacturer.

.5 Sheathing: to Section 06 10 00 - Rough Carpentry: FSC Certified, Douglas Fir or Pine Exterior Grade Plywood.

.6 Air Barrier: to Section 07 27 00.01 - Air Barriers and Vapour Retarders.

.7 Primers and paint: for matte black finish, primers and finish paint as required, to Section 09 91 00.

2.05 FABRICATION

.1 Field-cut or drill tile if required to suit conditions using equipment and methods recommended by manufacturer, vertical joint width to be as indicated.

.2 Fabricate support grid in accordance with engineered, stamped shop drawings.

.3 Brake form metal flashings to profile required, in maximum practical lengths in accordance with Section 07 62 00.

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 INSTALLATION

.1 Protect surface of metals in contact with concrete, mortar, plaster or other cementitious surface with isolation coating.

.2 Install grid framing members.
- .1 Secure to building framing system with screws. Install sub-girt supports at panel joints.
- .2 Ensure flatness and alignment to specified tolerances.

.3 Install head and sill flashings, edge trim, cap pieces and fillers.

.4 Insert tile onto grid framing system, tight and flush, ensuring full contact, using spring or adhesive method as determined by Departmental Representative; se only one method for project.

.5 Installed tile shall be level and plumb, in accordance with the following installation tolerances:
- .1 Maximum variation from plane or location shown on accepted shop drawings: 2 mm per 3 m of length vertically and horizontally and 3 mm 3 m maximum diagonally across face of panel.
- .2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

3.03 CLEANING AND WASTE MANAGEMENT

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Wash down exposed exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths.
- .2 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 and Section 01 35 21 - LEED Requirements.

3.04 FIELD QUALITY CONTROL

.1 Arrange for manufacturer's technical representative to visit the site to review the work and ensure that it is in conformance with manufacturer's recommendations. Submit reports to Departmental Representative within three days of visit. Schedule visits as follows:
- .1 Pre-installation meeting.
- .2 Shortly after commencement of installation work.
- .3 Periodically while installation work underway.
- .4 At completion.

3.05 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 21 13 – Board Insulation.

.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 ASTM International (ASTM).
- .1 ASTM B209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- .2 ASTM B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- .3 ASTM D6578/D6578M-13. Standard Practice for Determination of Graffiti Resistance.
- .4 ASTM D792-13 – Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- .5 ASTM E84-14, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.2 Canada Green Building Council (CaGBC)
- .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations

.3 International Organization for Standardization (ISO)

.4 Underwriters Laboratories Canada (ULC)
- .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC S134-13, Standard Method of Fire Test of Exterior Wall Assemblies.

1.03 PRE-INSTALLATION MEETINGS

.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, cladding manufacturer and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart 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.

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 for cladding system materials, preparation and installation instructions, storage and handling requirements and technical datasheets, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
  .1 Shop drawings: Submit drawings stamped and signed by professional engineer licensed to practice in Province of Prince Edward Island, Canada.
  .2 Indicate dimensions and thickness of panels, fastening and anchoring methods, detail and location of joints and gaskets, thermal movement provision, wall openings, head, jamb and sill details, materials and finish, compliance with design criteria and requirements of related work.

.4 Submit samples in accordance with Section 01 33 00 – Submittal Procedures:
  .1 Samples for Initial Selection: Submit 2 complete sets of colour swatches representing manufacturer’s full range of available colors, grain patterns, vein contrast and materials for each panel finish specified.

.2 Submit duplicate 300 x 300 mm samples of cladding system representative of materials, finishes and colours. Include clips, anchors, supports, fasteners, closures, and other accessories for assembly approval.

.5 Submit quality assurance submittals in accordance with Section 01 45 00 - Quality Control.
.1 Certificates: submit certificates signed by manufacturer certifying that cladding complies with specified performance characteristics and physical properties.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.6 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions and submit a complete list of recommended cleaning agents that will be required for on-going maintenance. Include information on substances and activities considered detrimental to finish and performance of wall system.

.1 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
.3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
.2 Wood Certification: submit vendor's and manufacturer's Chain-of-Custody Certificate number for FSC certified wood.

1.05 QUALITY ASSURANCE

.1 Composite wood veneer wall panels shall be manufactured at plant facilities with ISO 9001, ISO 14001, and ISO 14006 certifications. provide proof of certification to Departmental Representative upon request.
  .1 Panels shall meet ASTM E84 Class A criteria, flame spread 10 and smoke development 10.

.2 Wood veneer shall be PEFC-certified and meet LEED requirements for sustainable forest management practices, and submit Forestry Products Chain of Custody certificate.

.3 Retain a Professional Engineer, registered in Province of Price Edward Island to design fabrication and erection of the composite wood veneer cladding assembly.

.4 Mock-ups: construct mock-ups in accordance with Section 01 45 00 - Quality Control and to requirements supplemented as follows:
  .1 Provide 3000 mm x 3000 mm mock-up including corner and opening application for evaluation of surface finishes and workmanship.
  .2 Provide one completely assembled wall area, as shown in the Construction Documents, installed with all related accessories, in composite configurations and representative of the design as shown on the Drawings.
  .3 Extent of mock-up shall be the same as that which will be provided in the final work.
  .4 Mock-up shall be installed simulating actual construction conditions, including actual structural supports and connections. Use means, methods and techniques proposed for final installation.
  .5 Locate mock-up in location as directed by the Departmental Representative.
  .6 Personnel assembling mock-up shall be the same personnel that will perform the actual work at the project site.
  .7 Approved mock-up may remain as part of finished work.

1.06 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery: Deliver Materials to site in Manufacturer's original, unopened packaging, with labels clearly identifying product name and manufacturer.

.3 Storage: Place inspected panels in a climate-controlled enclosed space. Horizontal Storage: Lay panels on an elevated flat surface with max 6 mm between supports to ensure even distribution of loads. Storage Time: Cannot exceed five months as of factory dispatch date. Protective peel-off sheet must be removed immediately after panel is installed.

.4 Handling: Open crate within 72-hours of material delivery. Remove extra top panel and inspect contents by lifting each panel vertically to prevent chafing of the decorative face. Protect materials during handling to prevent damage.

1.07 PROJECT CONDITIONS

.1 Site Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where materials outlined in this Section are indicated to fit walls and other construction.

.2 Establish dimensions and proceed with materials outlined in this Section where field measurements cannot be made without delaying the work; allow for site trimming and fitting.

.3 Ambient Conditions: Install materials outlined in this Section after completion of work by other Sections is complete, and all penetrations are watertight; to provide adequate dry, clean, level, and plumb surfaces for installation and adhesion.

1.08 COORDINATION

.1 Coordinate work with exterior wall erection, installation of sheathing and weather barrier, and installation of windows, doors, and adjacent assemblies and materials.

1.09 WARRANTY

.1 Submit manufacturer's product warranty.

.2 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 PERFORMANCE REQUIREMENTS

.1 Fasteners shall accommodate thermal expansion/contraction without excessive stress to the panel. Each panel shall have central lock points to support gravity loads.

.2 Design and install cladding system to allow for thermal movement of local climate with at least 60 degrees C ambient or panel temperature fluctuations, without causing undue stress on fasteners or panel or other detrimental effects.

.3 Design to accommodate, by means of control joints, movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to in fills or racking of joints.

.4 Design members and suspension system to withstand gravity load, live loads, including negative loads, as calculated in accordance with National Building Code.

.5 Structural panel supports shall provide the minimum L/300 deflection stiffness required by the panel manufacturer. Panels themselves shall not deflect more than L/180 maximum at serviceability limit states.

2.02 PANELS

.1 Panels: Premanufactured exterior-grade composite wood veneer ventilated façade system, with panels composed of high-density Bakelite core clad with natural hardwood veneer, surface-treated with synthetic resins and exterior-grade PVDF film.

.1 Veneer: Grade A rotary-cut hardwood veneer, species and finished colour shall be selected by Departmental Representative from manufacturer's full range. Allow time in Construction Schedule for selection process and delivery of ordered product to site.

.2 Surface Burning Characteristics: Panels shall meet CAN/CSA S134 criteria for Category 1 (Class A).

.2 Panel Thickness: minimum 10 mm, or thicker if required to suit shop drawing design.

