1 GENERAL

1.01 RELATED REQUIREMENTS

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

.2 Section 06 12 10 – Structural Insulated Panels.

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

.4 Section 07 31 29.01 – Wood Shingle Siding and Roofing.

.5 Section 08 11 10 – Metal Doors and Frames.

.6 Section 08 14 76.10 – Aluminum-Clad Wood Bi-Fold Doors.

.7 Section 08 52 13.10 – Aluminum-Clad Windows.

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 INFORMATIONAL 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.

1.09 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.

1.10 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.

1.11 WARRANTY

.1 For sealant and sheet materials, provide a 12-month warranty period prescribed in subsection GC 32.1.

.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 E96/E96M-13, Standard Test Method for Water Vapor Transmission of Materials.

.2 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 ASTM D41/D41M-11(2016), Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

.4 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.5 ASTM D448 12, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

.6 ASTM D449/D449M-03(2014)e1, Standard Specification for Asphalt Used in Dampproofing and Waterproofing.

.7 ASTM D5147/D5147M-14, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.

.8 ASTM C1325-08b, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

.9 ASTM D2178/D2178M-13a, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

.10 ASTM D6162-00a(2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.

.11 ASTM D6163-00(2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.

.12 ASTM D6164/D6164M-11, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.13 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

.2 Canadian General Standards Board (CGSB)
.1 CGSB 37-GP-9MA, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
.2 CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.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 INFORMATIONAL 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.

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 Work of this Section 07 13 52 - Modified Bituminous Sheet Waterproofing, 12 months warranty period 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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.

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
- .3 Ensure emptied containers are sealed and stored safely.
- .4 Divert unused aggregate materials from landfill to local quarry or licenced accepting facility for reuse as reviewed by DEPARTMENTAL Representative.
- .5 Unused hazardous materials must be disposed of at official hazardous material collections site as reviewed by DEPARTMENTAL Representative.
- .6 Unused adhesive, sealant and asphalt materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Dispose of unused adhesive material at official hazardous material collections site approved by DEPARTMENTAL Representative.
- .8 Dispose of unused sealant material at official hazardous material collections site approved by DEPARTMENTAL Representative.
- .9 Dispose of unused asphalt material at official hazardous material collections site approved by DEPARTMENTAL Representative.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

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

.2 Section 09 21 16 – Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- .2 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

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

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

.4 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 S604 M91, Standard for Factory Built Type A Chimneys.
- .3 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .4 CAN/ULC S716.2-12, Standard for Exterior Insulation and Finish Systems (EIFS) – Installation.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. Indicate VOC's during application and curing.

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

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

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

1.04 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect specified materials from distortion, deterioration, wetting, or damage.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 INSULATION

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

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

.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.

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 after building substrate materials are dry.

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

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

.4 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

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

.6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

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.
- .3 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.
- .4 Install cement board as indicated, adhesively bonded.
- .5 Protect below grade installations from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

3.04 CLEANING

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

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

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 00_01 - Air Barriers and Vapour Retarders.

1.02 REFERENCE STANDARDS

.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 S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.

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

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

1.04 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
.1 Store materials off ground, indoors, in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect specified materials from getting wet and from damage or deterioration[.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 INSULATION (SOUND ATTENUATION BLANKET)

.1 Fibrous mineral slag acoustical insulation for fire and smoke rated assemblies: Un-faced preformed fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:
.1 Type: 1.
.2 Width: to friction fit in stud spaces.
.3 Thickness: minimum 89 mm to fill a minimum of 90% of the cavity thickness.
.4 Nominal density: 40 kg/m^3.

.2 Fibrous mineral slag acoustical insulation: Un-faced, preformed mineral slag fibrous insulation in accordance with CAN/ULC S702 and meeting or exceeding following minimum requirements:
.1 Type: 1
.2 Thermal Resistance: nominal RSI of 0.67/25 mm.
.3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S114.
.4 Flame spread: less than 5 in accordance with CAN/ULC S102.
.5 Density: 32 kg/m^3.
.6 Thickness: as indicated on Drawings.

2.02 ACCESSORIES

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

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

.3 Staples: galvanized, 12 mm minimum leg.

.4 Tape: as recommended by manufacturer.

3 EXECUTION

3.01 EXAMINATION

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

3.02 INSULATION INSTALLATION

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

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

.3 Do not compress insulation to fit into spaces.

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

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

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

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

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

3.03 CLEANING

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

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

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

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

.2 Section 06 12 10 – Structural Insulated Panels.

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

.4 Section 07 27 00_01 - Air Barriers and Vapour Retarders.

.5 Section 08 11 10 – Metal Doors and Frames.

.6 Section 08 14 76.10 – Aluminum-Clad Wood Bi-Fold Doors.

.7 Section 08 52 13.10 – Aluminum-Clad Windows.

1.02 REFERENCES

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

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

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

.4 Underwriters' Laboratories of Canada (ULC)
  .1 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
  .2 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
  .3 CAN/ULC S705.1-15, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification.
  .4 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Submit test reports in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and replacement procedures at end of lifecycle.
- .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3-days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.04 QUALITY ASSURANCE

.1 Applicators to conform to CUFCA Quality Assurance Program.

