

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 31 23 33.01 - Excavating, Trenching, Backfilling

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C578-12a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .2 ASTM C591-11, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .3 ASTM C612-10, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .4 ASTM E96/E96M-10, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
 - .2 CAN/CGA-B149.2-05, Propane Storage and Handling Code.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-M91, Standard for Type A Chimneys.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation Polystyrene, Boards and Pipe Coverings.
 - .3 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .4 CAN/ULC-S704-11, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Canadian Standards Association (CSA International)
 - .1 CSA O121-08(R2013), Douglas Fir Plywood
 - .2 CSA-O80 Series 15, Wood Preservation

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 00 10 – General Instructions.

- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 – Health and Safety Requirements. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .3 Submit the following documentation:
 - .1 Product Data:– MSDS, Spec Sheet, Product Label,, post consumer and post industrial recycled content, weight, VOC compliance, Environmental Certification if available. (materials)

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Prior to beginning work of this Section and on-site installations:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Review manufacturer's installation instructions and warranty requirements.
- .4 Health and Safety Requirements: construction occupational health and safety to be in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

- .1 Description 1: Extruded polystyrene (XPS) insulation to CAN/ULC-S701.
 - .1 Type: 4, rigid, closed cell type.
 - .2 Thickness: 50mm.
 - .3 Size: use full boards where ever possible
 - .4 Compressive Strength: 414 kPa

2.2 PLYWOOD

- .1 Plywood sheathing – exterior grade good one side Douglas Fir plywood.
- .2 Pressure treated to series – 15, minimum 20mm thick.

2.3 ACCESSORIES

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

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 WORKMANSHIP

- .1 Install insulation after substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to structures, sewers, and spaces.
- .3 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.
- .4 Offset both vertical and horizontal joints in multiple layer applications.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Departmental Representative in writing of defects.
- .2 Prior to commencement of work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 RIGID INSULATION INSTALLATION UNDERSTRUCTURE COVERS

- .1 Under cover of transition chamber: Place boards on top of 20mm pressure treated plywood as per dwg C1.

3.5 SEWER INSULATION

- .1 Insulation Board: Below grade application: extend boards horizontally past outside edge of pipe as indicated on drawings, extend vertically below bottom of pipe as indicated on drawings. Minimum RSI value required 1.06.

3.6 CLEANING

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

END OF SECTION

Part 1 GENERAL**1.1 RELATED REQUIREMENTS**

- .1 Section 07 92 00 – Joint Sealants
- .2 Section 08 11 00 – Metal Doors and Frames
- .3 Section 08 36 13.02 – Sectional Metal Door

1.2 REFERENCES

- .1 National Building Code – latest edition
- .2 The Aluminum Association, Inc. (AA)
 - .1 AA DAF45-03, Designation System for Aluminum Finishes.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-14M-76(R1984), Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .4 Green Seal Environmental Standards
 - .1 Standard GC-03-93, Anti-Corrosive Paints.
 - .2 Standard GS-11-97, Architectural Paints.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA 501.1: Standard Test Method for Metal Curtain Walls for water penetration using Dynamic Pressure
 - .2 AAMA 501.2: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
 - .3 AAMA 620: Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates
 - .4 AAMA 621: Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates
 - .5 AAMA 809.2: Voluntary Specification for Non-Drying Sealants
- .8 American Society of Civil Engineers (ASCE)
 - .1 ASCE 7: Minimum Design Loads for Buildings and Other Structures.

- .9 ASTM International
- .10 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 167-99(2004), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 240/A 240M-05a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM D 523-89(R1999), Standard Test Method for Specular Gloss.
 - .4 ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .5 ASTM A755: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
 - .6 ASTM A792: Standard Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 - .7 ASTM D 822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .8 ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - .9 ASTM A480: Standard Specification for General Requirements for Flat-rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
 - .10 ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .11 ASTM A755: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
 - .12 ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - .13 ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus
 - .14 ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - .15 ASTM C209: Standard Test Methods for Cellulosic Fiber Insulating Board
 - .16 ASTM C272: Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - .17 ASTM C273: Standard Test Method for Shear Properties of Sandwich Core Materials
 - .18 ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - .19 ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .20 ASTM C920: Standard Specification for Elastomeric Joint Sealants
 - .21 ASTM C1363: Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

- .22 ASTM D224: Standard Specification for Smooth-Surface Asphalt Roll
- .23 ASTM D522: Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
- .24 ASTM D523: Standard Test Method for Specular Gloss
- .25 ASTM D714: Standard Test Method for Evaluating Degree of Blistering of Paints
- .26 ASTM D968: Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
- .27 ASTM D1308: Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- .28 ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- .29 ASTM D1622: Standard Test Method for Apparent Density of Rigid cellular Plastics
- .30 ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
- .31 ASTM D1654: Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- .32 ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics
- .33 ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- .34 ASTM D2244: Standard practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- .35 ASTM D2247: Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity
- .36 ASTM D2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
- .37 ASTM D2863: Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle Like Combustion of Plastics (Oxygen Index).
- .38 ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- .39 ASTM D3359: Standard Test Methods for Measuring Adhesion by Tape Test
- .40 ASTM D3363: Standard Test Method for Film Hardness by Pencil Test
- .41 ASTM D4145: Standard Test Method for Coating Flexibility of Prepainted Sheet
- .42 ASTM D4214: Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
- .43 ASTM D5894: Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV Condensation Cabinet)
- .44 ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics

- .45 ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
- .46 ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
- .47 ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- .48 ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- .49 ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, Curtain Walls by Uniform Static Air pressure Difference
- .50 ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- .51 ASTM E1105: Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- .52 ASTM G153: Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
- .53 ASTM G154: Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
- .11 National Fire Protection Association (NFPA)
 - .1 NFPA 259: Standard Test Method for Potential Heat of Building Materials
- .12 FM Global (FM)
 - .1 Approval Standard 4880; Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems.
 - .2 Approval Standard 4881 ; Class1 Exterior Wall Systems.
- .13 National Fire Protection Agency (NFPA)
 - .1 NFPA 259: Standard Test Method for Potential Heat of Building Materials.
 - .2 NFPA 268: Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
 - .3 NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
- .14 UL Canada (ULC)Approvals:
 - .1 CAN/ULC-S101: Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .2 CAN/ULC-S102: Standard Method of Test for Surface Building Characteristics of Building Materials and Assemblies
 - .3 CAN/ULC-S127: Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Building Materials

- .4 CAN/ULC-S134: Fire Test of Exterior Wall Assemblies
- .15 International Organization for Standardization (ISO)
 - .1 ISO 14025: Environmental Labels and Declarations

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meeting:
 - .1 Conduct a pre-installation meeting at the job site attended by Departmental Representative, Manufacturer's Technical Representative, Panel Installer, and Contractors of related trades. Coordinate structural support requirements in relation to insulated wall panel system, installation of any separate air/water barriers, treatment of fenestration, and other requirements specific to the project.

1.4 DESIGN REQUIREMENTS

- .1 Design cladding to allow for thermal movement of component materials caused by variation in ambient temperature range of 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .2 Maximum deviation from vertical and horizontal alignment of erected panels: 1 to 1000.

1.5 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 cladding system materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate dimensions and thickness of panels, fastening and anchoring methods, detail and location of joints and gaskets, thermal movement provision, wall openings, head, jamb and sill details, materials and finish, compliance with design criteria and requirements of related work.
 - .3 Clearly indicate the following:
 - .1 Profile
 - .2 Gauge of both exterior and interior sheet
 - .3 Location, layout and dimensions of panels
 - .4 Location and type of fasteners
 - .5 Shape and method of attachment of all trim
 - .6 Locations and type of sealants

- .7 Installation sequence
 - .8 Coordination Drawings: Provide elevation drawings and building sections which show panels in relationship to required locations for structural support. Include panel details and details showing attachment to structural support.
 - .9 Other details as may be required for a weathertight installation
- .4 Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding the specified limit. Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout.
- .5 Samples:
- .1 Submit duplicate 100 x 600 mm samples of wall system, representative of materials, finishes and colours.
- .6 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Certificates: submit certificates signed by manufacturer certifying that composite wall panels comply with specified performance characteristics and physical properties.
 - .2 Submit Documentation that products have been certified in accordance with ISO 14025.
- .7 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and protect material in accordance with panel manufacturer's recommendations.
- .3 Deliver panel materials and components in manufacturer's original, unopened, undamaged packaging with identification labels intact.
- .4 Store wall panel materials on dry, level, firm, and clean surface. Stack no more than two bundles high. Elevate one end of bundle to allow moisture run-off, cover and ventilate to allow air to circulate and moisture to escape.
- .5 Do not expose panels with strippable film to direct sunlight or extreme heat.

1.7 EXTENDED WARRANTY

- .1 For the work of this Section 07 42 43 – Composite Wall Panels, the 12 month warranty period is extended to 24 months.

Part 2 PRODUCTS**2.1 LAMINATED STEEL EXTERIOR WALL PANELS**

- .1 Design Criteria:
 - .1 Wind Loads: in conformance with NBC.
 - .2 Deflection criteria shall be L/180 and in conformance with NBC.
- .2 Performance Criteria:
 - .1 Structural Test: Structural performance shall be verifiable by witnessed structural testing for simulated wind loads in accordance with ASTM E72 or ASTM E330.
 - .2 Large Projectile Impact with Cyclic Pressure: Panels shall successfully pass test standards TAS 201/203 Large Missile Impact with Cyclic inward and outward pressures to demonstrate suitability for High Velocity Hurricane Zone applications with windborne debris.
 - .3 Fatigue Test: There shall be no evidence of metal/insulation interface delamination when the panel is tested by simulated wind loads of 20 psf (positive and negative loads), when applied for two million alternate cycles.
 - .4 Bond Strength: No metal primer interface corrosion and/or delamination shall occur after 1000 hours at 135 deg. F and 100 percent relative humidity. No delamination shall occur after 2 1/2 hours in a 2 psi 217 deg. F autoclave.
 - .5 Pressure Equalization: The typical horizontal and vertical joint system shall exhibit rapid pressure equalization when subjected to cyclic external pressure fluctuations applied in accordance with ASTM E1233. Panels shall be successfully tested using procedure similar to AAMA 508; modified as appropriate for insulated foam core panels with an integral vapor barrier. The liner sheet of the panel shall be considered as the imperfect air barrier during the test procedure.
- .3 Water Penetration:
 - .1 Dynamic: There shall be no uncontrolled water leakage when tested in accordance with AAMA 501.1 at a pressure differential of 12 psf.
 - .2 Static: No uncontrolled water leakage, when tested in accordance with ASTM E331 at a 20 psf pressure differential.
 - .3 Static – 2 hour duration: No uncontrolled water leakage, when tested in accordance with ASTM E331 at 6.24 psf pressure differential for a two (2) hour duration.
- .4 Water Absorption: There shall be no more than 0.148 percent water absorption by volume when a 12 by 12 inch foamed-in-place insulated metal wall panel sample is subjected to a 24-hour full water submersion in accordance with ASTM C209
- .5 Air Infiltration: Air infiltration through the panel shall not exceed 0.0012 cfm/sf at 6.24 psf air pressure differential when tested in accordance with ASTM E283.
 - .1 50mm (2 inches) thick Flat: R-14
 - .2 75mm (3 inches) thick Flat: R-21