2.03 MOUNTING SYSTEM

.2 General:
- .1 Supply panel manufacturer's recommended substructure assembly with all parts, components, and fasteners as required for a complete installation in accordance with engineered, stamped shop drawings.
- .2 Sub-Structure: shall be designed to withstand structural loading due to wind load and the dead load of the panel, painted matte black as required to conceal behind the open joinery of the attachment system.

.3 Hanging Hooks: supply panel manufacturer's concealed fastener hanging hooks, which shall be structurally fastened to back of panels in accordance with manufacturer's printed instructions and details. Hanging hooks shall be supplied complete with manufacturer's leveling screws and panel screws as required.

.4 Aluminum Guide Rails: supply panel manufacturer's black anodized aluminum horizontal rails. Supply manufacturer's self-threading screws as required for a complete installation.

.5 Vertical T-Battens and/or L-Battens: supply hot dipped galvanized battens, painted matte black, as required in accordance with engineered, stamped shop drawings.
- .1 Battens shall be minimum 1.5 mm thick galvanized zinc-coated steel to ASTM A653 with Grade A coating Z275, painted matte black.
- .2 Fasteners shall be compatible with aluminum and galvanized steel to prevent galvanic corrosion.
- .3 Supply EPDM Self-Adhesive Rubber Flashing Tape, width as required to cover face of Batten.

.6 Extrusions, including trim, closures, vent screens, formed members, sheet, and plate, shall conform with the recommendations of the manufacturer. Aluminum pieces shall be black anodized where visible or partly visible. Metal pieces shall be hot dipped galvanized and finish painted matte black.

.7 Gaskets: EPDM rubber sheet.

.8 Thermally-Broken Clips (Sub-Framing Spacers): pre-engineered prefabricated hot dipped galvanized thermally-broken clip with integral moulded thermal pad, painted matte black. Supply manufacturer’s recommended fasteners as required for securing clips through air barrier and sheathing to wood studs, and recommended fasteners for securing battens to clips.

2.04 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.

.4 Metal Fabrications: to Section 05 50 00 and as recommended by panel manufacturer.

.5 Sheathing: to Section 06 10 00 – Rough Carpentry: FSC-Certified, Douglas Fir or Pine Exterior Grade Plywood.

.6 Air Barrier: to Section 07 27 00.01 - Air Barriers and Vapour Retarders: VAPOUR-PERMEABLE WATER-RESISTIVE & UV-RESISTANT UNDERLAYMENT (black).

.7 Primers and paint: for matte black finish, primers and finish paint as required, to Section 09 91 00.

.8 General: panel manufacturer’s recommended accessories conforming to rain screen principles and meeting or exceeding performance and design criteria.

.9 EPDM Self-Adhesive Flashing Tape, black.

2.05 FABRICATION

.1 Use tools and equipment recommended by panel manufacturer. Comply with panel manufacturer's recommended fabrication methods and processes.

.2 Fabricated wall panels and components shall comply with details indicated on drawings and comply with submitted engineered shop drawings.

.3 Panels shall be factory-fabricated to greatest extent practicable, ready for field installation. Panel assembly shall match quality and installation method of accepted mock-up.

.4 Fabrication Tolerances:
- .1 Panel dimensions: where final dimensions cannot be established by field measurement before completion of panel manufacturing, make allowance for field adjustments as recommended by manufacturer.
- .2 Panel lines, breaks, and angles: Sharp and true. No warp or buckle.
- .3 Panel Bow: Maximum 0.8% of panel dimension in width and length measured over any 1828 mm panel dimension.
- .4 Panel Length and Width: 1 mm +/- maximum.
- .5 Panel diagonal: 3 mm +/- maximum.

3 Execution

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for 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. Commencing with Work means acceptance of conditions.

3.02 COMPLIANCE

.1 Comply with cladding manufacturer's printed installation instructions, guidelines, technical datasheets, and details.

.2 Work shall comply with National Building Code of Canada requirements.

3.03 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.

3.04 WEATHER BARRIER SYSTEM (AIR-BARRIER)

.1 Weather Barrier (air barrier): to Section 07 27 00.01 - Air Barriers and Vapour Retarders: VAPOUR-PERMEABLE WATER-RESISTIVE & UV-RESISTANT UNDERLAYMENT (black).

.2 Coordinate with erection of sub-frame assembly to ensure all visible and semi-visible parts are black anodized for aluminum components and painted matte black for hot dipped galvanized components. Use black EPDM flashing tape at exposed face of battens.

3.05 RANDOM POSITIONING OF PANELS

.1 Number all the pallets 1, 2, 3, etc.. Store the pallets throughout the fabrication and installation process in accordance with manufacturer’s requirements.

.2 Open pallet No. 1 and remove two panels. Place these two panels on a flat pallet, with a maximum distance of 800 mm between supports.

.3 Turn over the third panel from pallet No. 1 without removing it from the pallet.

.4 Close pallet No. 1 and store it in accordance with manufacturer’s requirements.

.5 Repeat the same process with the other pallets, selecting them in a random order until 10 to 20 panels have been removed. For example, if there are 20 pallets, remove panels from numbers 1, 8, 13, 15 and 20, or other random order.

.6 Mix the 10 to 20 panels that have been removed and install them within 2 to 3 hours from the time the first panel was removed.

.7 Repeat the first six steps until all the panels have been installed.

3.06 INSTALLATION

.1 Install wall panels and sub-frame system in accordance with manufacturer's instructions.

.2 Install wall panels plumb and level and accurately spaced in accordance with manufacturer’s recommendations, and engineered shop drawings.

.3 Anchor panels and sub-framing securely per engineering recommendations and in accordance with engineered, stamped shop drawings to allow for necessary movement and structural support.

.4 Fasten wall panels with fasteners approved for use with supporting substrate.

.5 Touch-up galvanized members with galvanizing repair primer where galvanizing damaged.

.6 Apply gaskets to framing members as required in accordance with shop drawings.
.1 Do not stretch gaskets during application.

.7 Do not install panels or component parts that are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.

.8 Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.

.9 Install profiles, closures and trim with fasteners and methods appropriate for use with adjoining construction and as recommended by manufacturer.

3.07 INSTALLATION TOLERANCES

.1 Maintain following minimum installation tolerances:
  .1 Maximum variation from plane or location shown on shop drawings: 10 mm/10 m of length and up to 20 mm/100 m.
  .2 Maximum deviation for vertical member: 3 mm in an 8.5 m run.
  .3 Maximum deviation for a horizontal member: 3 mm in an 8.5 m run
  .4 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

3.08 FIELD QUALITY CONTROL

.1 Arrange for manufacturer's technical representative to visit the site to review the work and ensure that it is in conformance with manufacturer's recommendations. Submit reports to Departmental Representative within three days of visit. Schedule visits as follows:
  .1 Pre-installation meeting.
  .2 Shortly after commencement of installation work.
  .3 Periodically while installation work underway.
  .4 At completion.

3.09 ADJUSTING

.1 Remove masking or panel protection as soon as possible after installation.

.2 Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

.3 Repair panels with minor damage. Remove and replace panels damaged beyond repair as a direct result of the panel installation.

.4 Clean finished surfaces as recommended by panel manufacturer.

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 Disposal and Section 01 35 21 - LEED Requirements.

.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 the work of this Section.

END OF SECTION

1 General

1.01 RELATED REQUIREMENTS

.1 Section 07 21 13 – Board Insulation.

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

.3 Section 07 61 00 – Sheet Metal Roofing.

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

.5 Section 07 92 00 – Joint Sealants.

1.02 REFERENCES

.1 American Architectural Manufacturers Association (AAMA)
  .1 AAMA 2605-13, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

.2 American Society for Testing and Materials International (ASTM)
  .1 ASTM C297/C297M-16 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.
  .2 ASTM D1781-98(2012) Standard Test Method for Climbing Drum Peel for Adhesives.

.3 Canada Green Building Council (CaGBC)
  .1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.

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

.5 South Coast Air Quality Management District (SCAQMD), California State
  .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-rehabilitation meeting one week prior to beginning work of this Section and on-site installations,with Contractor and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart in order to:

.1 Verify Project requirements.
.2 Review installation and substrate conditions.
.3 Review coordination with other building trades and sequencing of work.
.4 Review manufacturer's installation instructions and warranty requirements.