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

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

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

1.05 DELIVERY, STORAGE AND HANDLING

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

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

1.06 SITE CONDITIONS

.1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24-hour after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

2 PRODUCTS

2.01 MATERIALS

.1 Insulation: spray polyurethane to CAN/ULC S705.1, one-component rigid urethane foam with the following minimum physical properties:
.1 Density (ASTM D1622): 30.3 kg/m^3.

.2 Compressive Strength (ASTM D1621): 57.5 kPa.
.3 Compressive Modulus (10% deflection): 848 kPa.
.4 Tensile Strength (ASTM D1623): 133.5 kPa.
.5 Flatwise Shear (ASTM C273): 58.5 kPa.
.6 Thermal Resistance: 1.41 RSI/25 mm thickness.
.7 Water Absorption (ASTM D2842): 3.0 kg/H20/m².
.8 Water Vapour Transmission (ASTM E96): 2.327 perms.

.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.
.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

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 06 10 00 – Rough Carpentry.

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

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

.5 Section 07 92 00 – Joint Sealants.

.6 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C411-05 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.2 ASTM C518-10 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.3 ASTM C1338-08 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

.4 ASTM D1621-10 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.

.5 ASTM D1622-08 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.6 ASTM D1623-09 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics (Type C sample).

.7 ASTM D2126-09 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

.8 ASTM D2369-10, Standard Test Method for Volatile Content of Coatings.

.9 ASTM D2842-06 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.10 ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics.

.11 ASTM E96/E96M-10 - Standard Test Methods for Water Vapor Transmission of Materials

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

.3 Canadian Gas Association (CGA).

.1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.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 SCAQMD Rule 1113-06, Architectural Coatings.

.6 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC S101 07, 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 S127-07, Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Building Materials.
.4 CAN/ULC S705.1 01-AM3, Amendment 3 to Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification, Includes Amendments 1,2.
.5 CAN/ULC S705.2 05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.
.6 CAN/ULC S770 09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
.7 CAN/ULC S774-03 - Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittals:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.2 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, 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.

1.4 QUALITY ASSURANCE

.1 Applicators to conform to CUFCA Quality Assurance Program.

.2 Qualifications:
.1 Installer: person specializing in sprayed insulation installations with 5 years documented experience, approved by manufacturer.
.2 Manufacturer: company with minimum 5 years experience in producing of material used for work required for this project, with sufficient production capacity to produce and deliver required units without causing delay in work.

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

.4 Independent Testing Agency:
.1 Arrange for site reviews by Manufacturer’s authorized agent. Schedule the number of site reviews in accordance with the following schedule:

Coverage Area, sq. m. (sq. ft.)	No. of Site Reviews
3,252 – 6,503 (35,000 – 70,000)	1
6,503 –9,755 (70,001 – 105,000)	2
9,755 – 13,006 (105,001 – 140,000)	3
over 13,006 (over 140,000)	4+

1.5 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 Deliver materials in sealed unopened containers clearly indicating manufacturer, product identification and safety information.

.4 Store materials above minimum temperature as recommended by manufacturer.

.5 Store materials in dry and well-ventilated area away from weather and direct sunlight. Maintain temperatures between 18°C and 30°C.

1.6 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.

Part 2 Products

2.1 MATERIALS

.1 Two-component urethane foam insulation system of medium density, specifically intended for spray applied applications. When tested, material shall meet the requirements of CAN/ULC S705.1 Standard for Thermal Insulation Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification and the following criteria:

- .1 Long term thermal resistance: to CAN/ULC S770, 1.94 minimum RSI at 50 mm thickness (R-11 per 2").
- .2 Water vapour permeability: to ASTM E-96, <42 ng/Pa.s.m2 at 50 mm thickness (< 0.7 Perms at 2")
- .3 Water absorption % by Volume: To ASTM D-2842, < 1.2%.
- .4 Flame Spread: To CAN/ULC S-102 or (S-127), <315.
- .5 VOC's: To CAN/ULC S774: Pass.
- .6 Low temperature requirements: ambient air temperature of minus 10 degrees C, and substrate surface temperature of minus 7 degrees C.

.2 Primers/adhesives: in accordance with the spray polyurethane and/or air/vapour barrier membrane manufacturers' recommendations for surface conditions. The type of primer/ adhesive and the installation of the primer/adhesive shall follow the requirements of the manufacturer for the surface conditions.

.3 Thermal Barrier: gypsum wall board and exterior sheathing as indicated.

2.2 EQUIPMENT

.1 The equipment used to spray the polyurethane foam material shall be in accordance with ULC S705.2 and the equipment manufacturer's recommendations for each specific type of application and condition required for this project.

.2 Equipment settings are to be recorded on the Daily Work Record as required by the CAN/ULC S705.2 Installation Standard.