- .6 Seismic Performance: Comply with ASCE 7, Section 13, "Seismic Design Requirements for Non-Structural Components". Panels shall be hard-fastened to structure along one edge only such that lateral slippage between panels can occur in the event of seismic activity.
 - .1 FM 4880: Class I rated per FM Global, panels are approved for use without a thermal barrier and do not create a requirement for automatic sprinkler protection.
 - .2 STM E84 Surface Burning Characteristics; Finished panel shall have a Flame Spread equal to 5, and Smoke Developed equal to 30.
 - .3 NFPA 285 intermediate scale multi-story fire evaluation; successfully passed acceptance criteria.
 - .4 UL 263 Fire Resistive Rating; classified as a component of a fire-rated wall assembly for 1-hour and 2-hour rating Design No. U053 (rated assemblies include appropriate layers of fire-rated Type X Gypsum board).
 - .5 ASTM D1929 Minimum Flash and Self Ignition; established for foam core.
 - .6 NFPA 259 Potential Heat Content; established for foam core.
- .7 Insulating Core: Polyisocyanurate (ISO) core, ASTM C591 Type III, CFC and HCFC free, compliant with Montreal Protocol and Clean Air Act, with the following minimum physical properties:
 - .1 Density Nominal: 3.0 pcf
 - .2 Shear Strength: 19 psi
 - .3 Compressive Strength: 61 psi
 - .4 Tensile Strength: 19 psi
 - .5 Closed Cell Content: 90 percent minimum
 - .6 FM Global approvals: Class 1 per FM 4880
 - .7 Surface burning characteristics of unfaced foam core when tested in accordance with ASTM E84:
 - .1 Flame Spread: equal to 25
 - .2 Smoke Developed: equal to 250
 - .8 Ignition characteristics when tested in accordance with ASTM D1929:
 - .1 Self-Ignition: 856 degrees F, minimum
 - .2 Flash Ignition: 842 degrees F, minimum
 - .9 Potential Heat Content per NFPA 259: 11,580 BTU/lb.
- .8 Performance Criteria - Integrated Windows: 4500 Integrated Window System:
 - .1 Structural Test: Structural performance shall be verifiable by structural testing for simulated wind loads in accordance with ASTM E330. Deflection criteria shall not exceed L/175 for any framing member.
 - .2 Static Water Penetration: No uncontrolled water leakage when tested in accordance with ASTM E331 at 10 psf pressure differential.
 - .3 Air Infiltration: Air infiltration shall not exceed 0.06 cfm/sf at 6.24 psf air pressure differential when tested in accordance with ASTM E283.

- .4 Condensation Resistance Factor (CFR): Window frame shall have a minimum condensation resistance factor, CFR equal to 69
- .9 Exterior Paint Finish Characteristics for Panels meeting the requirements of AAMA 621 for G90 galvanized steel or AZ50 Galvalume®:
 - .1 Gloss: 15 plus or minus 5 measured at 60 degree angle tested in accordance with ASTM D523.
 - .2 Pencil Hardness: HB-H minimum tested in accordance with ASTM D3363.
 - .3 Flexibility, T-Bend: 1-2T bend with no adhesion loss when tested in accordance with ASTM D4145.
 - .4 Flexibility, Mandrel: No cracking when bent 180 degrees around a 1/8 mandrel as tested in accordance with ASTM D522.
 - .5 Adhesion: No adhesion loss tested in accordance with ASTM D3359.
 - .6 Reverse Impact: No cracking or adhesion loss when impacted 3000 x inches of metal thickness (lb-in), tested in accordance with ASTM D2794.
 - .7 Abrasion Resistance: Nominal 65 liters of falling sand to expose 5/32 inch diameter of metal substrate when tested in accordance with ASTM D968.
 - .8 Graffiti Resistance: Minimal effect.
 - .9 Acid Pollutant Resistance: No effect when subjected to 30 percent sulfuric acid for 18 hours, or 10 percent muriatic acid for 15 minutes when tested in accordance with ASTM D1308.
 - .10 Salt Fog Resistance: Passes 1000 hours, when tested in accordance with ASTM B117 (5 percent salt fog at 95 deg. F).
 - .11 Cyclic Salt Fog and UV Exposure: Passes 2016 hours when tested in accordance with ASTM D5894.
 - .12 Humidity Resistance: Passes 1500 hours at 100 percent relative humidity and 95 deg. F, with a test rating of 10 when tested in accordance with ASTM D2247 and D714.
 - .13 Color Retention: Passes 5000 hours when tested in accordance with ASTM G153 and G154.
 - .14 Chalk Resistance: Maximum chalk is a rating of 8 when tested in accordance with ASTM D4214, Method A.
 - .15 Color Tolerances: Maximum of 5ΔE Hunter units on panels when tested in accordance with ASTM D2244.
- .10 Panel Assembly:
 - .1 Panel thickness: 75mm thick.
 - .1 Panel width (Flat Panels): As indicated on drawings of maximum practicable width to achieve dimensions as indicated on drawings or as required to fit to given dimensions.
 - .2 Panel joint shall consist of fasteners completely concealed within the joint. Panel joint shall have a continuous finned rubber gasket seal for defense against water infiltration. Horizontal panels shall have a nominal gutter height of 55mm.