.2 Prior to start of Work arrange for site visit with Departmental Representative to examine existing site conditions.

.3 Hold project meetings in accordance with requirements of Section 01 31 19 – Project Meetings.

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 for cladding system 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 Shop Drawings:
.1 Submit shop drawings and indicate assembly method, layout, profiles and product components including method of attachment to substructures, accessories, finish colours and textures.
.2 Include details showing thickness and dimensions of the various system parts, locations of joints and gaskets, and location and configuration of movement joints.

.4 Samples:
.1 Submit duplicate 300 x 300 mm samples of composite panel in thickness specified from representative materials, finishes and colours. Include 1 sample each of any clips, anchors, supports, fasteners, closures, and other panel accessories required for panel replacement. Clearly label each item, identifying name and purpose of each item.

.5 Quality assurance submittals:
.1 Certificates: submit certificates signed by manufacturer certifying that composite wall panels comply with specified performance characteristics and physical properties.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
.3 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.

.6 LEED Submittals: Submittals that are required to comply with requirements for LEED certification include, but not necessarily limited to, the following:
.1 Recycled Content: Provide product data and certification letter indicating percentages by weight of post consumer and pre consumer recycled content for products having recycled content.
.2 Low-Emitting Materials: Submit listing of adhesives and sealants and paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.
.3 Regional Materials: Provide product data for regional materials indicating location and distance from the Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Distance shall be within 500 miles (805 Km) of the Project Site.

1.05 QUALITY ASSURANCE

.1 Manufacturer's representative shall provide periodic inspection visits during the course of work of this specification section to review quality and conformance of panel installation.

1.06 MOCK-UPS

.1 Mock-ups: construct mock-up in accordance with Section 01 45 00 – Quality Control and to supplemental requirements as follows:
.1 Provide mock-up for evaluation of assembly method, surface finishes and workmanship. Proceed with mock-up as follows.

.1 Demonstrate method of attachment of new panels.
.2 Make arrangements with Departmental Representative for on-site presence during mock-up to observe execution of work of each Stage.
.3 Provide advance notice of expected schedule, minimum 72 hours, to Departmental Representative.
.4 Provide hoarding, scaffold and other apparatus, materials and equipment as required for safe access to work areas and safety.

.2 Provide initial production units for job-site assembly with other materials for review.
.3 Coordinate type and location of mock-ups with project requirements.
.4 Accepted units will be used as standard for acceptance of production units.
.5 Remove and replace units which are not accepted.
.6 Do not proceed with remaining work until workmanship, colour, and finish are reviewed and accepted by Departmental Representative.
.7 Refinish mock-up area as required to produce acceptable work.
.8 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.

1.07 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver, store and protect material in accordance with panel manufacturer's printed instructions.

.3 Do not expose panels with strippable film to direct sunlight or extreme heat.

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 PERFORMANCE REQUIREMENTS

.1 Maximum deflection not to exceed L/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.

.2 Calculate live load deflections in accordance with CSSBI 20M, as modified by the requirements of this Section.

.3 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from 40 degrees C to +50 degrees C, and wind loads noted above.

.4 Include expansion joints to accommodate movement in wall system and between wall system and building structure, where these movements are caused by deflection of building structure, and accommodate these movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

.5 Provide for positive drainage to the exterior of all water entering or condensation occurring within the system.

.6 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Consultant, Contractor and the Subcontractor.

2.02 COMPOSITE METAL PANEL MATERIALS

.1 Composite panels: aluminum sheets thermally bonded in continuous process, under tension, to thermoplastic core with no glues or adhesives between dissimilar materials, and as follows:

.1 Total Composite Thickness: refer to Exterior Materials and Finish Schedule.

.2 Aluminum Face Sheets:

.1 Alloy: AA3000 Series.

.2 Thickness: 0.8 mm.

.3 Factory Finish: powder-coated, to AAMA 2605.

.4 Colour: as selected from manufacturer’s full range.

.3 Core: non-combustible.

.4 Minimum Bond Integrity Criteria: tested for resistance to delamination as follows:

.1 Bond Strength: 10.3 MPa minimum to ASTM C297.

.2 Peel Strength: 100 N mm/mm minimum to ASTM D1781.
.3 No degradation in bond performance after 8 hours of submersion in boiling water and after 21 days of immersion in water at 21°C.

.2 Aluminum extrusions:
.1 Alloy: AA-6063-T5.
.2 Colour: Mill finish where non-exposed.

.3 Stiffeners:
.1 Alloy: AA-6063-T5
.2 Colour: Mill finish.

.4 Accessories:
.1 Fasteners:
.1 Attachment of the panel system to the primary panel structural supports shall be made using manufacturer's recommended fasteners.
.2 Typical joinery shall be attached with concealed, non-corrosive fasteners. When exposed fasteners are required in isolated conditions, the fastener shall be obscured in the panel joinery, exposed fasteners shall be stainless steel.
.2 Gaskets: Santoprene or EPDM as recommended by manufacturer.
.3 Flashings: Fabricate flashing from 1.6 mm minimum thickness aluminum sheet. Where exposed to view, finish to match adjacent panels. Provide lap strip under flashing at abutted conditions; with lapped surfaces sealed with a full bed of non hardening sealant.

2.03 SYSTEM BACK-UP MATERIALS

.1 Girts: Fabricated from minimum 1.27 mm thickness galvanized steel to ASTM A653, Grade 230 with Z275 coating. Material visible after assembly of wall panel shall be finished to match aluminum panels.

.2 Sub girts: Structural quality steel to ASTM A653, with Z275 zinc coating to ASTM A792, adjustable double-angle profile as indicated to accept panel with structural attachment to building frame.

.3 Isolation Tape: Manufacturers standard material for separating dissimilar metals from direct contact.

.4 Stiffeners, as required: Minimum 25 mm x 25 mm aluminum, bonded to the full length of face sheet using double sided high bond isolating tape to prevent weather staining and frost lines to the face of the panel. Bonding tape to be protected with continuous bead of caulking on both sides of stiffeners, type as recommended by manufacturer.

.5 Insulation Fastenings: Corrosion resistant, galvanized bugle head screws with 38 mm diameter washer, 25 mm minimum penetration into framing.

.6 Insulation: as specified in Section 07 21 13.

.7 Air Barrier: as specified in Section 07 27 00.01 - Air Barriers and Vapour Retarders.

.8 Joint Sealants: as specified in Section 07 92 00.

2.04 FABRICATION

.1 Aluminum wall panels and components shall comply with details as indicated on drawings and as indicated in shop drawings.

.2 All components shall be factory fabricated ready for field installation. All components shall match quality and installation of accepted mock-up.

.3 Panel Tolerances:
- .1 Panel bow: maximum 0.8% of panel dimension in width and length.
- .2 Panel dimensions: where final dimensions cannot be established by field measurement before completion of panel manufacturing, make allowance for field adjustments as recommended by manufacturer.
- .3 Panel lines, breaks and angles: sharp, true and surfaces free from warp or buckle.

3 Execution

3.01 EXAMINATION

.1 Verification of Conditions:
- .1 Examine substrates to receive work and surrounding adjacent surfaces for conditions affecting installation. Coordinate with related sections to ensure proper dimensions are maintained.

.2 Verify site dimensions by accurate field measurements so that work will be accurately designed, fabricated and fitted to the structure.

.3 All penetrations through the façade for the work of other trades shall be fitted with a watertight sleeve. Verify flashings are in place, sealed with waterproof membrane and covered with building membranes.

.4 Maintain sheathing membrane integrity.

.2 Notify Departmental Representative in writing of any conditions that are not acceptable.

.3 Proceed with installation after verification and correction of surface conditions acceptable to manufacturer. Commencement of work means acceptance of conditions.

3.02 MANUFACTURER'S INSTRUCTIONS

.1 Install in accordance with manufacturer's printed installation instructions, engineered shop drawings, data sheets and specifications.

3.03 COORDINATION

.1 Coordinate with other trades as required.

3.04 INSTALLATION

.1 Install composite panels in accordance with manufacturer's written instructions and shop drawings. Allow for thermal movement.

.2 Install air barrier membrane in accordance with Section 07 27 00.01 - Air Barriers and Vapour Retarders and the manufacturer’s instructions.