.3 Each proportioned unit to supply only one spray gun.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

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

.2 Surface Preparation:
- .1 Surfaces to receive spray applied foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the membrane.
- .2 Ensure that all work by other trades that may penetrates through the foam insulation is in place and complete.
- .3 Ensure that surface preparation and any primer/adhesive required conform to the manufacturer's instructions.
- .4 Following application of the spray applied foam insulation and prior to the application of the thermal barrier material, apply a bonding agent to all areas to receive the thermal barrier application.

3.3 APPLICATION

.1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2 and manufacturer's printed instructions.

.2 Use primer where recommended by manufacturer.

.3 Apply sprayed foam insulation in thickness as indicated.

.4 Remove masking materials and overspray from adjacent areas immediately after foam surface has hardened.

.5 Repair damaged areas in accordance with manufacturer's application guidelines for insulation.

.6 Trim, as required, any excess thickness that would interfere with the work of other trades. Where insulation must be cut back, the cut surface must be patched to the requirements of the manufacturer to provide a water shedding surface.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visit(s) for inspection of product installation in accordance with manufacturer's instructions.

3.5 TOLERANCES

.1 Maximum variation from indicated thickness: minus (-) 3 mm (1/8"); plus (+) 13 mm (½").

3.6 PROTECTION

.1 Protect applied materials from damage during construction.

.2 Repair damage to adjacent materials caused by medium density closed-cell spray polyurethane foam insulation application.

.3 Protect spray polyurethane foam from ultraviolet light in accordance with manufacturer's requirements.

3.7 CLEANING

.1 Progress and Final Cleaning: 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 from site.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

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

.2 Section 06 12 10 – Structural Insulated Panels.

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

.4 Section 08 11 10 – Metal Doors and Frames.

.5 Section 08 14 76.10 – Aluminum-Clad Wood Bi-Fold Doors.

.6 Section 08 52 13.10 – Aluminum-Clad Windows

1.02 REFERENCES

.1 ASTM International Inc.
- .1 ASTM D93-12, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.
- .2 ASTM E96/E96M 10, Standard Test Methods for Water Vapor Transmission of Materials.
- .3 ASTM D146/D146M-04 (2012) e1, Standard Test Methods for Sampling and Testing Bitumen Saturated Felts and Woven Fabrics for Roofing and Waterproofing.
- .4 ASTM D41206ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
- .5 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- .6 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- .7 ASTM D1709-09, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- .8 ASTM D1970/D1970M 11, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .9 ASTM D2103-10, Standard Specification for Polyethylene Film and Sheeting.
- .10 ASTM D2261-13, Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).

.11 ASTM D2582-09, Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
.12 ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
.13 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
.14 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
.15 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.
.16 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
.17 ASTM E1643-11, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
.18 ASTM E1745-11, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
.19 ASTM E2112-07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.
.20 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials.
.21 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.3 Sealant and Waterproofer's Institute - Sealant and Caulking Guide 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 INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications, and datasheets, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.

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

.4 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and replacement procedures at end of lifecycle.
- .4 Manufacturer's Field Reports: submit manufacturer's written reports within 3-days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.05 QUALITY ASSURANCE

.1 Qualifications:
  .1 Applicator: company specializing in performing work of this section with minimum 5-years' documented experience with installation of air/vapour barrier 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-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.

.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.

1.06 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 WASTE MANAGEMENT AND DISPOSAL

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

1.08 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.

1.09 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.

1.10 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 sheet 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 INTERIOR APPLICATION: SEMI-IMPERMEABLE VAPOUR RETARDER

.1 Refer to Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders for definition of 'semi-impermeable'.

.2 Vapour Retarder (sometimes referred to as 'poly vapour barrier' or 'poly' on Drawings): in lieu of conventional polyurethane sheet, Provide semi-impermeable polyimide film vapour retarder for use with unfaced, vapour-permeable mineral wool insulation in wall and ceiling cavities, and as indicated, meeting or exceeding the following minimum requirements:
   .1 Water Vapour Permeance, to ASTM E86:
      .1 Dry cup method: 1.0 perms (57 ng/Pa•s•m^2).
      .2 Wet cup method: 10.0 perms (1144 ng/Pa•s•m^2).
   .2 Class A for flame spread and smoke developed.

2.02 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 (15 mils).

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

2.03 FOAM-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.

2.04 MASTICS AND ADHESIVES

.1 Waterproofing Mastic: solvent-based mastic containing SBS modified bitumen, fibres and mineral fillers, used to seal around penetrations and extrusions.
   .1 Compatibility: With air/vapour barrier membrane, substrate, and insulation.
   .2 Specific gravity at 20 degrees C: 1.0 kg/l to 1.12 kg/l.

.3 Application Temperature: -10 degrees C to +35 degrees C.
.4 Solids by Weight: 70% to 83 %.

.2 Adhesives: compatible with sheet seal and substrate, permanently non-curing.

2.05 ACCESSORIES

.1 Thinners and cleaners: as recommended by sheet material manufacturer.

.2 Attachments: galvanized steel bars and anchors.

.3 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.

.4 Through-Wall Membranes: Manufacturer’s recommended reinforced self-adhesive, compatible with air and vapour membrane and that will not become plastic and extrude onto finished surfaces when exposed to high wall temperatures.