- .2 Exterior Face of Panel:
 - .1 Material:
 - .1 Steel Coil material shall be Grade 33, G90 galvanized steel in accordance with ASTM A653, A755, and A924
 - .2 Gauge: 20 (steel).
 - .3 Profile: Flat
 - .3 Flat profile to have no flutes, planking, or mild profiling of any type.
 - .4 Texture: Non-directional embossed.
- .11 Exterior Paint Finish Color:
 - .1 Custom color as selected by Departmental Representative.
- .12 Exterior Aggregate Finish:
 - .1 Baked Epoxy primer with factory applied 36 mil dry film thickness finish coat of acrylic bonder an silica aggregate.
 - .1 Silica aggregate color: As selected by Departmental Representative
- .13 Exterior Aggregate finish characteristics
 - .1 Moisture resistance: 14 days exposure with no deleterious effects when tested in accordance with ASTM D2247.
 - .2 Salt Spray: 100 hours, no deleterious effects when tested in accordance with ASTM B117.
 - .3 Abrasion resistance: 500 liters of sand, no deleterious effects when tested in accordance with ASTM D968.
 - .4 Freeze/Thaw (60 cycles): no checking, cracking or splitting.
 - .5 Mold Resistance: No growth or mold when tested per ASTM D3273.
 - .6 Flame Spread: Less than 25, Class 1 rating when tested in accordance with ASTM E84 and NBC.
- .14 Interior Face of Panel:
 - .1 Material:
 - .1 Steel coil material shall be Grade 33, G90 galvanized steel in accordance with ASTM A653, A755, and A924.
 - .2 Gauge 24 (steel)
 - .3 Profile: Standard, flat, non –profiled.
 - .4 Texture: smooth.
 - .5 Interior finish: Standard USDA Imperial White
 - .2 Insulating core: Core material shall be polyisocyanurate (ISO) foamed-in-place during panel manufacture to a nominal in-place density of 3.0 pcf.
- .15 Finish System:
 - .1 2.4 mil. Fluoropolymer (PVDF) Three Coat system: 0.8 mil primer with 0.8 mil Kynar 500 (70 percent) SOLID color coat and 0.8 mil clear coat.

2.2 PRODUCTS – INTERIOR FREEZER PANELS

- .1 Performance Criteria
 - .1 Structural Test: Structural performance shall be verifiable by witnessed structural testing for simulated wind loads in accordance with ASTM E72 and E330. Deflection criteria shall be L/180.
 - .2 Fatigue Test: There shall be no evidence of metal/insulation interface delamination when the panel is tested by simulated wind loads (positive and negative loads), when applied for two million alternate cycles of L/180 deflection.
 - .3 Freeze / Heat Cycling Test: Panels shall exhibit no delamination, surface blisters, permanent bowing or deformation when subjected to cyclic temperature extremes of minus 36 deg. F to plus 180 deg. F temperatures for twenty one, eight-hour cycles.
 - .4 Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a pressure differential of 20 psf, when tested in accordance with ASTM E331.
 - .5 Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel assembly at a pressure difference of 12 psf, when tested in accordance with AAMA 501.1.
 - .6 Air Infiltration: Air infiltration through the panel shall not exceed 0.001 cfm/sf at 20 psf air pressure differential when tested in accordance with ASTM E283.
 - .7 Humidity Test: Panels shall exhibit no delamination or metal interface corrosion when subjected to plus 140 deg. F temperature and 100 percent relative humidity for a total of 1500 hours (62 days).
 - .8 Autoclave Test: Panels shall exhibit no delamination or shrinkage/melting of the foam core from the metal skins after being subjected in an autoclave to a pressure of 2psig (13.8kPa) at a temperature of plus 218 deg. F (plus 103 deg. C) for a period of 2 1/2 hours.
 - .9 Seismic Performance: Comply with ASCE 7, Section 13, "Seismic Design Requirements for Non-Structural Components". Panels shall be hard-fastened to structure along one edge only such that lateral slippage between panels can occur in the event of seismic activity.
- .2 Panel Fire Tests:
 - .1 Fire Endurance Test – 10 minutes: Panels remained in place without joint stitch fastening per CAN/ULC-S101.
 - .2 Fire Endurance Test – 15 minutes: Panels remained in place with joint stitch fastening per CAN/ULC-S101.
- .3 Flame Spread and Smoke Developed Tests on exposed Insulating Core:
 - .1 Flame Spread: Less than 25.
 - .2 Smoke Developed: Less than 250.
 - .3 Tests performed in accordance with CAN/ULC-S102 and ASTM E84.