.3 Install both layers of girts as indicated on drawings and to ensure no air gap between girts and insulation boards.

.4 Install girts attached to structural support or wall framing, using recommended fasteners.

.5 Install insulation between girts forming tight to following applied girt to maintain continuous thermal barrier.

.6 Erect panels plumb, level and true.

.7 Do not install component parts that are observed to be defective, including warped, bowed, dented, scraped and broken members.

.8 Install exterior metal cladding to structural support by hidden mechanical fasteners.

.9 All fasteners shall penetrate wall framing. Where fastener does not penetrate framing, do not remove fastener. Removal of fastener will damage integrity of air/vapour membrane. Realign fastener location and install new fastener in close proximity to original fastener.

.10 Install pre-formed corners and end enclosures, sealed to arrest direct weather penetration.

.11 Ensure panels aligned vertically and horizontally.

.12 Assemble and secure wall system so stresses on sealants are within manufacturers' recommended limits.

.13 Separate dissimilar metals; use appropriate gasket and fasteners to minimize corrosive or electrolytic action between metals.

.14 Install flashings to divert all moisture and condensation to exterior. Trim and flash around doors, louvers, and windows. Use only membrane flashing supported by insulation per architectural details.

3.05 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.

3.06 RESTORATIVE WORK

.1 Restore elements damaged during disassembly and installation so no evidence remains of restorative work. If results of restorative work are unsuccessful, as determined by the Departmental Representative, remove and replace damaged elements at no additional cost to the Owner.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. Leave Work area clean at end of each day.

.2 Remove strippable film coating as soon as possible after surrounding material has been installed.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt. Clean glass and glazing materials with approved non-abrasive cleaner.

.4 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

3.08 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 06 20 00 - Finish Carpentry.

.3 Section 06 17 53 – Prefabricated Wood Trusses.

.4 Section 06 18 00 – Glue Laminated Construction.

.5 Section 07 27 00.01 – Air Barriers and Vapour Retarders.

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

.7 Section 07 92 00 – Joint Sealants.

1.02 REFERENCES

.1 ASCE 7-10, Minimum Design Loads for Buildings and Other Structures, Third Printing (Includes Errata).

.2 ASTM International (ASTM)
- .1 ASTM C1177/C1177M-13 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .2 ASTM D994/D994M-11 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- .3 ASTM D6162-00a(2015)e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- .4 ASTM D6163-00(2015)e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
- .5 ASTM D6164/D6164M-11, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .6 ASTM D6630-08, Standard Guide for Low Slope Insulated Roof Membrane Assembly Performance.
- .6 ASTM E96/E96M-15 Standard Test Methods for Water Vapor Transmission of Materials.
- .7 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.

.3 Canada Green Building Council (CaGBC)

.1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.

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

.5 CSA Group (CSA)
.1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt (Reaffirmed 2010).
.2 CSA A123.4-04(R2013), Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
.3 CSA A123.21-14, Standard test method for the dynamic wind uplift resistance of membrane-roofing systems, Includes Update No. 1 (2010).
.4 CSA A231.1/A231.2-14, Precast Concrete Paving Slabs/Precast Concrete Pavers.

.6 Factory Mutual (FM Global)
.1 FM Approvals - Roofing Products.

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

.8 Underwriters Laboratories' of Canada (ULC)
.1 CAN/ULC S107-10, Methods of Fire Tests of Roof Coverings.
.2 CAN/ULC S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with roofing 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.

1.04 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:

.1 Provide two copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Provide two copies of WHMIS MSDS, and indicate VOC content for:
.1 Primers.
.2 Asphalt.
.3 Sealers.
.4 Filter fabric.

.3 Provide shop drawings:
.1 Indicate flashing, control joints, tapered insulation details.
.2 Provide layout for tapered insulation.

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

.5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of materials with specification requirements.

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

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

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

.9 Submit warranties specified.

.10 Submit written declaration to Departmental Representative prior to commencement of work at site confirming that all material selections have been reviewed by the SBS membrane manufacturer, and that, based on this review, warranty requirements for material selection will be met for this project, co-signed by the manufacturer.
.1 Submit written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

.11 Submit written evidence and confirmation that installer meets manufacturer's warranty conditions for training, experience, and familiarity with their systems.

.12 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
.1 Submit LEED submittal forms for Credit SS 7.2 – Heat Island: Roof in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Compliance Requirements: Submit manufacturer's product information indicating that roofing materials meet a minimum SRI of 78 required by LEED; Consultant will sign LEED Letter Template declaring compliant materials based on product literature and testing results provided by membrane manufacturer.

1.05 QUALITY ASSURANCE

.1 Use same manufacturer for base and cap sheet, and ensure all other materials required for roof warranty are incorporated into the work as recommended by roofing manufacturer.

.2 Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience and approved by manufacturer.

.3 Ensure that products used comply with membrane manufacturer's warranty, and are compatible.

.4 Roofing and sheet metal work shall be performed in conformance with roofing manufacturer's printed recommendations using materials in accordance with CAN/ULC S107 to obtain minimum Class C fire-resistance rating.

.5 Conform to the recommendations of CRCA Roofing Specifications Manual, ASTM D6630, ASCE 7 and this specification section 07 52 00.

.6 Work shall be executed by an applicator approved by the CRCA as a member in good standing at time of application. Submit a copy of trade membership in good standing to Departmental Representative.

.7 Comply with safety measures described in manufacturer's printed installation requirements, requirements of insurance companies, and requirements of Authorities Having Jurisdiction.

.8 Do not conceal nor cover any phase of the Work until after it has been reviewed by Departmental Representative.

.9 Manufacturer's Inspection review:
.1 Arrange for the roof membrane system manufacturer's qualified technical representative to visit site regularly during application and upon completion of work to ensure adherence to specifications and to check quality of completed work.
.2 Arrange to have manufacturer's technical representative submit written reports to Departmental Representative and Contractor after each site visit.
.3 Manufacturer's inspection review, including written reports, shall be at no extra cost to Canada.
.4 Field reviews shall in no way relieve the Contractor of its responsibility to meet the requirements of the Contract.

1.06 PROTECTION

.1 Protect work of other trades from damage while doing the work specified herein. Provide tarpaulins and other coverings, as required, to protect adjacent building finishes and surfaces.

.2 At end of each day's work, or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage. Prevent water infiltration. Do not permit materials to get wet.

.3 Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof drain plugs when no work is taking place, or when rain is forecast.

.4 If bituminous materials, sealants or adhesives drip and stain walls and finished surfaces, clean off immediately. Replace damaged finished surfaces at no cost to Owner if stains cannot be fully removed without damaging the finish.

.5 Take precautions to protect openings made in the roofing against entry of elements.

.6 Protect completed portions of roofs from damage by placing 12 mm thick plywood, or other approved protection board covers, on 25 mm thick extruded polystyrene boards to serve as runways for movement of materials and other traffic.

.7 Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof. Assume full responsibility for damages.

.8 Protect partially completed work left exposed longer than eight hours.

.9 Repair or replace damaged areas as required.

.10 Supply and install temporary ballast as required to protect installations from wind uplift forces during the work. Cooperate with other trades as required.

.11 Safety Requirements:
- .1 Use warning signs and barriers. Maintain in good order until completion of Work.
- .2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
- .3 Fire Protection:
  - .1 Comply with the requirements of Section 01 50 00.
  - .2 Obtain Contractor’s Hot Work Permit for all work involving the use of an open flame, such as torch-adhered membranes.
  - .3 Protect roof junctions at parapets, roof curbs and upstands using the specified transition tape. Install prior to installation of flashing base sheets.
  - .4 Use a heat detector gun to survey work areas to identify smouldering or concealed fire at the end of each workday.
  - .5 Do not apply torch directly to wood or similar combustible surfaces.
  - .6 Maintain a clean Site.
  - .7 Have minimum 9 kg approved ABC fire extinguisher fully charged and in operable condition within 6 meters of every location where open flames are used.

.8 Maintain fire watch for minimum 3 hours after each day roofing operations cease when open flames have been used.
.9 Do not place torches near combustible and flammable Products.
.10 Maintain fire watch for 1 hour after each day's roofing operations cease.

.12 Respect all safety measures specified in manufacturer’s technical data sheets.

.13 Keep dumpster minimum 11 metres away from building during non-work hours.