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

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

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.

3.05 PREPARATION

.1 Remove loose or foreign matter, which might impair adhesion of materials.

.2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.

.3 Ensure substrates are free of surface moisture prior to application of self-adhesive membrane and primer.

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

.5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.06 INSTALLATION – INTERIOR SEMI-IMPERMEABLE VAPOUR RETARDER

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

.2 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturer’s written instructions.

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

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

.5 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.

.6 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.

.7 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.

.8 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.

3.07 INSTALLATION – 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.

3.08 FIELD QUALITY CONTROL

.1 At 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 m2 as directed by Departmental Representative; repair test areas at no extra cost to Owner.

.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.

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

3.9 CLEANING

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

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

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

3.10 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 from wet weather conditions during and after application of membrane. 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.

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 12 10 - Structural Insulated Panels.

.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 52 00 - Modified Bituminous Membrane Roofing.

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

.8 Section 07 92 00 - Joint Sealants.

1.02 REFERENCE STANDARDS

.1 Air Barrier Association of America (ABAA)

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

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

.6 Canadian Commission on Building and Fire Codes/National Research Council of Canada
.1 National Building Code of Canada (NBC), edition adopted and currently enforced by the Province of Prince Edward Island.

.7 Maritime Lumber Bureau (MLB) Grading Agency

.8 National Lumber Grades Authority (NLGA)
.1 NLGA Standard Grading Rules for Canadian Lumber 2003.

.9 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 ASSEMBLY DESCRIPTION – WALL AND ROOF

.1 Cedar Shingles.
.3 Ventilating Underlayment.
.3 Weather Barrier.
.4 Structural Insulated Panels.
.5 Sawn Heavy Timber Framing.

1.05 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Departmental Representative, installer, manufacturer's representative in accordance with Section 01 31 19 – Project Meetings to:
.1 Verify project requirements.
.2 Review structural load limitations.
.3 Coordination with other building trades.
.4 Review manufacturer's installation instructions.

1.06 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 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.

.4 Shop Drawings:
.1 Submit drawings showing elevations, sections, details, including transition details to other parts of the work. Indicate details of flashing installation.

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

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

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

.8 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions.
.2 Submit manufacturer’s warranties as specified

1.07 QUALITY ASSURANCE

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

.2 Grade cedar shakes in accordance with CSA 0118.1.

.3 Sole source:
.1 All cedar shingles for the roof and siding shall be supplied by the same manufacturer.
.2 The Ventilation Rainscreen and Water Resistive Barrier shall be from the same manufacturer, including manufacturer’s supplied or recommended accessorizes and auxiliary materials.

1.08 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 off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.3 Store and protect shingles from weather and construction damage.
.4 Replace defective or damaged materials with new.
.5 Remove only in quantities required for same day use.

1.09 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.

1.10 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.

1.11 WARRANTY

.1 Eastern White Cedar, as installed: 30-years against wood decay.

2 PRODUCTS

2.01 MATERIALS – CEDAR SIDING

.1 Eastern White Cedar: kiln-dried, cedar shingle roofing, to CSA O118.2, Eastern White Cedar Shingles.
  .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 board and other lumber: Type 316 stainless steel fasteners, suitable for fastening strapping to structural backup wall.
    .2 Siding installation: Type 316 stainless steel splitless ring shanked nails with minimum 7/32” (0.6 cm) flat head.

2.02 MATERIALS – CEDAR ROOFING

.1 Eastern White Cedar: kiln-dried, cedar shingle roofing, to CSA O118.2, Eastern White Cedar Shingles.
  .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 board and other lumber: Type 316 stainless steel fasteners, suitable for fastening strapping to structural backup wall.
.2 Siding installation: Type 316 stainless steel splitless ring shanked nails with minimum 7/32” (0.6 cm) flat head.

2.03 WEATHER BARRIER SYSTEM - WALLS

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

.2 Weather Barrier: Primary fully self-adhered water-resistive vapour permeable air barrier membrane components and accessories must be obtained from a single-source manufacture to ensure total system compatibility and integrity. Commercial-grade multi-layered spunbonded polyolefin, non-woven, non-perforated, weather barrier with the following minimum physical properties and performance characteristics:
.1 Breaking strength and Elongation to ASTM D5034: 88 lbf (391 N), machine direction; 83 lbf (369 N), cross-machine direction.
.2 Water Vapour Permeance tested to ASTM E96 Method B: minimum of 50 perms(2861 ng/Pa.s.m^2).
.3 Water Vapour Permeance tested to ASTM E398: minimum of 50 perms (2861 ng/Pa.s.m^2).

.4 Air Leakage: ≤0.00002 cfm/ft^2 @ 1.57 psf (≤0.0001 L/s m^2 @ 75 Pa) when tested in accordance with ASTM E2178 and <0.01 cfm/ft^2 @ 1.57 psf (<0.01 L/s m^2 @ 75 Pa)) when tested in accordance with ASTM E2357 and. Meets Air Barrier Association of America (ABAA) requirements for "Adhesive Backed Commercial Building Wraps".