- .4 Fire Test Response Characteristics: Steel-faced panels with polyisocyanurate (ISO) core shall fully comply with Chapter 26 of International Building Code regarding the use of Foam Plastic.
 - .1 FM 4880: Class I rated per FM Global, panels are approved for use without a thermal barrier and do not create a requirement for automatic sprinkler protection.
 - .2 NFPA 259 Potential Heat Content; established for foam core.
 - .3 NFPA 268 Ignitability of Exterior Wall Assemblies Using a Radiant Heat Source; successfully passed acceptance criteria.
 - .4 NFPA 285 Intermediate Scale Multi-story Fire Evaluation; successfully passed acceptance criteria.
 - .5 UL 263 Fire Resistive Rating; classified as a component of a fire-rated wall assembly for 1-hour and 2-hour rating Design No. U053 (rated assemblies include appropriate layers of fire-rated Type X Gypsum board).
 - .6 ASTM D1929 Minimum Flash and Self-Ignition; established for foam core.
 - .7 S101, S102, S127, S134 UL Canada fire test standards; successfully passed.
- .5 Insulating Core: Polyisocyanurate (ISO) core, ASTM C591 Type IV, CFC and HCFC free, compliant with Montreal Protocol and Clean Air Act, with the following minimum physical properties:
 - .1 Core is 95 percent closed cell when tested in accordance with ASTM D6226
 - .2 Panel shall provide a nominal R-value of 7.2 hr·ft²·°F/Btu per inch thickness when tested in accordance with ASTM C 518 at 75°F mean temperature and 8.0 hr·ft²·°F/Btu per inch thickness when tested in accordance with ASTM C 518 at 35°F mean temperature.
 - .3 Foam has a density of 2.2 to 2.8 pounds per cubic foot when tested in accordance with ASTM D1622
 - .4 Compressive Stress: Panels shall have a compressive stress of 19 psi. when tested according to ASTM D1621
 - .5 Shear Stress: 25 psi when tested in accordance with ASTM C273
 - .6 Tensile Stress: 23 psi when tested in accordance with ASTM D1623
 - .7 Oven Aging at 212 degrees F:
 - .1 1 day: plus 1 percent volume change
 - .2 7 days: plus 3 percent volume change
 - .3 Tested according to ASTM D2126
 - .8 Low Temperature Aging at minus 40 degrees F:
 - .1 1 day: 0 percent volume change
 - .2 7 days: 0 percent volume change
 - .3 Tested according to ASTM D2126
- .6 Paint Finish Characteristics:
 - .1 Gloss: 15 ± 5 measured at 60 degree angle tested in accordance with ASTM D523.

- .2 Pencil Hardness: HB-H minimum tested in accordance with ASTM D3363.
- .3 Flexibility, T-Bend: 1-2T bend with no adhesion loss when tested in accordance with ASTM D4145.
- .4 Flexibility, Mandrel: No cracking when bent 180° around a 1/8 mandrel as tested in accordance with ASTM D522.
- .5 Adhesion: No adhesion loss tested in accordance with ASTM D3359.
- .6 Reverse Impact: No cracking or adhesion loss when impacted 3000 by inches of metal thickness (lb-in), tested in accordance with ASTM D2794.
- .7 Abrasion Resistance: Nominal 65 liters of falling sand to expose 5/32 inch diameter of metal substrate when tested in accordance with ASTM D968.
- .8 Graffiti Resistance: Minimal effect.
- .9 Acid Pollutant Resistance: No effect when subjected to 30 percent sulfuric acid for 18 hours, or 10 percent muriatic acid for 15 minutes when tested in accordance with ASTM D1308.
- .10 Salt Fog Resistance: Passes 1000 hours, when tested in accordance with ASTM B117 (5 percent salt fog at 95 deg. F).
- .11 Cyclic Salt Fog and UV Exposure: Passes 2016 hours when tested in accordance with ASTM D5894.
- .12 Humidity Resistance: Passes 1500 hours at 100 percent relative humidity and 95 deg. F, with a test rating of 10 when tested in accordance with ASTM D2247, and D714.
- .13 Color Retention: Passes 5000 hours when tested in accordance with ASTM G153 and G154.
- .14 Chalk Resistance: Maximum chalk is a rating of 8 when tested in accordance with ASTM D4214, Method A.
- .15 Color Tolerances: Maximum of 5ΔE Hunter units on panels when tested in accordance with ASTM D2244.
- .7 Exterior Aggregate Finish Characteristics:
 - .1 Moisture Resistance: 14 days exposure with no deleterious effects when tested in accordance with ASTM D2247.
 - .2 Salt Spray: 1000 hours, no deleterious effects when tested in accordance with ASTM B117.
 - .3 Abrasion Resistance: 500 liters of sand, no deleterious effects when tested in accordance with ASTM D968.
 - .4 Freeze/Thaw (60 cycles): No checking, cracking or splitting.
 - .5 Mildew Resistance: No growth of mildew per ASTM D3273.
 - .6 Flame Spread: less than 25, Class 1 rating when tested in accordance with ASTM E84.
- .8 Panel Assembly:
 - .1 Panel thickness: 150mm (6 inches) thick.
 - .2 Panel width: As indicated on drawings and of maximum practicable width to meet dimensions as indicated on drawings.