1.07 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Storage and Handling Requirements:
.1 Provide and maintain dry, off-ground weatherproof storage.
.2 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
.3 Remove only in quantities required for same day use.
.4 Place plywood runways over completed work to enable movement of material and other traffic.
.5 Store sealants at +5 degrees C minimum.
.6 Store insulation protected from daylight and weather and deleterious materials.

.3 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 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
.2 Fold up metal banding, flatten and place in designated area for recycling.

1.08 SITE CONDITIONS

.1 Ambient Conditions

.1 Do not install roofing when temperature remains below -18 degrees C for torch application, or -5 degrees C, and to manufacturers' recommendations, for mop application.
.2 Minimum temperature for solvent-based adhesive is -5 degrees C.

.2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

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 The SBS-modified membrane manufacturer shall issue a written document to the Crown in right of Canada, valid for a 15-year period, stating that it will repair any leaks in the roofing membrane to restore the roofing system to a dry and watertight condition to the extent that manufacturing or installation defects caused such water infiltration. The warranty shall cover the total cost of repair(s) during the entire warranty period. The warranty shall be transferable, at no extra cost, to subsequent building owners. The warranty certificate shall reflect these requirements.

2 PRODUCTS

2.01 PERFORMANCE CRITERIA

.1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

.2 Roof testing and design: to ASTM D6630.

.3 Minimum design loads: to ASCE 7.

.4 The roofing installation shall be capable of withstanding wind loads determined in accordance with the NBC plus amendments, and wind uplift loads to CSA A123.21, and to the following approximate criteria determined in accordance with National Research Council Canada, Wind-RCI internet-based wind load calculation tool for roof coverings:
.1 End Zone Width, **Z**: 6 m.
.2 Corners, Ⓒ: -3.4 kPa.
.3 Edges, Ⓢ: -1.78 kPa.
.4 Field, ⓡ: -1.24 kPa.

2.02 SUBASSEMBLY

.1 Wood deck: Nail Laminated Timber (NLT) & Plywood Sheathing. Refer to Section 06 20 00, and structural drawings and specifications.

.2 Vapour Retarder:
.1 Refer to Section 07 27 00.01 – Air Barriers and Vapour Retarders: Vapour-Permeable Water-Resistive Air Barrier.

.3 Insulation: to Section 07 21 13 - Board Insulation, roof insulation sloped to drain.

.4 Protection Board: Pre-Primed Glass Mat Faced Gypsum Board, to ASTM C1177/C1177M, mould resistant, minimum 10 mm thick, purpose-made for direct torch-on application of base sheet vapour retarder. Edges: Square.

2.03 MEMBRANES

.1 Base sheet: to CGSB 37-GP-56M, non-woven polyester fibres to ASTM D6164.
.1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, having nominal weight of 180 g/m^2.
.2 Type 2, heat welded.
.3 Top and bottom surfaces:
.1 Thermofusible plastic film/Thermofusible plastic film.
.4 Base sheet membrane: meet or exceed following minimum properties, to CGSB 37-GP-56M.
.1 Strain energy (longitudinal/transversal): MD 9.0 / XD 7.0 kN/m.

.2 Breaking strength (longitudinal/transversal): MD 17.0 / XD 12.5 N/m.
.3 Ultimate elongation (longitudinal/transversal): MD 60 / XD 65 %.
.4 Tear resistance: 60 N.
.5 Cold bending at -30 degrees C: no cracking.
.6 Softening point: 105 degrees C.
.7 Static puncture resistance: 400.
.8 Dimensional Stability: MD -0.3 / XD 0.3 %.
.9 Water vapour transmission (ASTM E96 method B): 0.21 ng / Pa.s.m^2.

.2 Base sheet flashing:
.1 Primer: Manufacturer's recommended elastomeric bitumen or synthetic rubber blend, volatile solvents, adhesive enhancing additives and resins used to prime substrate to enhance the adhesion of self-adhesive membranes suitable for application temperatures.
.2 Roofing membrane with non woven polyester reinforcement and glass grid and elastomeric bitumen. Top face covered with thermofusible plastic film, underside self-adhesive and protected by silicone release paper in accordance with CGSB 37-GP-56M type 2, class C, grade 1.
.3 Components:
.1 Reinforcement: Non woven polyester and glass grid.
.2 Elastomeric bitumen: Mix of selected bitumen and SBS polymer.
.3 Mark top face with lines to ensure proper roll alignment.
.4 Meet or exceed following minimum properties:
.1 Cold bending at minimum 25°C: No cracking
.2 Softening point: ≥ 110°C
.3 Reinforcing weight: minimum 160 g/m^2.
.4 Membrane Thickness: minimum 2.5 mm.

.3 Cap sheet: High-SRI white cap sheet, to ASTM D6162 Type I, composed of non-woven polyester and SBS modified bitumen, and to following minimum requirements:
.1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, polyester reinforcement, having nominal roll weight of ≥4.7 kg/m^2.
.2 Heat-welded.

.3 Class A-granule surfaced. Colour: highly-reflective white granules, SRI ≥84 determined by ASTM E1980 testing. Supply extra SRI ≥84 granules as required for spreading at torch-adhered joints.
.4 Bottom surface: Thermofusible plastic film.
.6 Cap sheet minimum properties: meet or exceed CGSB 3-GP-56M, 9th Draft, and as follows:
.1 Strain Energy: same or better than MD 12 XD/ 10 kN/m.
.2 Breaking Strength: same or better than MD 20/ XD 15 kN/m.
.3 Ultimate elongation:
.1 same or better than MD 60% / XD 75%.
.4 Tear resistance: ≥70 N.
.5 Cold bending at -30 degrees C: No cracking.
.6 Plastic flow: ≥110 degrees C.
.7 Static puncture resistance: ≥470 N.
.8 Dimensional Stability: same or better than MD 0.2% / XD 0.1%.
.9 Lap strength: pass >4 kN/m.
.9 Thickness: 4 mm.

2.04 CARPENTRY

.1 Plywood, lumber, blocking, nailers, and other carpentry to Section 06 10 00 requirements.

.2 Plywood shall be Douglas fir or Pine plywood (DFP), Exterior grade, waterproof glue bond, no added urea formaldehyde.

.3 Do not use pressure-treated materials unless to be left exposed after completion of project.

2.05 SEALERS

.1 Primers for self-adhering membranes: as recommended by roofing membrane manufacturer, meeting warranty requirements and ambient conditions at time of installation.

.2 Mastics: as recommended by roofing membrane manufacturer, meeting warranty requirements, containing SBS modified bitumen, fibres, and mineral fillers.

.3 Transition tape, membrane flashing, base sheets, sealers, and sealing compounds: as recommended by roof membrane cap-sheet manufacturer, conforming to warranty requirements.

.4 Sealants: Caulking - see Section 07 92 00 - Joint Sealants.

2.06 CANT STRIPS

.1 Cants (mandatory at upturns): to ASTM 726, rigid mineral wool fibre cant manufactured from basalt rock and steel slag with bitumen saturated, lightly sanded surface, precut to provide 45 degree transitions, torch safe and fire resistant.

2.07 FASTENERS

.1 Nails and Fasteners: ensure fastener compatibility with roof membranes and flashing. Ensure fasteners are acceptable to roofing membrane manufacturer and meet warranty requirements.
  .1 Use self-drilling, self-tapping, organic fluoropolymer coated screws for securing of wood nailers and blocking. Screws to pass FM V Class 1 criteria, minimum of 30 cycles in a Kesternich Cabinet. Ensure thread diameter is minimum 6 mm (0.245").
  .2 Ensure nails used to secure metal to wood are galvanized and long enough to penetrate wood by a minimum of 25 mm (1”).
  .3 Use self-drilling, self-tapping, organic fluoropolymer coated screws to secure rigid insulation to decking. Screws to pass FM Class 1 criteria, minimum of 30 cycles in a Kesternich Cabinet. Ensure thread diameter is minimum 5.58 mm (0.220”) and penetrate decking by a minimum of 25 mm (1”).
  .4 Stressplates for Attachment:
    .1 75 mm (3") diameter, galvanized steel or Galvalume.
    .2 Minimum Screw Size: #14 fasteners minimum.
  .5 Ensure fasteners are acceptable to membrane manufacturer, and are in compliance with fastener standard FM 4470, 1-28 and 1-29.
  .6 Where nails are in contact with metal flashing, use nails made from same metal as flashing.
  .7 Structural screws to match adjacent exposed colour.
  .8 Pin bolts: 6 mm diameter, lengths as required.