.5 Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage.

.6 Application Temperature: Ambient temperature must be above 20 °F (minus 6.7°C).

.7 Surface Burning Characteristics tested to ASTM E84: Class A, Flame-spread index of less than 5, Smoke developed index of less than 15.

.8 Physical Dimensions: 0.022 inches (0.56 mm) thick and 59 inches (1.5 m) wide and 7.58 oz/yd^2 (257 g/m^2).

.3 Accessories: weather barrier manufacturer's supplied or recommended accessories as necessary for a complete system, including but not limited to the following:

.1 Water-resistive vapour permeable transition and flashing membranes.

.2 Water-resistive vapour permeable flashing system purpose-made for rough openings.

.3 Water-resistive vapour permeable flashing system and accessories, purpose-made for through-wall applications.

.4 Penetration sealant; provide commercial-grade sealants recommended or supplied by membrane manufacturer that comply with ASTM C920, elastomeric polymer sealant as required to maintain watertight conditions.

.5 Other accessories as recommended or supplied by membrane manufacturer to suit site conditions and as required for a complete system, meeting requirements of Section 07 05 27.01 - Common Work Results for Air Barriers and Vapour Retarders.

2.04 WEATHER BARRIER SYSTEM – ROOF

.1 Weather Barrier: commercial-grade to ASTM D1970, self-adhered SBS-modified bitumen underlayment, reinforced with skid-resistant polyethylene surface film designed for sloped roof installation, meeting or exceeding the following minimum physical properties and performance characteristics:

.1 Adhesion to Plywood (to ASTM D1970) lbf/in.
- 24°C (75°F): ≥1.6 lbf/in.
- 4.4°C (40°F): ≥2.5 lbf/in.
- -10°C (14°F): ≥1.4 lbf/in.

.2 Lap Peel Strength (to ASTM D1876) lbf/in.
- 24°C (75°F): ≥4.8 lbf/in.
- 4.4°C (40°F): ≥9.9 lbf/in.
- -10°C (14°F): ≥3.1 lbf/in.

.3 Tear Resistance (to ASTM D1970) lbf.
- MD: >220 lbf (50 N).
- XD: >200 lbf (46 N).

.4 Air Leakage @ 75 Pa (to ASTM E2178): <0.004 cfm/ft²

.5 Sealability around nail (to ASTM D1970): Pass.

.6 Water Vapour Transmission (ASTM E96): 0.88 ng/m².s.

.7 Low Temperature Flexibility @ -29°C (-20°F) (to ASTM D1970): Pass.

.8 Application temperature: -10°C (14°F) and above.

.9 Product thickness: 1 mm.

.10 Maximum Load (to ASTM D1970):
- MD: 6.1 kN/m (35 lbf/in).
- XD: 7.7 kN/m (44 lbf/in).

.2 Accessories: provide membrane manufacturer's recommended or supplied primer, mastic, termination bars and anchors, roof-to-wall pre-manufactured transition membrane, through-wall membrane.

2.05 VENTILATING GRID SYSTEM

.1 Ventilating Grid: Rigid, flat 4-foot x 8-foot engineered plastic grid panels with ¼-inch long stand-off dimples for an overall panel thickness of ½-inch. Weight per panel shall be approximately 8-lbs (1/4 lb/sq.ft.). Vertical load capacity: ≥8000 lbs/sq.ft.. 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.

2.06 ROOF RIDGE EXHAUST VENT

.1 Roof Ridge Exhaust Vent: UV-stable, single-layer non-fabric covered coil ridge vent made of 100% recycled nonwoven modified polyester, non-wicking, fiber-based matting of three-dimensional construction, with the following minimum physical properties and performance:
  .1 Dimensions: 270 mm wide x nominal 16 mm thick.
  .2 Material weight (nominal): 139 g per 300 mm.
  .3 Net Free Ventilation Area (NFVA): >14 square inches per lineal foot.
  .4 Passes 110 mph wind-driven rain and snow infiltration tests in laboratory conditions.
  .5 Air flow at 10 Pa using CCMC Attic Pressurization Test Protocol.

.2 Accessories: Manufacturer's supplied or recommended nails for mechanical attachment through weather barrier into Structural Insulated Panels.

2.07 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.

2.08 FABRICATION

.1 Fabricate mouldings, facia, and trim to match adjacent existing work, to 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 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 New Roof Construction Manual for Roof Application Details and CSSB Exterior and Interior Wall Manual for Sidewall Application Details.

3.02 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. Proceeding with work means acceptance of conditions.

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.

.4 Coordinate with other trades as required to maintain construction schedule.

3.04 WEATHER BARRIER SYSTEM - WALLS

.1 Installation Summary:
- .1 Self-adhered vapour permeable air barrier sheets may be installed vertically or horizontally over the outside face of exterior sheathing board or other approved substrates.
- .2 Complete detail work at; wall openings, building transitions and penetrations prior to field applications.
- .3 Install fully self-adhered vapour permeable air barrier sheet over the outside face of exterior sheathing board or substrate, measure and pre-cut into manageable sized sheets to suit the application conditions.
- .4 Install fully self-adhered vapour permeable air barrier sheet complete and continuous to substrate in a sequential minimal 3 inch (76.2 mm) overlapping weatherboard.
- .5 Stagger all end lap seams.
- .6 Roll installed membrane with roller to ensure positive contact and adhesion with substrate immediately.