- .3 Panel Lengths: Minimum 4.15m (164 Inches) in height and as indicated on Drawings.
- .4 Panel Attachment: Shall consist of fasteners and stainless steel attachment clip completely concealed within the panel side joint.
- .5 Horizontal Panel Joint Reveals: 1/8 inch preferable, 3/8 inch maximum.
- .6 Vertical Joint Treatments (for horizontal panels):
 - .1 Panel trimless ends with black EPDM gasket insert
- .9 Vertical Panel Joint Reveals: 3mm (1/8 inch).
- .10 Exterior Face of Panel:
 - .1 Material:
 - .1 Steel coil material shall be in accordance with ASTM A755 Grade 33, G90 galvanized steel in accordance with ASTM A653 and A924.
 - .2 Gauge: 22 gauge
 - .2 Profile: selected from Manufacturer's standard range, textured finish.
 - .3 Texture: Non-directional stucco embossed
 - .4 Exterior Paint Finish Color:
 - .1 Custom color as selected by Departmental Representative.
 - .5 Finish System:
 - .1 2.4 mil. Fluoropolymer (PVDF) Three Coat system: 0.8 mil primer with 0.8 mil Kynar 500 (70 percent) SOLID color coat and 0.8 mil clear coat.
- .11 Exterior Aggregate Finish:
 - .1 Baked epoxy primer with factory applied 36 mil dry film thickness finish coat of acrylic bonder and silica aggregate.
 - .1 Silica Aggregate Color: Custom color as selected by Departmental Representative.
- .12 Interior Face of Panel:
 - .1 Material:
 - .1 Stainless steel sheet: to ASTM A 167 and ASTM A 240/2 40M.
 - .1 Thickness: 0.38 mm.
 - .2 Alloy: Type 316.
 - .3 Finish: ASTM A 480/A 480M No. 4 Finish.
 - .2 Profile: From manufacturer's standard lines.
 - .3 Texture: Non-directional stucco embossed.
 - .4 Gauge: 22 gauge.

2.3 INTEGRATED WINDOWS

- .1 Integrated windows - General:
 - .1 Window framing members shall be manufacturer's standard, thermally broken, aluminum extrusions.

- .2 Window framing members shall be designed to Integrate with horizontal metal wall panel profile without exposed fasteners or flashings.
- .3 Window integration shall be designed to preserve and maintain the same weather-proofing principles as the horizontal insulated panels.
- .4 Window system shall be designed to be re-glazeable without dismantling of the window or panel system.
- .5 Glazing: Sash to accept 25mm insulated glazing unit.
- .2 Integrated window:
 - .1 Framing member sizes:
 - .1 Depth: 150mm (6")
 - .2 Head: 57mm (2.25")
 - .3 Sill: 89mm (3.5")
 - .4 Mullions: 50mm (2")
 - .2 Fabrication: shop-assemble; inside-glazed system
 - .3 Integration at head and sill: Thermally broken adapter extrusions.
 - .4 Application: Horizontal panel applications using spandrel supports, stud framing, or punched openings in masonry construction.
- .3 Finish - Exterior & Interior:
 - .1 Match metal wall panel finish and color.

2.4 ACCESSORIES

- .1 Fasteners:
 - .1 Self-drilling fasteners shall be corrosion resistant plated steel with neoprene washer, as recommended by manufacturer.
 - .2 Material: Hex-head type with steel and neoprene washer and 12 gauge stainless steel clip supplied by the manufacturer.
 - .3 Size: As recommended by manufacturer.
- .2 Perimeter Trim:
 - .1 Fabricated perimeter trim and metal flashing: Shall be same gauge, material and coating color as exterior face of insulated metal wall panel.
 - .2 Extruded perimeter trim: Shall be extruded aluminum 6063-T5 alloy with spray applied PVF coating in same color as exterior face of insulated metal wall panel.
- .3 Sealants: Butyl, non-skinning/curing type as recommended by manufacturer to AAMA 809.2.
 - .1 Concealed sealants: one-component, butyl-polyisobutylene polymer base, solvent curing to CGSB 19-GP-14M.
 - .2 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.
 - .3 Exposed sealants: one-component, silicone base, solvent curing, colour to match panel.
 - .4 Maximum VOC limit 250 g/L to SCAQMD Rule 1168

- .4 Butyl Tape: As recommended by manufacturer.
- .5 Vertical joint gasket (for horizontal exterior panel applications)
 - .1 Material: Extruded rubber gasket shall have a finned profile. Vertical joint gasket shall give the appearance of a recessed and tooled caulk joint and be capable of accommodating joint with variations from 9mm to 19mm due to normal construction tolerances.
 - .2 Color: standard black

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 EXAMINATION

- .1 Before installation examine alignment of substrate and notify Departmental Representative in writing if substrate does not comply with requirements of panel installer.
- .2 Provide field measurements to manufacturer as required to achieve proper fit of the preformed wall panel envelope. Measurements shall be provided in a timely manner so that there is no impact to construction or manufacturing schedule.
- .3 Supporting Steel: All structural supports required for installation of panels shall be by others. Support members shall be installed within the following tolerances:
 - .1 Plus or minus 3mm in 1525mm in any plane along plane of framing.
 - .2 Plus or minus 6mm cumulative in 6100mm in any direction along plane of framing.
 - .3 Plus or minus 12mm from framing plane on any elevation.
 - .4 Plumb or level within 3mm at all changes of transverse for pre-formed corner panel applications.
- .4 Verify that bearing support has been provided behind vertical joints of horizontal panel systems and horizontal joints of vertical panel systems. Width of support shall be as recommended by Manufacturer.
- .5 Examine individual panels upon removing from the bundle; notify Manufacturer of panel defects. Do not install defective panels.

3.3 INSTALLATION

- .1 Install composite panels in accordance with manufacturer's written instructions and shop drawings.
 - .1 Allow for thermal movement.
- .2 Install panels plumb, level and true-to-line to dimensions and layout indicated on shop drawings.
- .3 Cut panels prior to installing, where indicated on shop drawings, using a power circular saw with fine tooth carbide tip blade per Manufacturer's instructions. Personnel should wear respiratory and eye protection devices.
- .4 Butyl Weather Barrier Sealant:
 - .1 Apply non-skinning butyl sealant as shown on shop drawings and Manufacturer's installation instructions as necessary to establish the vapor barrier for the panels.
 - .2 Use non-skinning butyl tube sealant only for tight metal-to-metal contact.

- .3 Do not use non-skinning butyl tube sealant to bridge gaps.
- .5 Place panel fasteners through pre-punched holes in attachment clips, concealed within the joint of the panel. Secure units to the structural supports. Space clips as recommended by Manufacturer or otherwise indicated on the approved shop drawings.
- .6 Remove strippable coating from panels as they are erected.

3.4 INTEGRATED COMPONENT INSTALLATION

- .1 Window assemblies shall be installed per approved shop drawings. Coordinate framed openings and locations with panel layout to assure on-target panel joint alignment with integrated components. Field cutting of panels with corrective flashings will not be accepted without written approval from the Departmental Representative
- .2 Installation of Integrated windows shall be performed only by a manufacturer trained and certified installer experienced in both panel and window installation. Follow standard professional procedures for installing and weatherizing high performance window systems unless otherwise noted on approved shop drawings.

3.5 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.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Remove protective film immediately after installation.
- .3 Touch-up, repair or replace metal panels and trim that have been damaged.
- .4 After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt and sealant
- .5 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .6 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Materials and installation for High Performance, One-Part, Moisture-Triggered, Polyurethane Roofing Membrane.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .2 ASTM C 1371-15 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
 - .3 ASTM C 1549 (09)-2014 Standard Test Method for Determination of Solar Reflectance near Ambient Temperature Using a Portable Solar Reflectometer
 - .4 ASTM D522 / D522M – 13; Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
 - .5 ASTM D624 - 00(2012); Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
 - .6 ASTM D1644 - 01(2012); Standard Test Methods for Non-volatile Content of Varnishes
 - .7 ASTM D2196-15; Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer
 - .8 ASTM D2240-15; Standard Test Method for Rubber Property—Durometer Hardness
 - .9 ASTM D2697 - 03(2014); Standard Test Method for Volume Non-volatile Matter in Clear or Pigmented Coatings
 - .10 ASTM D3960-05(2013); Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
 - .11 ASTM D5635/D5635M-11; Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens
 - .12 ASTM D5602/D5602M-11 Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens
 - .13 ASTM E96/E96M-16; Standard Test Methods for Water Vapor Transmission of Materials
 - .14 ASTM E1980-11 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
 - .15 ASTM G154-12a Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Non-metallic Materials
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .2 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing.

- .3 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S706-09, Standard for Wood Fibre Thermal Insulation for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Flashing.
 - .2 Control joints.
 - .3 Tapered insulation.
 - .4 Roof penetrations.
 - .5 Site fabricated seams.
 - .2 Provide layout for tapered insulation if required.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 from nicks, scratches, and blemishes.
 - .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 local regulations.

1.5 LIMITATIONS

- .1 Do not apply when ambient temperatures are below 50°F (10°C)

- .2 Do not adhere to expanded polystyrene or extruded polystyrene.
- .3 Do not apply directly to plywood, tongue and groove decks, wood decks, poured in place gypsum or lightweight insulating concrete decks.
- .4 Not for use over coal tar pitch, gravel BUR, corrugated metal roof systems or silicone-based coatings and sealants.
- .5 Do not apply to structural concrete deck with-out using a primer
- .6 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of rubberized asphalt, sealing compounds, primers and caulking materials.
- .7 Ventilation:
 - .1 Ventilate area of Work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces.
 - .3 Provide continuous ventilation during and after roofing membrane application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of roofing membrane installation.

Part 2 PRODUCTS

2.1 COMPATIBILITY

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

2.2 DECK COVERING

- .1 Glass Mat Gypsum Board: to ASTM C 1177/C 1177M, 13mm thick.

2.3 PRIMER

- .1 Low-VOC, water-based quick-drying, one-part primer, as recommended by roofing membrane manufacturer.

2.4 BASE COAT

- .1 Low- VOC, one-part, moisture triggered, polyurethane roof coating; to be used with fiberglass mat reinforcement. Colour: gray. Grade: Brush/roller/squeegee.

2.5 TOP COAT

- .1 One-part, moisture-triggered, polyurethane roof coating, to ASTM D7311. low-odour, non-flammable.
- .2 Colour: high gloss white
- .3 Grade: Brush/roller/squeegee.

2.6 VAPOUR RETARDER

- .1 Modified Bitumen Vapour Barrier:
 - .1 Description: The SBS modified bitumen membrane shall be reinforced with a fibreglass mat in conformance with Prefabricated membrane, complies with CAN/CGSB 37-GP-56M (9th draft). The upper surface is sanded, the under face is covered with a thermofusible plastic film.

2.7 INSULATION

- .1 Polyisocyanurate insulation:
 - .1 Description: closed-cell polyisocyanurate foam core integrally laminated to heavy non-asphaltic fibre-reinforced grey felt facers.

2.8 PROTECTION BOARD

- .1 Mineral-fortified asphaltic core between two layers of high-strength reinforcing glass fibre mat; 3mm thick

2.9 SEALERS

- .1 Sealant: asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.

2.10 SOURCE QUALITY CONTROL

- .1 Submit laboratory test reports in accordance with Section 01 45 00 - Quality Control.
- .2 Submit laboratory test reports certifying compliance with specification requirements.