.9 Termination bars, stainless steel, 3 mm x 25 mm, pre-punched at 150 mm on centre.

2.08 ROOF SPECIALTY ACCESSORIES

.1 Roof Drains to Division 22.

3 EXECUTION

3.01 QUALITY OF WORK

.1 Comply with the NBC. Where the requirements of this section exceed the requirements of the Code, this section governs.

.2 Install roofing materials, up to and including Protection Board, over area to receive roofing in compliance with CSA A123.21 14: Mechanically Fastened Designs.

.3 Comply with SBS membrane manufacturer’s warranty conditions, printed installation instructions, data sheets, standard details, and project-specific details.

.4 CRCA Roofing Manual guidelines and recommendations are the minimum standard for execution of the work of this specification section, with this specification section and the SBS membrane manufacturer’s warranty conditions taking precedence.

.5 Do priming in accordance with manufacturer’s written recommendations.

.6 Fit interface of walls and roof assemblies with sheet metal, providing connection point for continuity of air barrier.

.7 Install cant strips at all upturns. Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

.8 Assembly, component, and material connections shall be made in consideration of appropriate design loads.

3.02 EXAMINATION OF ROOF DECKS

.1 Verification of Conditions:
  .1 Inspect with Departmental Representative deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.

.2 Evaluation and Assessment:
  .1 Prior to beginning of work ensure:
    .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
    .2 Curbs have been built.
    .3 Roof drains have been installed at proper elevations relative to finished roof surface.
    .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.

.3 Do not install roofing materials during rain or snowfall.

3.03 PROTECTION OF IN-PLACE CONDITIONS

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

.2 Use warning signs and barriers. Maintain in good order until completion of Work.

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

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

.5 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.

.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

.7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.04 METAL INSULATION STOPS

.1 At hot exhaust stacks, install metal insulation stops on decking centered around roof projection.

.2 Allow for gap between insulation stop upturn and projection.

.3 Secure flange to deck with manufacturer's recommended fasteners.

.4 Prime exposed surfaces of flange and upturn prior to installing vapour retarder.

3.05 SUBASSEMBLY

.1 Install Vapour Retarder, Insulation and Protection Board in accordance with manufacturer's technical datasheets, specifications and illustrations.

.2 Complete rough carpentry work as required.

3.06 CANTS

.1 Install prefabricated mineral wool fibre cants over rigid insulation.

.2 Apply manufacturer's recommended adhesive to receiving surface, and embed cant firmly by hand.

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

3.07 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

.1 Base sheet flashing application:
- .1 Complete installation of flashing base sheet prior to installing membrane cap sheet.
- .2 Heat-weld base and cap sheet onto substrate in 1-metre-wide strips.
- .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal by heat-welding.
- .4 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
- .5 Provide 75 mm minimum side lap and seal.
- .6 Properly secure flashing to substrate without sags, blisters, fish mouths or wrinkles.

.2 Cap sheet application, heat-welded over mechanically fastened coverboard composite panels:
- .1 Once combined cover board and base sheet is applied and no defects are apparent, proceed with cap sheet installation.
- .2 Begin with double-selvedge starter roll. If starter roll is not used, side laps covered in granules must be de granulated by embedding side laps in torch-heated bitumen over a 75 mm width.
- .3 Starting at drain, unroll the cap sheet membrane on the base sheet without adhering, taking care to align the first strip parallel to the edge of the roof.
- .4 Weld cap sheet onto base sheet with torch recommended by membrane manufacturer. During application, simultaneously melt both designated contact surfaces so a bead of bitumen is apparent as cap sheet unrolls.
- .5 Avoid overheating. Take care to avoid excessive bitumen bleed out at joints during installation.
- .6 Unless overlap widths differ between cap and base sheets, make sure joints between the two layers are staggered by at least 300 mm.
- .7 Overlap cap sheet side laps by 75 mm and end laps by 150 mm. Cut off corners at end laps to be covered by next roll. Overlap surfaces must be granule free or degranulated.
- .8 Complete welds between two membranes. Leave no zone unwelded. In cold weather, adjust welding time to obtain homogenous seam.
- .9 Once cap sheet is installed, carefully check overlapped joints. Leave bleed-out at joints ungranulated until inspected and accepted by Departmental Representative. Apply coloured granules to bleed-out areas by priming with self-adhesive primer, and while still tacky, shaking granules onto surface and pressing/rolling into place.

.3 Cap Sheet Flashing Application:
- .1 Install cap sheet in 1 metre widths. Overlap side laps by 75 mm. Stagger base and cap sheet overlaps on roof by at least 100 mm to avoid excessive layering. Make overlaps 150 mm wide.
- .2 Draw parallel chalk line 150 mm from up stand or parapet bases.

.3 Sink surface granules into bed of hot bitumen with torch and round nosed trowel from chalk line on roof to up stand or parapet base as well as over granulated vertical parts to be overlapped.

.4 Torch weld cap sheet directly onto base sheet from top to bottom to soften both membranes and obtain homogenous seal.

.5 During installation, avoid overheating membrane and excessive bitumen bleed out at joints.

.6 Once cap sheet flashing is installed, carefully check overlapped joints. Leave bleed-out at joints ungranulated until inspected and accepted by Departmental Representative. Apply coloured granules to bleed-out areas by priming with self-adhesive primer, and while still tacky, shaking granules onto surface and pressing/rolling into place.

.4 Sheet Metal Flashing and Trim: to Section 07 62 00 - Sheet Metal Flashing and Trim; install in accordance with SMACNA specifications and/or CRCA FL series details.

.5 Roof penetrations:

.1 Install cast iron downpipes to drain rainwater from roof and away from building as required.

3.08 COLD WEATHER PRECAUTIONS

.1 Follow cold weather application guidelines from manufacturer when temperatures are expected to be below 5 deg C.

.2 During cold weather store roll goods and pail goods in a heated environment and bring to roof site just prior to use. Unroll and allow SBS rolls to relax fully prior to installation.

3.09 TEMPORARY WORKS

.1 At the end of each day or at the threat or onset of inclement weather, protect the installed insulation by extending the membrane beyond the insulation and sealing it to the deck with cut-off sealant. Ensure membrane edge is either mechanically fastened or sufficiently ballasted to protect against wind uplift.

.2 When resuming the work, cut and dispose of the portion of membrane contaminated with the night seal (cut-off sealant).

3.10 FIELD QUALITY CONTROL

.1 Site Tests and Inspections:
- .1 Departmental Representative may appoint an independent roofing inspection company.
- .2 If required by inspection company or by Departmental Representative, make cut tests. Roofing Contractor to pay costs of tests and making good roofing after completion of test.
- .3 Owner may engage independent inspection company to inspect work of this Section. Give minimum 2 weeks notice of starting work and allow inspector free access. Inspection may include thermographic survey of completed roof.
- .4 Inspection - Roof Levels:
  - .1 Before roofing is commenced, inspect and check roof surfaces for levels.
  - .2 Undertake a series of spot level checks to determine unevenness in roof decks which may result in pools of water remaining on completed roofing in excess of 13 mm depth.
  - .3 Ensure deck has been inspected and approved by Departmental Representative prior to start of roofing work.

.2 Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Departmental Representative at no cost to Owner.

.3 Manufacturer Services: Arrange for membrane manufacturer representative to visit site on day roofing is commenced and periodically thereafter, to ensure work is properly performed. Upon completion of work of this Section, ensure manufacturer's representative inspects roof and verifies quality of work to yield weathertight waterproofing roofing system and issue manufacturer's warranty. Ensure manufacturer's representative informs Departmental Representative, Contractor and Subcontractor executing work of this Section promptly in writing when inspection is complete and provide detailed report.

.4 Obtain reports within three days of review and submit to Departmental Representative.

3.11 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

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

3.12 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 06 17 53 – Prefabricated Wood Trusses.

.3 Section 06 18 00 – Glue Laminated Construction.

.4 Section 07 27 00.01 – Air Barriers and Vapour Retarders.