.2 Building Transitions:
- .1 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-adhering air barrier transition and flashing membrane.
- .2 Align and position fully self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Provide minimum 3 inch (76.2 mm) lap on to substrates.
- .3 Ensure minimum 3 inch (76.2 mm) overlap at side and end laps of membrane and 6 inch (152.4 mm) at inside and outside corners, if joints occur at corner locations.
- .4 Roll membrane and lap seams with roller to ensure positive contact and adhesion, immediately.

.3 Mechanical Equipment Penetrations:
.1 Mechanical pipe, electrical conduit and/or duct work must be secured solid into position prior to installation of fully self-adhered vapour permeable air barrier membrane.
.2 Electrical services penetrating the wall assembly and fully self-adhered vapour permeable air barrier membrane must be placed in appropriate conduit and secured solid into position.
.3 Install manufactured flanged penetration sleeves as recommended by sleeve manufacturer.
.4 For straight sided penetrations, cut and fit fully self-adhered vapour permeable air barrier to accommodate sleeve, install mastic to seal the air barrier membrane to ductwork or preformed flange sleeve.
.5 For pipe penetrations, refer to manufacturer's standard details.

.4 Window, Door and Other Wall Openings:
.1 Apply fully self-adhered flashing, mastics and related accessories around window or wall openings subject to the opening size and installation of window, door or louver type.
.2 Install fully self-adhered air barrier transition and flashing membrane installed 2 ¾ inch (70 mm) into rough wall openings for the sill, jambs and head.
.3 Remove release film, align flashing membrane and apply pressure to ensure positive contact. Roll Lap seams to ensure adhesion. Provide lap seams in singled fashion, to shed water.
.4 Liquid Applied Treatments:
.1 Liquid-applied window and door flashing shall be a liquid-applied vapour permeable air barrier flashing material with resistance to moisture and air leakage properties compatible with the primary weather resistant air barrier membrane.
.2 Apply a 12-15 wet mil (0.030-0.038 mm) coating onto the installed self-adhered membrane, 1 inch (25.4 mm) onto the face continuing into the rough opening, covering the 2 ¾ inch (70 mm) self-adhered membrane and the exposed rough opening surface.

.5 Through-Wall Flashings:

1. Apply through-wall self-adhered flashing membrane along the base of masonry veneer walls and over shelf angles as detailed by designer.
   - .1 Press membrane firmly into place, overlap minimum 3 inches (76 mm) at all laps. Promptly roll all surfaces using a hand roller to ensure good adhesion.
   - .2 Applications shall form a continuous flashing membrane and shall extend up a minimum of 8 inches (20 cm) up the back-up wall.
   - .3 Seal the top edge of the membrane where it meets the substrate using manufacturer's recommended seal product. Trowel-apply a feathered edge to seal termination to shed water or install termination bar and sealant at the top edge.
   - .4 Install through-wall flashing membrane ½ inch (13 mm) from outside edge of veneer. Provide end dam flashing detail in accordance with shop drawings.

.6 Self-Adhered Membrane – Horizontal Application:

- .1 For horizontal applications, align sheets and begin installation of water-resistive weather barrier at bottom or lowest point of wall.
- .2 To avoid wrinkles and misalignment of subsequent applications, it is recommended to pre-mark or snap a level chalk line to work from.
- .3 Measure and pre-cut into manageable sized sheets to suit the application conditions.
- .4 Allow for excess material at bottom of wall to accommodate tie-ins and connections to adjacent surfaces.
- .5 Align and position fully self-adhered membrane, remove release film and press firmly into place. Provide minimum 3 inch (76 mm) overlap at all side and end laps of membrane. Roll membrane and lapped seams with a two handed roller to ensure contact and adhesion.
- .6 Continue to remove release film and apply pressure to ensure positive contact onto wall substrate.
- .7 Install subsequent sheets of fully self-adhered vapour permeable air barrier sheets in overlapping weatherboard format. Ensure sheets lay smooth and flat to surfaces. Roll membrane and lapped seams with a two handed roller to ensure contact and adhesion.

3.05 WEATHER BARRIER SYSTEM - ROOF

.1 Install in accordance with membrane manufacturer's printed installation instructions, technical datasheets and specifications.

.2 Apply membrane parallel or perpendicular to slope. When applied perpendicular to slope, apply membrane beginning at low point and proceed in shingle fashion. Position the sheet to achieve correct overlap and alignment. Release upper half of release film by peeling off at 90° angle, then peel back second half of lower release film. Overlap on to clear film on sides and at ends a minimum of 70 mm for all applications. Apply firm hand pressure, or pressure with feet to press the membrane onto the substrate.