Part 3 EXECUTION**3.1 SUBSTRATE EXAMINATION**

- .1 Examine substrates and immediately inform Departmental Representative in writing of defects.
- .2 Prior to beginning of Work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, contamination and swept clean of dust and debris.
 - .2 Curbs have been built.
 - .3 Drains have been installed at proper elevations relative to finished surfaces.
 - .4 Sleeves, vents, pipes and other items passing through substrates receiving work of this Section are properly and rigidly installed.
 - .5 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.2 PREPARATION – PROTECTION

- .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 material immediately.
- .4 Dispose of rain water away from face of building until drains or hoppers installed and connected.
- .5 Protect from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
- .6 Place plywood runways over work to enable movement of material and other traffic.
- .7 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.
- .8 Seal and ballast exposed edges.
- .9 Free substrates from curing compounds, dust and loose particles, grease, paint, frost, form oil and other material detrimental to bond of membrane materials.

3.3 PREPARATION

- .1 Reinforce substrate cracks less than 3 mm wide as per manufacturer's written instructions.
- .2 Reinforce substrate cracks larger than 3 mm as per manufacturer's written instructions.
- .3 Provide mechanical vent and pipe flashings, as per manufacturer's written instructions.

3.4 DECK COVERING

- .1 Lay glass mat gypsum Board with tightly butted joints. Longitudinal joints must be at right angles to flute direction. Joints occurring along widths of board to be continuously supported on top flange of metal deck.
- .2 Mechanically fasten deck covering to steel deck with self-tapping, non-corroding screws spaced 400 mm on centre each way and to only top flanges of steel deck.
- .3 Reinforce joints with 75 mm joint tape, centered on joints.

3.5 VAPOUR BARRIER

- .1 Apply vapour barrier, adhere as per manufacturer's written instructions

3.6 INSULATION

- .1 Apply insulation; adhere as per manufacturer's written instructions.

3.7 PROTECTION BOARD

- .1 Install protection board as per manufacturer's written instructions.

3.8 MEMBRANE

- .1 Apply primers as per manufacturer's written instructions.
- .2 Apply Base Coat and fiberglass mat reinforcement as per manufacturer's written instructions.
- .3 Ensure continuity of building envelope air barrier.

- .4 Base coat left exposed for 72 hours or grater must be re-primed as per manufacturer's written instructions.

3.9 TOP COAT

- .1 Apply Top Coat as per manufacturer's written instructions.
- .2 For areas where a slip-resistant surface is required, 20- 0 mesh silica sand can be broadcast at 0.5-0.7 kg/m2 and back rolled in an additional layer of non-skid top coat.
- .3 Before the product cures, clean surfaces and equipment with mineral spirits.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .4 Clean to Departmental Representative's approval, soiled surfaces, spatters, and damage caused by Work of this Section.
- .5 Check area drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.
- .6 Waste Management: separate waste materials for reuse and recycling in accordance with local regulations.
- .7 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 PROTECTION

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

END OF SECTION

Part 1 GENERAL**1.1 RELATED REQUIREMENTS**

- .1 09 21 16 Gypsum Board Assemblies

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 919-08, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .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, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 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.
- .3 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.
- .4 Submit 2 (two) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .5 Samples:
 - .1 Submit 2 (two) samples of each type of material and colour.
 - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .6 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.

1.4 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.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled 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 joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 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.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.
- .2 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

Part 2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas 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 are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Polysulfide two part:
 - .1 Self-levelling to CAN/CGSB-19.24, Type 1, Class B, colour to match adjacent materials.
- .2 Polysulfide two part:
 - .1 Non-sag: to CAN/CGSB-19.24, Type 2, Class B, colour to match adjacent materials.
- .3 Silicones one part: to CAN/CGSB-19.13. Mildew resistant, colour to match adjacent materials.
- .4 Acoustical sealant: to ASTM C 919.
- .5 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.

- .2 Neoprene or butyl rubber:
 - .1 Round solid rod, Shore A hardness 70.
- .3 High density foam:
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): sealant type: Polysulfide two part. Non sag.
- .2 Expansion and control joints in exterior surfaces of poured-in-place concrete walls: sealant type: Polysulfide two part. Non sag.
- .3 Coping joints and coping-to facade joints: sealant type: Polysulfide two part. Non sag.
- .4 Cornice and wash (or horizontal surface joints): sealant type: Polysulfide two part. Self-leveling.
- .5 Exterior joints in horizontal wearing surfaces (as itemized): sealant type: Polysulfide two part. Self-leveling.
- .6 Expansion and control joints on the interior of exterior precast, architectural wall panels: sealant type: Polysulfide two part. Non Sag..
- .7 Joints of underside of precast beams or planks: sealant type: Acoustical sealant.
- .8 Interior control and expansion joints in floor surfaces: sealant type: Polysulfide two part. Non Sag.
- .9 Perimeters of interior frames, as detailed and itemized: sealant type: Polysulfide two part. Non Sag.
- .10 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): sealant type: Polysulfide two part. Non Sag.
- .11 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: Silicone one part, mildew resistant.
- .12 Countertop junctions with walls: sealant type: Silicone one part, mildew resistant.
- .13 Joints and junctions of Air Barrier Membrane: sealant type: Acoustical sealant.
- .14 Joints and junctions in Vapour Barrier Membrane: sealant type: Acoustical sealant.
- .15 Joints at perimeter of electrical junction boxes in exterior walls: sealant type: Acoustical sealant.
- .16 Exposed interior control joints in drywall: sealant type: Sealant type: Silicone one part.

2.4 JOINT CLEANER

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

Part 3 EXECUTION**3.1 EXAMINATION**

- .1 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 Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter 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.

3.3 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.

3.4 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 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.

3.7 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.

3.8 PROTECTION

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

END OF SECTION