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

.6 Section 07 92 00 – Joint Sealants.

.7 Section 08 63 25 - Fixed-Curb Metal-Framed Skylights.

1.02 REFERENCES

.1 Aluminum Association (AA)
  .1 DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
  .2 ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.

.2 ASTM International
  .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
  .2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
  .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum Zinc Alloy Coated by the Hot Dip Process.
  .4 ASTM D523-08, Standard Test Method for Specular Gloss.
  .5 ASTM D822/D822M-13 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
  .6 ASTM E2112-07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.3 Canada Green Building Council (CaGBC)
  .1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.5 Canadian Roofing Contractors Association (CRCA)
.1 CRCA Roofing Specifications Manual.

.6 CSA Group (CSA)
.1 CSA A123.3-05(2010), Asphalt Saturated Organic Roofing Felt.
.2 CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.

.7 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA), 1999.

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

.9 National Building Code of Canada 2010(NBC).

.10 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
.1 CCMC Registry of Product Evaluations.

.11 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 Architectural Sheet Metal Manual, 7th Edition, 2012.

.12 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act (TDGA), 1992.

.13 Underwriters Laboratories (UL)
.1 UL 1703-02, Flat-Plate Photovoltaic Modules and Panels.

1.03 DESIGN REQUIREMENTS

.1 Design roof system to resist:
.1 Snow loads and snow build-up and rain load, expected in this geographical region NBCC climatic data, 50 year probability.
.2 Wind loads, positive and negative, expected in this geographical region NBCC climatic data, 50 year probability.
.3 Dead load of roof system.

.4 If the roof system is to be designed as a shear diaphragm, then the factored shear design loads "Q" and the flexibility factors "F" must be shown on the structural drawings.

.2 Deflection of the roof system is not to exceed 1/180th of the span for the specified live loading.

.3 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
.1 Temperature Change (Range): 20 deg C, ambient; 40 deg C, material surfaces.

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 sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Proof of manufacturer's CCMC listing and listing number.
.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island, Canada.
.1 Indicate arrangement of pre-finished Roof Sheet, including joints, types and locations of supports, fasteners, flashing, gutters, mitres, and all metal components related to the roof installation. Include for underlayment as part of the roof system.
.2 Submit detailed shop drawings to Departmental Representative showing how skylights and solar panels will be integrated into the work.

.4 Samples:
.1 Submit samples of finished metal roof sheet for review by the consultant, prior to fabrication.

.5 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
.2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.
.3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
.4 Submit LEED submittal forms for Credit SS 7.2 - Heat Island: Roof in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
.1 Compliance Requirements: Submit manufacturer's product information indicating that roofing materials meet a minimum SRI of ≥29 required by LEED; Consultant will sign LEED Letter Template declaring compliant materials based on product literature and testing results provided by membrane manufacturer.

1.05 QUALITY ASSURANCE

.1 Mock-ups:
.1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.
.2 Fabricate sample roofing panel assembly, minimum 2 panels wide from ridge to eave, using identical project materials and methods to include typical seam.
.3 Mock-up will be used:
.1 To evaluate quality of work, substrate preparation, operation of equipment, and material application.

.4 Locate where directed.
.5 Allow 24-hours for inspection of mock-up by Departmental Representative before proceeding with sheet metal flashing work.
.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.
.7 Approved mock-up may remain as part of finished Work.

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

1.07 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 SUBASSEMBLY

.1 Wood deck: Nail Laminated Timber (NLT) & Plywood Sheathing.
.1 Refer to Section 06 20 00, and structural drawings and specifications.

.2 Vapour Retarder:
.1 Refer to Section 07 27 00.01 – Air Barriers and Vapour Retarders: Self-Adhered Vapour-Permeable Water-Resistive Air Barrier.
.2 Location: installed over coverboard.

.3 Insulation:
.1 Refer to Section 07 21 13 - Board Insulation.
.2 Location: installed over Vapour Retarder.

.4 Sheathing:
.1 Refer to Section 06 10 00 – Rough Carpentry: Exterior Grade Douglas Fir or Pine Plywood.
.2 Location: installed over insulation.

.5 Membrane Weatherproofing:
.1 Refer to Section 07 27 00.01 – Air Barriers and Vapour Retarders: High Temperature Roof Underlayment.
.2 Location: installed over sheathing.

.6 Drainage Plain: Ventilation and Drainage Mat sandwich structure, open core with nonwoven filter core, meeting or exceeding the following minimum criteria:
.1 Core Material: ≥40% post-industrial recycled polypropylene; colour: black.
.2 Thickness: 12 mm.
.3 Total weight: 695 g/m^2.
.4 Core weight: 540 g/m^2.
.5 Compressive load test results, to ASTM D1621 and ASTM D4716: no failure at 1436 kN/m^2.
.6 Flow rate of core, to ASTM D4491: 4900 litres/sec/m^2.

2.02 ROOF SYSTEM COMPONENTS

.1 Allow time in construction schedule to custom order products specified herein, which may be non-standard.

.2 Clip System:
.1 Thermally responsive clips to be fabricated from a minimum of 0.61 mm aluminum-zinc alloy steel with minimum AZ180 galvanized coating, designed to accommodate expansion and contraction of the roof sheet.
.2 Roof Fasteners: As specified by manufacturer to resist wind uplift and sliding snow forces.

.3 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, 0.61 mm minimum base metal thickness.

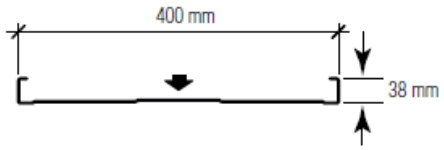
.4 Seam Cap:

.1 Seam Caps: Provide seam caps for full length of the roof panel with sealant of non-skinning, non-drying sealant on the unexposed side. Caps to be mechanically seamed onto panel side-laps. Fabricated from AZ180 galvanized (aluminum-zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a minimum nominal core thickness 0.61 mm. Finish and colour to match roof sheet.

2.03 ROOF PANEL PROFILE

.1 Profile of roof panels shall be same as or similar to the following:

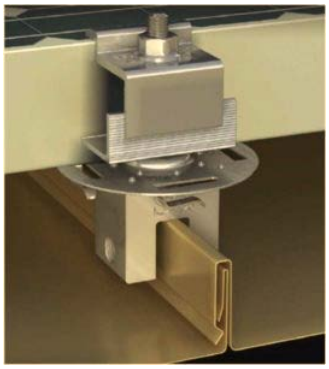
.1 T-style mechanically seamed side-lap roofing panels with intermediate rib; designed for slopes as low as 2:12 (9.46 degrees); 400 mm wide panels; end ribs 38 mm high; 95 mm wide intermediate rib, centered, with 150 mm either side.



2.04 ACCESSORIES

.1 Supply components required for complete roofing system assembly, including trim, coping, fascia, soffit and soffit moulding, corner units, premanufactured vented ridge cap and closures, clips, flexible and pre-moulded flashing, sealants, gaskets, fillers, closure strips, and similar items as required; match material and finish of metal roofing system.

.2 Solar Panel Accessories: Supply seam clamps as required for mounting and anchoring photovoltaic (PV) modules and other ancillary equipment to metal roof assembly (see example below):



.3 Isolation coating: alkali-resistant bituminous paint.

.4 Plastic cement: to ASTM D4586/D4586M.

.5 Sealant/caulking: neutral-cure silicone sealant, to ASTM C920 and ASTM C719 Class 50; ± 50% movement capability.

.6 Cold-applied rubber asphalt joint sealing compound: Cold-Applied Rubberized-Asphalt Sealer.

.7 Fasteners: aluminum zinc alloy coated, suitable for structural deck material.

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

.9 Sheet metal flashing, curbs, and trim: prefinished flashing materials to match roofing materials, except 0.8 mm minimum base metal thickness.

.10 Penetration flashing: pre-manufactured silicone flashings able to withstand constant temperatures at the roofline of -50°C (-58°F) to 200°C (392°F) and up to 250°C (482°F) intermittently.

.11 Touch-up coating materials: as recommended by sheet metal roofing manufacturer.

2.05 FABRICATION

.1 Fabricate aluminum-zinc alloy sheet metal system in accordance with AA ASM-35.

.2 Fabricate roof components to comply with dimensions, profiles, gauges and details as shown on the shop drawings, including fascia and soffit panels and all companion flashing.

.3 Fabricate all components of the system in the factory, ready for field installation.

.4 Provide roof sheet and all accessories in longest practicable length to minimize field lapping of joints.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sheet metal roofing 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 COMPLIANCE

.1 Comply with Warranty requirements, roofing manufacturer’s printed installation instructions, and CRCA Roofing Application Standards Manual guidelines.

.2 All installation work shall be carried out by trained erection crews in accordance with roofing manufacturer's and these specifications.

3.03 COORDINATION

.1 Coordinate with and tie-in to overhead glazing (skylights) and solar panels as required to maintain continuity of waterproofing, vapour retarder, air barrier and roofing protection.

.2 Refer to Section 08 63 25 - Fixed-Curb Metal-Framed Skylights for skylight specifications. Refer to electrical specifications and drawings for solar panels.

.3 Coordinate and cooperate with solar panel installation work to ensure continuity of waterproofing and roofing performance, and maintenance of construction schedule.

.4 Cooperate and coordinate with other trades as required to ensure continuity of waterproofing, vapour retarder and air barrier systems.

.5 Submit detailed shop drawings to Departmental Representative showing how skylights and solar panels will be integrated into the work.

3.04 PREPARATION

.1 Install subassembly materials in accordance with manufacturer’s technical datasheets and printed installation instructions and illustrations.

3.05 INSTALLATION

.1 Roof Materials:
- .1 Membrane Weatherproofing: Install Membrane Weatherproofing fully adhered to solid substrate according to manufacturer's recommendations. Ensure all joints are properly lapped and sealed. Tie-in with barriers on adjacent surfaces to ensure airtight construction. Provide a continuous seal around all openings in the insulated metal roof system.
- .2 Install Drainage Plain ventilation and drainage mat in accordance with manufacturer’s technical datasheets and printed installation instructions and illustrations. Coordinate with installation of Clip System.
- .3 Clip System: Attach Tradition clips using fasteners as recommended by the manufacturer, to suit the substrate.

.2 Roof Panel Installation
.1 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure metal roofing sheet side-lap is positively retained by clips, and proper sheet coverage is maintained.
.2 Install the seam-cap at all side laps as shown on the approved shop drawings. Add sealant as required. Mitre snap-cap as required to resist water entry.
.3 Where indicated on approved shop drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturers specifications and details to provide a weather-tight seal. Exposed fasteners to match colour of the roof sheet.
.4 Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.
.5 Install all companion flashing {gutters}, {ventilators} as shown on the shop drawings. Use concealed fasteners when possible. Exposed fasteners to match colour of roof sheet..

.3 Solar photovoltaic (PV) power systems mounted to standing-seam metal roof:
.1 There are 60 solar panels to be installed with minimum 4-connection points each.
.2 Coordinate with other trades as required.
.3 Install purpose-made PV seam clamps in accordance with manufacturer’s datasheet and guide specifications.
.4 Direct-attach clamps and PV panels in accordance with requirements of National Building Code of Canada and UL 1703.

.4 Other Work:
.1 Complete installation of roofing as required in accordance with roofing manufacturer’s printed installation instructions and illustrations; ensure a complete weatherproof installation tied-in to adjacent assemblies as required.

3.06 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 and Section 01 35 21 - LEED Requirements.

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

3.07 PROTECTION

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

.2 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

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 42 29 – Ceramic Wall Panels.

.4 Section 07 42 43 – Composite Wood Veneer Wall Panels.

.5 Section 07 52 00 – Modified Bituminous Membrane Roofing.

.6 Section 07 61 00 – Sheet Metal Roofing.

.7 Section 08 11 00 – Metal Doors and Frames.

.8 Section 08 42 29 – Automatic Entrances.

.9 Section 08 44 13 – Glazed Aluminum Framing Systems.

.10 Section 08 63 25 – Fixed-Curb Metal-Framed Skylights.

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 Shop Drawings:
.1 Shop drawings: submit drawings showing proposed method of shaping, forming, jointing, fastening, and application of flashing and sheet metal work, stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.

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

.5 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
.1 Submit LEED submittal forms for Credit MR 4 – Recycled Content in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
.2 Submit LEED submittal forms for Credits MR 5 – Regional Materials in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:
.1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.

.6 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 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: as indicated in Section 07 92 00 – Joint Sealants.
.1 Mastic Sealant: polyisobutylene; non hardening, non skinning, non drying, non migrating sealant.
.2 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00.

.5 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.

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

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

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

.9 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.

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

2.05 FABRICATION

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

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

.3 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.

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

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

.6 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.

.7 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.

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

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

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

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

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

.13 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.

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

.15 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 Consultant. 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 Consultant.

.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 Shop Drawings:
.1 Submit fire stop schedule and drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island, Canada.

.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
.2 Construction details should accurately reflect actual job conditions.
.3 Not later than 30 working days following award of Contract, submit a schedule and shop drawings, including room numbers from the Drawings. Indicate ULC assembly number for each condition, required temperature rise and flame rating, hose stream rating, thickness, installation methods and materials of firestopping and smoke seals, damming materials, reinforcements, anchorages and fastenings, size of opening, adjacent materials and number of penetrations. Include manufacturer's printed instructions for each type of penetration.
.4 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with CAN/ULC S101.

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

.5 LEED Submittals:
.1 Submit required documents in accordance with Section 01 33 29 – General LEED Requirements.
.2 At project start-up meeting, submit LEED® Conformance Submittals for the following: Low VOC Content.
.3 Submit LEED submittal form for Credit EQ 4.1 - Low Emitting Materials, Adhesives and Sealants in accordance with Submit required documents in accordance with Section 01 33 29 – General LEED Requirements. Indicate the following:
.1 Sealants: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.
.2 Adhesives: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.

.6 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Test reports: in accordance with CAN ULC-S101 for fire endurance and CAN ULC-S102 for surface burning characteristics.
.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
.2 Certificates: 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 5-years' documented experience 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 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 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 Disposal and Section 01 35 21 - LEED Requirements.
.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.

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

3.09 SCHEDULE

.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 06 18 00 – Glue Laminated Construction

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

.4 Section 07 42 29 – Ceramic Walls Panels.

.5 Section 07 42 43 – Composite Wall Panels.

.6 Section 07 52 00 – Modified Bituminous Membrane Roofing.

.7 Section 07 61 00 – Sheet Metal Roofing.

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

.9 Section 08 11 00 – Metal Doors and Frames.

.10 Section 08 42 29 – Automatic Entrances.

.11 Section 08 44 13 – Glazed Aluminum Framing Systems.

.12 Section 08 63 25 - Fixed-Curb Metal-Framed Skylights

.13 Section 09 21 16 – Gypsum Board Assemblies.

.14 Section 10 26 00 – Impact Resistant Wall Protection.

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 Samples:
.1 Submit 2 samples of each type of material and colour.
.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:
.1 Submit instructions to include installation instructions for each product used.
.5 LEED Submittals:
.1 Submit LEED submittal form for Credit EQ 4.1 – Low Emitting Materials, Adhesives and Sealants in accordance with Section 01 35 21 – LEED Requirements. Indicate the following:

.1 Sealants: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.
.2 Adhesives: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.

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 Roofing:
  - .1 Non-Membrane Related Sealants: VOC content limit 300 g/L.
  - .2 Single Ply Roofing Sealants: VOC content limit 450 g/L.
  - .3 SBS Membrane Sealant Primer: VOC content limit 500 g/L.
- .3 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-3: Silicone Sealant; structural glazing.
.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, and O.

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

.5 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.

.6 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.

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

.8 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.

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

.10 Type S-10: Exterior door thresholds, Showers, 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.

2.03 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 mould & mildew resistant silicone sealant Type S-1 for non moving joints in washrooms and kitchens. Do not use on floors.

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

.6 Use structural glazing silicone Type S-3 for sealing glass, interior and exterior.

.7 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.

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

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

.10 Use multi component sealant Type S-7 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.11 Use one-part sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, not subject to pedestrian and vehicular traffic.

.12 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.

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

2.04 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 masonry control joints to match mortar colour.
  .2 Sealants at other locations to match colour of adjacent exposed material.
  .3 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.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 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.

3.08 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