.3 Roof Edge Applications: When membrane is folded over the roof edge, cover with sheet metal by flashing. Apply membrane far enough up the roof deck to meet local codes and to prevent leaks caused by ice dam formations.

.4 Ridge & Valley Applications: Roll out and align manageable lengths of membrane. Slowly peel first half of release film. Press firmly in place beginning at center of ridge or valley. Repeat with second half of release film. Overlap at ends and sides a minimum of 75 mm. Apply in shingle fashion on valleys.

.5 Vertical Termination Seals: Seal the top edge of vertical installations with a termination bead of membrane manufacturer's recommended polymer-modified sealing compound or sealant.

3.06 ROOF RIDGE EXHAUST VENT

.1 Install Roof Ridge Exhaust Vent at roof ridge over weather barrier in accordance with manufacturer's printed installation instructions and technical datasheet.

.2 Unroll exhaust vent material along roof ridge and fold over at middle so 50% of roll width extends down roof slope each side.

.3 Fasten in place with manufacturer's recommended fasteners.

3.07 VENTILATING GRID SYSTEM – ROOF AND WALLS

.1 Confirm that weather barrier system has been fully installed.

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

.3 Install wood blocking and sheet metal flashing closures at gable ends of roof from eave to ridge peak to stop insects and other unwanted debris from entering the air space beneath the shingles/shakes; refer to Section 07 62 00 - Sheet Metal Flashing and Trim for requirements. Install ventilating grid snug to installed roof ridge exhaust vent material.

.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; if ambient temperatures during installation are at or below 32°F, allow ½-inch gap between sheets.

.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.

3.08 CEDAR SHINGLE 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 roofing to CSSB New Roof Construction Manual for Roof Application Details.

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

.4 Install shingles over ventilated rainscreen substrate.

.5 Space shingles from 6 to 10 mm.

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

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

.8 Drive nails flush but do not crush shingles.

3.09 SHINGLE ROOFING

.1 Eave protection:
.1 Install water-resistive barrier to form continuous membrane transition from roof to wall assembly.

.2 Install 457 mm long shingles with 140 mm weather exposure and having triple thickness of shingle at any given point.

.3 Double shingles at eaves, projecting butts 40 mm beyond the fascia and approximately 25 mm over the gable or rake end.

.4 Lay shingles with grain perpendicular to eaves.

.5 Saw shingles parallel to valley centre line. Do not break joints into valley.

.6 Apply strip of water-resistive barrier minimum 200 mm wide over hips and ridges. Use shingles of uniform width approximately 150 mm wide. Apply shingles at same weather exposure as field of roof.

.7 Install bottom step flashing (soaker base flashing) interleafed between shingles at vertical junctions.

.8 Fabricate ridge caps in accordance with Drawings and CSSB New Roof Construction Manual for Roof Application Details: Figure 8, page 7. Ensure shall have concealed nailing and alternate overlaps. Stainless steel fasteners shall be of sufficient length to pass through shingles, rood ridge exhaust vent material and underlayment, into structural insulated panels.

3.10 WALL SIDING SHINGLES AND SHAKES

.1 Underlayment: ventilated rainscreen system over water-resistive barrier system over Structural Insulated Panels.

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

3.11 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.

3.12 CLEANING

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

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

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

3.13 PROTECTION

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

.2 Repair damage to adjacent materials caused by wood shingles and shakes installation.

3.14 MAINTENANCE

.1 Explain proper maintenance procedures to Departmental Representative's maintenance personnel at project closeout.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 06 17 00 – Shop Fabricated Timber Framing

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

.4 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 Inc.
- .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.
- .7 ASTM E96/E96M-15 Standard Test Methods for Water Vapor Transmission of Materials.
- .8 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 Canadian Roofing Contractors Association (CRCA)
- .1 CRCA Roofing Specifications Manual-2012.

.4 CSA International
- .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.

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

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

.7 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 INFORMATIONAL 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.

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 Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12-month warranty period 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 DECK SHEATHING AND COVERBOARD

.1 Timber deck and structural support, to Section 06 17 00 – Shop Fabricated Timber Framing. Panel sheathing to Section 06 10 00 – Rough Carpentry.

.2 Coverboard: Pre-Primed Glass Mat Faced Gypsum Board, to ASTM C1177/C1177M, mould resistant, minimum 13 mm thick (9.5 mm thick at plywood-faced parapets and upturns), purpose-made for direct torch-on application of base sheet vapour retarder.
.1 Surface Burning Characteristics: In accordance with CAN/ULC S102.
.1 Flame Spread: 0.
.2 Smoke Developed: 0.
.2 Long Edges: Square.
.3 Location: Roof substrates over steel decks and sheathing for parapets.

2.03 MEMBRANES

.1 Base sheet: to CGSB 37-GP-56M, non-woven polyester fibres to ASTM D 6164.
.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 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 Membrane 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 Characteristics:
.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 Traffic Bearing 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 weight of 4.8 kg/m^2.
.2 Heat-welded.
.3 Class A-granule surfaced.
.1 Colour for granular surface: as selected by Departmental Representative.
.4 Grade traffic bearing heavy duty service.
.5 Bottom surface: Thermofusible plastic film.

.6 Traffic Bearing Cap Sheet membrane minimum properties: to CGSB 37-GP-56M.
.1 Peak Load at -18°C ±2°C: MD 22/ XD 19 kN/m.
.2 Peak Load at 23°C ±2°C: MD 16/ XD 14 kN/m.
.3 Elongation at -23°C ±2°C: MD 30%/ XD 30%.
.4 Elongation at 23°C ±2°C: MD 60%/ XD 60%.
.3 Ultimate elongation at ±2°C: MD 60% / XD 60%.
.4 Tear resistance at 23°C ±2°C: MD 500 / XD 450 N.
.5 Cold bending at -18 degrees C: No cracking.
.6 Plastic flow: ≥ 110 degrees C.
.7 Static puncture resistance: ≥ 420.
.8 Dimensional Stability: MD 0.5% / XD 0.5%.
.9 Thickness: 4 mm.

2.04 CARPENTRY

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

.2 Plywood shall be Douglas fir plywood (DFP): to CSA O121, "Exterior" grade, waterproof glue bond, no added urea formaldehyde.

.2 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 DECK SHEATHING

.1 Place panels perpendicular to the flutes of the metal deck and structurally support edges.

.2 Structurally support all edges and stagger end joints between rows minimum 610 mm.

.3 Lightly butt boards together with moderate contact. Long, uninterrupted runs of panels may require slight gapping due to higher surface temperature gain. Install transition tape at joints as required to prevent asphalt leakage into the building interior.

.4 Install fasteners perpendicular to the deck and into the upper rib surfaces at a rate of 10 or 12 fasteners per 1220 mm x 2440 mm panel. Include washers with each fastener. Increase the fastening rate by 25%, (e.g., to 12/14 fasteners with washers for a 1220 mm x 2440 mm panel), for a distance of 2440 mm around the perimeter of the roof and 45 degrees across the corners at a distance of 3050 mm.

.5 Keep panels dry before, during and after installation. Install only as many panels as can be covered in the same day by a roof membrane system.

.6 Parapet Framing and Fastening:
.1 Use stainless steel fasteners.
.2 Maximum Parapet Framing Spacing: 600 mm o.c. for 12.7 mm thick boards.
.3 Fasten at maximum 300 mm around the perimeter and 300 mm in the field. Minimum fastener penetration in wood framing shall be 19 mm and in steel framing shall be 10 mm.

3.05 PROTECTION OF WOOD SURFACES AT PARAPETS AND UPTURNS

.1 Cover wood surfaces with 9.5 mm thick pre-primed Deck Sheathing board. Fasten Deck Sheathing with #12 x 50 mm (2-inch) FM-approved screws and plates at the rate of one per square foot.

3.06 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.

3.07 (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 (3 in) 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 area by priming with self-adhesive primer, and while still tacky shake granules onto surface and press 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.

.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.

3.10 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.

3.11 COLD WEATHER PRECAUTIONS

.1 Follow cold weather application guidelines from manufacturer when temperatures are expected to be below 5 deg C (40 deg F).

.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.

3.12 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).

3.13 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 (1/2") 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.

3.14 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.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

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

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

.3 Section 08 11 10 – Metal Doors and Frames.

.4 Section 08 14 76.10 – Aluminum-Clad Wood Bi-Fold Doors.

.5 Section 08 52 13.10 – Aluminum-Clad Windows.

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 INFORMATIONAL 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 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, cap flashings, etc.) Aluminum zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet: to ASTM A792/A792M, SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated, and as follows:
.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: Galvalume™, by ArcelorMittal Dofasco; includes aluminum zinc alloy to specifications, factory applied to both sides of substrate.
.5 Manufacturer’s Coil Coating System: silicone-modified polyester (SMP) system, applied over a zinc phosphate pre-treatment, and high-performance, flexible primer.

.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.

2.04 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 CAN4 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 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 INFORMATIONAL 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 Nova Scotia, 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 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 (the Work).

.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.

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

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; 1-hour at electrical room #106.

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

3.08 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 12 10 - Structural Insulated Panels.

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

.3 Section 07 31 29.10 – Wood Shingle Siding and Roofing.

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

.5 Section 08 14.76.10 - Aluminum-Clad Wood Bi-Fold Doors.

.6 Section 08 52 13.10 - Aluminum-Clad Windows.

.7 Section 09 21 16 – Gypsum Board Assemblies.

.8 Section 10 26 23 – 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 INFORMATIONAL SUBMITTALS

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

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for 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.

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.

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.

2.05 SEALANT SELECTION

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

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

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

.4 Use 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.

2.06 COLOURS

.1 Sealant colour: confirm sealant selections with DEPARTMENTAL Representative prior to ordering materials. Colours shall be selected by Departmental Representative from manufacture’s full range, and as follows:
- .1 Sealants at 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.

3.08 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
.2 Clean adjacent surfaces immediately.
.3 Remove excess and droppings, using recommended cleaners as work progresses.
.4 Remove masking tape after initial set of sealant.

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

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

3.09 PROTECTION

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

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION