
1.0 GENERAL

1.1 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM D570 – 98 (2010) e1, Standard Test Method for Water Absorption of Plastics
 - .2 ASTM D882- 12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 - .3 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - .4 ASTM D1790-08, Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact
 - .5 ASTM D3767-03 (2008), Standard Practice for Rubber – Measurement of Dimensions
 - .6 ASTM D5147/5147M-14, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
 - .7 ASTM D6163-00 (2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcement
 - .8 ASTM D570 – 98 (2010)e1, Standard Test Method for Water Absorption of Plastics
 - .9 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials
 - .10 ASTM E154 - 08a, 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 the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .12 ASTM E1745 - 11, Standard Specification for Water Vapour Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
 - .13 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials
 - .14 ASTM E2357-11, Standard Test for Determining Air Leakage of Air Barrier Assemblies
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
 - .2 CAN/CGSB-51.34-M86 (Nov.88), Vapour Barrier, Polyethylene Sheet for Use in Building Construction
- .4 Green Seal (GS)
 - .1 GS-11, Green Seal Standard for Paints and Coatings
- .5 South Air Quality Management District, California State (SCAQMD)
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications

1.2 Performance Requirements

- .1 Achieve complete, uninterrupted moisture and air/vapour tightness of the building envelope,

ensuring continuity from lower walls up to and including the roof, covering all surfaces.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with **Section 01 33 00** and the following requirements:
 - .1 **Certificates of conformity:** confirm the integrity of all membrane assemblies and related accessories, and their installation in conformity with drawings, specifications, manufacturer's instructions, and the reference standards mentioned herein.
 - .2 Installers qualification:
 - .1 All workers must have received formal training on how to apply the products of this Section. A **training certificate** issued by the manufacturer of the membranes must be presented to the Departmental Representative before the work begins.

1.4 Delivery, Storage and Handling

- .1 Deliver materials in original containers, sealed, with labels intact, indicating manufacturer's name and product name.
- .2 Store primers at a temperature above 5°C, in order to facilitate handling. Keep primers away from any flame or excessive heat source.
- .3 Store rolled materials standing, jointing side up.
- .4 As primers contain petroleum distillates and are flammable, do not use near open flame.

1.5 Environmental Requirements

- .1 Apply membranes only when the ambient temperature and the temperature of surfaces to be treated are within the limits prescribed by the manufacturer.
- .2 Do not proceed with installation of membrane when a cold wind could hinder curing of the adhesives.
- .3 Do not apply membranes in humid weather or on wet or frozen surfaces.
- .4 For ease of application during cold weather, store materials in warm temperature before use, as per manufacturer's recommendations. Do not apply in temperatures lower than 5°C unless recommended by the manufacturer.

1.6 Waste Management

- .1 Separate waste materials for disposal, re-use and recycling in accordance with **Section 01 74 19**.

2.0 PRODUCTS

2.1 General

- .1 All adhesives and primers must be from the same manufacturer and compatible with each other and with the membranes and insulation materials, as recommended by the manufacturers.

2.2 Membranes

Identification (Type)	Applicable standards / Properties / Accessories	Location, where indicated on drawings, including:
Type MEMB.4 Self-adhesive air/vapour barrier membrane	Rubberized asphalt / polyethylene membrane, air/vapour barrier sheet membrane, self-adhesive ASTM D1970 : low temperature winter grade (-45 to 90C) ASTM E96 : 2.1 ng/Pa.s.m ² Self-adhesive roof underlayment and eave protection membrane composed of SBS modified bitumen with a glass mat reinforcement, slip resistant tri-laminate woven polyethylene, underface covered with a "split-back" silicone release film, thickness of 1mm (40mil). Primer: Primer composed of SBS synthetic rubbers, adhesion-enhancing resins and volatile solvents. It is used to enhance the adhesion of self-adhesive membranes on various substrates.	- on exterior grade plywood on roof
Type MEMB.6 Self-adhesive air/vapour barrier membrane	Modified bitumen and tri-laminated woven polyethylene facer air/vapour barrier sheet membrane, self-adhesive ASTM E96-B : 2.1 ng/Pa.s.m ² ASTM E2178 : 0.0005 L/s.m ² air leakage at 75 Pa Self-adhesive membrane composed of SBS modified bitumen and a tri-laminated woven polyethylene facer compatible for the use of sprayed polyurethane foam insulation, underface covered with a silicone release paper or film, thickness of 1mm (40mil). Primer: Solvent-based primer specifically designed to maximize adhesion of self-adhesive membranes on walls and foundations. It is composed of adhesive enhancing resins and volatile solvents.	- exterior walls, (including at connections, transitions, wall bottoms, shelf angles) - LT version for winter conditions - HT version for junctions of hot ducts or very high ambient temperatures

Identification (Type)	Applicable standards / Properties / Accessories	Location, where indicated on drawings, including:
Type MEMB.7 Polymer based adhesive and polyethylene film facer, high density, waterproofing and air/vapour barrier sheet membrane, self-adhesive	ASTM E2178 : 0.0014 L/s.m ² air permeability at 75 Pa ASTM D882 : 7/7mpa Polymer based adhesive and polyethylene film facer, compatible for the use of sprayed polyurethane foam insulation, underface covered with a silicone release paper or film, thickness of 0.25mm (10 mils).	- for transitions for insulated metal panels in floors
Type MEMB.8 Self-adhesive breathable membrane	Trilaminate polypropylene sheet air barrier / vapor permeable (breathable) membrane, self-adhesive ASTM E2178 : 0.0025 L/s.m ² air permeability at 75 Pa ASTM E2357 : 0.005 L/s.m ² air leakage resistance at 75 Pa ASTM E96-B : 972 ng/Pa.s.m ² Water vapor permeance ASTM D882 : 5.95/3.65 KN/m Self-adhesive and vapour permeable air barrier membrane composed of a tri-layer laminated polypropylene facer and self-adhesive underface covered with a silicone release film, thickness of 0.6mm (40 mils). Primer: Polymer emulsion-based primer designed to improve the adhesion of self-adhesive waterproofing membranes on most substrates.	- exterior walls
Type MEMB.9 Self-adhesive waterproofing membrane	Roof underlayment, vapour permeable (breathable) rain barrier, trilaminar polypropylene complex facer sheet membrane, self-adhesive ASTM E96-B : 972 ng/Pa.s.m ² water vapor permeance Water proofing roof underlayment vapour permeable rain barrier membrane composed of a trilaminar polypropylene complex facer with self-adhesive underside covered by a two-part silicone release film, thickness of 0.6mm (21mils) Primer: Polymer emulsion-based primer designed to improve the adhesion of self-adhesive waterproofing membranes on	- on exterior grade plywood on roof

Identification (Type)	Applicable standards / Properties / Accessories	Location, where indicated on drawings, including:
	most substrates.	
Type MEMB.10 Breathable drainage membrane	Spun-bonded high density white polyethylene sheet air barrier membrane ASTM E2178 : 0.001 cfm/ft ² at 1.57 psf air penetration resistance ASTM E96-B : 200 g/m ² water vapor transmission ASTM D882 : 38/35 lbs/in Sealing tape for joints: polypropylene film coated with 50 mm wide permanent waterproof acrylic adhesive, compatible with sheet material as recommended by the manufacturer.	- exterior walls

3.0 EXECUTION

3.1 General

- .1 Meet the requirements of the standards mentioned in references and the manufacturer's instructions for the application of the different products.
- .2 Ensure the compatibility of all materials in contact with one another, as well as with the materials and the substrates to which they are applied.
- .3 All surfaces to be dry, clean, free of grease, oil, dust or frost, mortar excess and other contaminants, and be smooth, without large voids, loose spilled materials or sharp protrusions.
- .4 Ensure that the substrate, the adhesive and the primer have completely cured and are clean prior to the application of the membrane.
- .5 Protect adjacent surfaces from overspraying of primers, coatings, membranes, etc.
- .6 Check continuity of air/vapour and water proofing barriers, repair perforated and torn membranes, seal around clips or other protrusions.
- .7 Follow manufacturer's instructions with respect to safety and protection of personnel for the use of all products.
- .8 Advise the Departmental Representative before covering membranes.

3.2 Application of Type MEMB.4 :

- .1 Installation on the roof:

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- .1 Install membrane as recommended by the manufacturer.
 - .2 Install membrane on a continuous, dry, clean, smooth and void-free carrier as recommended by the manufacturer.
 - .3 Apply primer to laying substrate. Refer to the manufacturer's recommendations.
 - .4 Install membrane in dry conditions when air, substrate and membrane temperature is -10 ° C or lower.
 - .5 Provide lateral overlap of at least 100 mm and longitudinal overlap of at least 150 mm.
 - .6 Lay the membrane according to the rules of the art, among others so that the joints repel the water.
 - .7 Pass all overlaps and entire surface with roller for complete sealing.
 - .8 The self-adhesive membrane must be protected from UV rays within thirty (30) days maximum of installation.
 - .9 Following installation, protect the self-adhesive membrane against mechanical damage.

3.3 Application of Type MEMB.6

- .1 Installation on the walls:
 - .1 Examination and preparation of surfaces
 - .1 Examination and preparation of surfaces must be done according to the instructions contained in the manufacturer's technical documentation.
 - .2 Do not begin any part of the work until surfaces are smooth, dry, free from ice and scrap materials, in accordance with manufacturer's instructions and recommendations.
 - .3 Do not lay materials in rainy or snowy weather.
 - .4 Any crack or void larger than 1/8 inch (3.2 mm) requires solid support. The crack must be filled.
 - .5 Deflection joints shall be covered with a 150 mm (6 ") wide self-adhesive membrane reinforcement strip centered on the joint.
 - .2 Laying the primer
 - .1 Impregnate the surface with SBS synthetic rubber primer at:

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- .1 porous supports: 0.3 to 0.5 liter / m²
 - .2 smooth supports: 0.1 to 0.25 liter / m²
 - .2 Prepared surfaces must be covered by membranes on the same day. If this is not the case, primed surfaces must be primed again.
 - .3 Application of Air / Vapor Barrier Membrane
 - .1 Be sure to select the correct product based on temperature during application.
 - .2 All inside and outside corners must be covered with a 150 mm wide adhesive membrane strip, centered on the corner. This strip must be applied directly to the previously primer-free substrate without presence of voids between the support and the membrane.
 - .3 Install the membrane by gradually removing the silicone paper while pressing on the membrane to promote adhesion.
 - .4 Each edge shall overlap the previous 50 mm laterally and transversely.
 - .5 Tears and holes must be repaired with appropriate membrane. The repair must exceed the affected area by at least 100 mm. The perimeter of the repair part will be sealed.
 - .6 Finish the application by placing a pressure roller over the entire membrane to obtain a complete adhesion.
 - .7 The Contractor shall meticulously check the membrane at the end of each working day and before installing the insulation. The top edge of the membrane should be sealed at the end of the day when precipitation is imminent or when application is delayed to more than one day.
 - .8 All small projections (pipes, etc.) must be pre-coated with a membrane and sealed.
 - .9 Install insulation as soon as possible after Departmental Representative inspection.
 - .2 Installation at openings (windows, doors, etc.):
 - .1 Install membrane as recommended by the manufacturer.
 - .2 Lay membrane on a dry, clean, smooth substrate free of voids and loose surfaces to ensure optimal adhesion and regular and continuous installation.
 - .3 Install membrane in dry conditions when air, substrate and membrane temperatures are at

least -4 ° C.

- .4 The air barrier must be connected to the membrane at the openings in the external walls (windows, doors, etc.) so as to prevent any air leakage at these locations (refer to the details of the plans).
 - .5 Self-adhesive membranes applied to connections, window frames, door frames, terminations and around the perimeter of the building, and receiving spray insulation, must be mechanically fastened to the support with a metal bar designed for this purpose.
 - .6 Roof penetrations such as vents, the passage of various mechanical devices shall be sealed according to the manufacturer's instructions and as indicated.
 - .7 The self-adhesive membrane must be protected from UV light within thirty (30) days maximum of installation.
 - .8 Following installation, protect the self-adhesive membrane against mechanical damage.
- .3 Installation of flexible flashing and at transitions:
- .1 Install flexible flashing as recommended by the manufacturer.
 - .2 Install flexible flashing on a dry, clean, smooth, void-free surface and detaching surface to ensure optimal adhesion and consistent, continuous installation.
 - .3 Install membrane in dry conditions when air, substrate and membrane temperatures are at least -4 ° C.
 - .4 Be sure to overlap soft flashing over a minimum of 150 mm. Seal at the joint with a sealant as recommended by the manufacturer.
 - .5 Following installation, protect self-adhesive membrane from mechanical damage

3.4 Application of Type MEMB.7

- .1 Transitions membrane:
 - .1 Install membrane as recommended by the manufacturer.
 - .2 Align and position self-adhering membrane, remove protective film and press firmly on entire surface. Ensure overlaps of at least 50 mm at all sides.
 - .3 Pass all overlaps and entire surface with roller for complete sealing.

3.5 Application of Type MEMB.8

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- .1 Installation on walls:
 - .1 Apply primer to laying substrate. Refer to the manufacturer's recommendations.
 - .2 Inner angles and salient angles:
 - .1 Seal interior angles and projecting corners of sheathing panels with a membrane strip, protruding at least 75 mm from each side of the corner detail.
 - .2 Pretreat re-entrant angles with a 15 mm continuous coil of sealant for terminations.
 - .3 Prime surfaces intermittently at a rate of 18.6 to 23.2 m² / gal to achieve adhesion in accordance with manufacturer's instructions. Let dry.
 - .4 Align and position self-adhering membrane, remove protective film and press firmly on entire surface. Make sure that overlaps of at least 50 mm at the side edges and at least 75 mm at the ends are made.
 - .5 Pass all overlaps and entire surface with roller for complete sealing.
 - .3 Connections:
 - .1 Fasten self-adhesive air barrier membrane to loadbearing beams, columns, floor slabs and floors, parapet edges, foundation walls, roof systems and dissimilar materials interface as indicated in shop drawings.
 - .2 Prime surfaces intermittently at a rate of 18.6 to 23.2 m² / gal to obtain proper adhesion, according to manufacturer's instructions. Let dry.
 - .3 Align and position self-adhering membrane, remove protective film and press firmly on entire surface. Allow at least 75 mm overlaps on all substrates.
 - .4 Ensure overlaps of at least 50 mm at all sides and at least 75 mm at all ends.
 - .5 Pass all overlaps and entire surface with roller for complete sealing.
 - 3.6 **Application of Type MEMB.9**
 - .1 Installation of the roof :
 - .1 Install membrane as recommended by the manufacturer.
 - .2 Install membrane on a continuous, dry, clean, smooth and void-free carrier as recommended by the manufacturer.

- .3 Apply primer to laying substrate. Refer to the manufacturer's recommendations.
- .4 Install membrane in dry conditions when air, substrate and membrane temperatures are -7 ° C or above.
- .5 Provide lateral overlap of at least 100 mm and longitudinal overlap of at least 150 mm.
- .6 Lay the membrane according to the rules of the art, among others so that the joints repel the water.
- .7 Pass all overlaps and entire surface with roller for complete sealing.
- .8 The self-adhesive membrane must be protected from UV rays within a maximum of one hundred and eighty (180) days after installation.
- .9 Following installation, protect the self-adhesive membrane against mechanical damage.

3.7 Application of Type MEMB.10

- .1 Installation on the walls:
 - .1 To minimize the number of joints, use the largest sheets possible.
 - .2 On the walls, arrange the air barrier horizontally, the upper rows overflowing on the lower rows. Provide a minimum overlap of 100 mm at horizontal joints and 200 mm at vertical joints. Secure the air barrier by stapling at a spacing of not more than 150 mm along the edges of the outer layer of paper.
 - .3 Prior to installation of the air barrier and under the drip flashing moldings, install an air barrier strip at the head of each opening to provide a better seal.
 - .4 Completely seal all horizontal and vertical joints between sheets with adhesive tape. Also seal around the rods of the insulation clips.
 - .5 Wedge all joints, leaf sides at the bottom and top of the walls and leaves around the openings under continuous furring, respecting the prescribed details and installation methods.

3.8 Protection

- .1 Do not leave the waterproofing membranes and insulation exposed to the elements: install insulation as soon as possible, as indicated. Otherwise, protect wall surfaces where membrane has been applied with temporary tarpaulin covers.

- .2 Protect the work of this Section from damage caused by other Sections. Clean, repair or replace all work damaged by this Section.
- .3 Backfill with care in order not to damage the panels.
- .4 Ensure proper protection for any welding on work site.

3.9 Cleaning

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 Upon completion of work, clean up and remove from site all debris, rubbish, surplus material and equipment.
- .3 Use mineral spirits if required.

End of Section

1.0 GENERAL

1.1 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C 612 - 10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation
 - .2 ASTM C 553-13, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .3 ASTM C 665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .4 ASTM C 1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .5 ASTM C1289 - 12e1, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- .3 UL-Underwriters' Laboratories/ULC-Underwriters' Laboratories of Canada (UL/ULC)
 - .1 CAN/ULC-S102-10- EN, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .2 CAN/ULC-S114-05- EN, Standard Method of Test Determination of Non-Combustibility in Building Materials
 - .3 CAN/ULC-S701-11- EN, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering
 - .4 CAN/ULC-S702-09-AM1- EN, Standard for Thermal Insulation Mineral Fibre, for Buildings
 - .5 CAN/ULC S704-11- EN, Standard for Thermal Insulation Polyurethane and Polyisocyanurate Boards, Faced
 - .6 CAN/ULC-S705.1-01-AM3- EN, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material – Specification
 - .7 CAN/ULC-S705.2-05- EN, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Installer's Responsibilities – Specification

1.2 Performance Requirements

- .1 Achieve total thermal insulation of the building envelope by ensuring continuity of insulating materials from the foundation walls up to the roof.
- .2 Provide and insure thermal insulation for all cavities/gab/shim of opening.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with **Section 01 33 00** and the following requirements:
 - .1 **Certificates of conformity:** confirm the integrity of all insulation assemblies and related accessories, and their installation in conformity with drawings, specifications, manufacturer's instructions, and the reference standards mentioned herein.

1.4 Handling and Storage

- .1 Do not leave rigid insulation exposed to sun. Cover with opaque polyethylene or a light coloured tarpaulin at all times.
- .2 Store flammable materials outside. Conform to fire protection by-laws as prescribed by authorities having jurisdiction.

1.5 Environmental Requirements

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

1.6 Protection of Work

- .1 Follow manufacturer's recommendations as to required protective measures.
- .2 Protect workers and work as recommended by insulation manufacturer.
- .3 Protect completed work from weather and sunlight as well as accidental fire using a thermal barrier or other means as soon as possible after application.

1.7 Waste Management

- .1 Separate waste materials for disposal, re-use and recycling in accordance with **Section 01 74 19**.

2.0 PRODUCTS**2.1 General**

- .1 All insulation materials to be compatible with each other and with membranes, adhesives and primers, as recommended by the manufacturers.

2.2 Insulations

Identification (Type)	Applicable standards / Properties	Location, where indicated, including
Type INSUL.BRD.1 Extruded polystyrene board floor insulation	CAN/ULC-S701 type 4 RSI = 0.88 / 25 mm 210 kPa compressive strength Ship-lapped edges	- under floor slab (concrete topping)
Type INSUL.BRD.2 Extruded polystyrene rigid insulation	CAN/ULC-S701 type 3 RSI = 0.88 / 25 mm 140 kPa compressive strength	- exterior walls (outer layer)
Type INSUL.BRD.3 Polyisocyanurate board insulation	CAN/ULC-S704, Type 2, Class 3 or ASTM C-1289 Type II, Class 1, Grade 2 rigid, closed cell insulation inorganic/organic felt facing, with ecological expansion agent;	- metal roofs inner layer

Identification (Type)	Applicable standards / Properties	Location, where indicated, including
	board size: 1220 mm x 1220 mm; square edges; RSI = 1.01 / 25 mm; 35 kg/m ³ density; 140 kPa compressive strength;	
Type INSUL.SPR.1 Sprayed or injected polyurethane insulation, portable system	two component, CFC free 28 kg/m ³ density (cans non acceptable)	<ul style="list-style-type: none"> - spot applications (exposed structure) - window and door frame details - various envelope details
Type INSUL.BAT.1 Mineral fiber acoustical batt insulation Fire resistance	CAN/ULC-S702 type 1 made of basalt rock and slag 45 kg/m ³ (2.8 lb/ft ³) density	<ul style="list-style-type: none"> - acoustical door frames - drywall partitions - Chimney perimeter
Type INSUL.BAT.4 Mineral fiber flexible batt insulation	ASTM C 665 made of fiberglass RSI = 0.68 / 25 mm	<ul style="list-style-type: none"> - cavities and shim spaces in envelope
Type INSUL.BAT.6 Mineral fiber semi-rigid board wall insulation, medium density	CAN/ULC-S702 type 1 made of stone wool and slag RSI = 0.75 / 25 mm, Dual density	<ul style="list-style-type: none"> - exterior walls (metal siding, inner layer) - roof (outer layer)

2.3 Adhesives and Primers

- .1 Complies with CGSB 71-GP-24M Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.
- .2 Ensure compliance with manufacturers' requirements and compatibility of adjacent materials.

2.4 Fasteners

- .1 **Fasteners for mineral fibre insulation:** impale type hangers of stainless steel weld pins of 2.7 mm (12 ga) diameter, with appropriate length, with 0.8 mm thick perforated cold rolled stainless steel square plates 50 mm x 50 mm, and adhesive, for adhering to metal or membrane surfaces, with self-locking 38 mm diameter stainless steel washers.
- .2 **Fasteners for rigid insulation:** as per manufacturer's recommendations, galvanized or corrosion-resistant coated, with 50 mm diameter or larger polypropylene washers, self-tapping corrosion resistant # 12 stainless or carbon steel screws and corrosion resistant 2.7 mm spiral nails, for attachment into Sub-Girts.

2.5 Other Accessories

- .1 Metal furrings and Sub-Girts U", "Z", "C", or "L" shaped, see **section 05 41 00**.
- .2 Joint tape for polystyrene insulation: 100 mm wide, 0.075 mm thick tape on a treated polypropylene backing, as recommended by insulation manufacturer.

3.0 EXECUTION

3.1 General

- .1 Meet requirements of the NBC of Canada, the latest version of energy conservation regulation for new buildings by the authority having jurisdiction and CSC Teck-Aid 07210 - Building Insulation.
- .2 Install insulation according to the manufacturers' instructions.
- .3 Verify condition of substrates before applying insulation and advise the Departmental Representative in writing of all conditions affecting the quality of work. Do not apply insulation before corrective measures are taken.
- .4 Do not apply insulation until substrate is dry.
- .5 Store adhesive at room temperature for a minimum of **24 hours** before use.
- .6 Apply adhesives, insulation and plaster on clean surfaces, free of moisture, frost, dust, dirt, oil, grease, laitance, contamination, foreign matter and other substances preventing or weakening adhesion.
- .7 Apply insulation boards and panels plumb, square, faces flush, horizontal and vertical joints staggered and butted tight.
- .8 Fit insulation tight around electrical outlets, plumbing fixtures, ductwork, openings, and other protrusions.
- .9 Keep combustible insulation minimum 75 mm from heat emitting sources and natural gas and propane vents.
- .10 Offset both vertical and horizontal joints in multiple layer applications.
- .11 Leave insulation board joints un-bonded over line of expansion and control joints.
- .12 Do not excessively compress batt insulation to fit into spaces.
- .13 Follow the manufacturer's recommendations for application at temperatures below 5°C.
- .14 Install fasteners, if required, as recommended by the manufacturer of each insulation type.
- .15 Do not cover insulation or backfill prior to the inspection and approval by the Departmental Representative.
- .16 Repair or replace insulation damaged by other work, with identical material.
- .17 Install insulation such as to preserve continuous thermal protection of the building envelope.
- .18 Temporarily protect exposed panels.

3.2 Installation Type INSUL.BRD.1

- .1 As per the board manufacturer's instructions for the condition described in architecture drawings.
- .2 Ensure that boards are fitted squarely together, without visible spaces between the boards.

3.3 Installation of Type INSUL.BRD.2

- .1 As per the board manufacturer's instructions for the condition described in architecture drawings.

3.4 Installation of Type INSUL.BRD.3

- .1 As per the board manufacturer's instructions for the condition described in architecture drawings.
- .2 Install insulation to obtain specified thicknesses. Shift the panels from one row to another to break the short joints and those of the panel sections.
- .3 Firmly butt each insulation board to surrounding boards. Stagger joints of successive strips by 80%; when multiple insulation layers are used, regular or tapered, stagger top layer vertically and offset from joints in the underlying layer(s). Do not jam or deform boards.
- .4 Fill cracks between insulation boards with flexible insulation as recommended by the manufacturer.

3.5 Installation of Type Type INSUL.SPR.1

- .1 Prepare the substrate as required, to ensure proper adherence of the sprayed insulation. Apply the primer as recommended by the manufacturer.
- .2 Perform adhesion tests before beginning the work to ensure adhesion of insulation.
- .3 Apply insulation to clean surfaces, as per CAN/ULC-S705.2 and the manufacturer's written instructions, using appropriate machinery and equipment, clean and in good working order. Ensure that no undue pressure is applied to surfaces to be insulated. Do not use urethane foam insulation in pressurized cans.
- .4 Apply Type INSUL.SPR.1 in areas that are difficult to access.
- .5 Ensure that openings, perforations or other gaps not required for cavity ventilation are sealed adequately before beginning work to prevent the insulation extending beyond area to be insulated.
- .6 Ensure that crevices and cavities are entirely filled with insulation without voids or empty spaces and make verification openings which are to be re-closed after completion of work.
- .7 Install galvanized sheet or bent plate elements and spacers where required, to fill and neatly stop the insulation.

3.6 Installation of Type INSUL.BAT.1

- .1 As per the batt manufacturer's instructions for the condition described in architecture drawings.

3.7 Installation of Type INSUL.BAT.4

- .1 As per the batt manufacturer's instructions for the condition described in architecture drawings.
- .2 Insert flexible batt insulation where indicated or required, fitting tightly, leaving no voids, ensuring continuity of thermal protection of the envelope.

3.8 Installation of Type INSUL.BAT.6

- .1 As per the batt manufacturer's instructions for the condition described in architecture drawings.

3.9 Field Quality Control

- .1 Advise the Departmental Representative before covering membranes and insulation.

3.10 Protection

- .1 Do not leave rigid insulation exposed. Cover with temporary protection panels as soon as installed.

3.11 Cleaning

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 At completion of work, remove protection and remove dirt on adjacent surfaces using mineral spirits.
- .3 At the end of each day's work, remove all refuse from site.

End of Section

1.0 GENERAL

1.1 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American National Standards Institute (ANSI/ASME)
 - .1 ANSI/ASME B18.6.4-1998(2005), Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch)
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM C1177/C1177M - 08, Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - .3 ASTM C1396/C1396M - 11, Standard Specification for Gypsum Board
 - .4 ASTM D217 - 10, Standard Test Methods for Cone Penetration of Lubricating Grease
- .4 Canadian Standards Association (CSA)
 - .1 CSA S136-07(R2012), Commentary on North American specification for the design of cold-formed steel structural members

1.2 Design Criteria

- .1 **Wall cladding:**
 - .1 Exterior walls shall resist a factored positive and negative wind pressures of min. 2.35 kPa with a deflection of less than 1/180th of the span, and be designed in accordance with NBC requirements and local by-laws. The wall cladding and its fixation shall resist a minimum factored wind suction load of 1.62 kPa.
 - .2 The walls shall be detailed using "Rain Screen" principles as per to recommendations of NRCC.
 - .3 Design cladding to take air circulation between the exterior environment and inside of metal cladding into account.
 - .4 The wall assembly shall permit expansion and contraction without losing its weather tightness from -35°C to 75°C.
 - .5 Acceptable differences in relation to horizontal or vertical planes or at an indicated location on shop drawings shall be 10 mm in 10 m (1/1000) and a maximum cumulative difference of 19 mm in 100 m. Deviations of alignment between two adjacent panels end to end shall not be more than 0.75 mm.
 - .6 Achieve complete and uninterrupted air/vapour/water tightness and thermal insulation of the building envelope.

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- .2 **Flashings and copings:**
 - .1 The flashings and copings shall withstand all applicable positive or negative wind forces, 223 kg/m² minimum.
 - .2 Ensure the finishing and colours match with adjacent or indicated material.
 - .3 **Roofing:**
 - .1 Calculate metal roofing panels in accordance with the requirements of CSA S136 and S136.1 standards and current version of the National Building Code of Canada.
 - .2 Metal roofing panels should be designed so as to allow movements of thermal expansion and contraction of the component materials to a temperature differential of about 80 °C without exerting excessive force on the fasteners, causing buckling of panels, rupture of seals, or any other damage or deterioration.
 - .3 Joints shall be designed to absorb the movement caused by expansion and contraction between individual panels and between the panels and the building structure or movement caused by displacement of the frame (wind loads and snow), without permanent deformation or damage to infill materials, construction joints and seals, and without water or air infiltration.
 - .4 The panels shall be designed taking into account the tolerances prescribed for mounting to the support frame.
 - .5 Respect the following tolerances when installing the panels:
 - .1 The maximum permissible variation in the flatness of the elements is 6 mm to 10 mm / 10 m or more in length.
 - .2 The maximum allowable shift in the alignment of two adjacent elements abutting in the same plane is 0.75 mm.
 - .3 Elements must be designed in accordance with the requirements of the NBC and the relevant local regulations. The maximum allowable deflection is 1/180 of the span. Gravity loads are provided on the structural drawings. The roof cladding and its fixations shall resist a minimum factored uplift wind loads of 2.2 kPa.
 - .6 Ensure minimum thermal resistance as indicated, calculated in the manner prescribed by ASHRAE, taking into consideration nominal wind loads.
 - .7 Roof cladding assembly shall provide permeance not exceeding 28 ng / (Pa.s.m²).
 - .8 Provide effective vapor barrier, with sealed joints that will withstand positive and negative pressures inside and outside the building and prevent any infiltration / exfiltration through the building envelope.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with **Section 01 33 00** and the following requirements:
 - .1 **Shop drawings:**
 - .1 Shop drawings shall be sealed and signed by a structural engineer who is a member in good standing of Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG).
 - .2 Provide structural calculations for all claddings and support systems.
 - .3 Shop drawings must indicate design load, dimensions of framing elements, materials used, nominal thickness of exterior cladding before installation, exterior cladding, assembly and bracing details, dimensions

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- and spacing of screws and anchorage details.
 - .4 Shop drawings must indicate the location, dimensions and openings of associated works, as well as their requirements.
 - .5 Drawings must indicate dimensions and profile of elements, fastening methods, wall level ratings, details of trims and fasteners, soffits, fascia, metal furs, colors as well as related works.
 - .2 **Certificates of conformity:** confirm that all cladding assemblies and related accessories, are in conformity with drawings, specifications, manufacturer's instructions, and the reference standards mentioned herein.
 - .3 **Extra materials:** supply 2% of cladding material, accessories, and fastenings for each type of cladding material.
 - .4 **Proof of qualification:** welders to be accredited by the Canadian Welding Bureau, in accordance to CSA W47.1 requirements.
 - .5 **Samples:** Submit 600 x 600 mm sample of each cladding materials, colors and profiles.
- .2 **Mock-up**
 - .1 Construct a sample 1500x1500mm according to each type of cladding assemblies and related accessories to be approved on construction site before final installation. Mock-ups must clearly indicate connections and sealing devices/products between different materials.
 - .2 Allow 72 hours for inspection by Departmental Representative before proceeding with works.
 - .3 Mock-ups must be erected in areas designated by the Departmental Representative.
 - .4 Accepted mock-ups shall become part of finished work.

1.4 Delivery and Storage

- .1 Order material with a long lead time because of profile or colour well in advance, so as not to delay progress of work.
- .2 Handle and store panels in such a way to avoid damage to material and installation.
- .3 Store in strict accordance with the manufacturer's instructions. Material shall be stacked piled on wood rails and slightly sloped to shed water.
- .4 Do not use material damaged from exposure to humidity, impact or any other cause.
- .5 Unless otherwise indicated, store material in original packaging with the manufacturer's name and seal intact.
- .6 Protect stored materials from elements in temporary enclosures.

1.5 Waste Management

- .1 Separate waste materials for disposal, re-use and recycling in accordance with **Section 01 74 19**.
- 2.0 PRODUCTS

2.1 Roof and wall metal cladding panels, Types 1, 2, 3:

- .1 **Exterior metal cladding panels, fluted, factory pre-painted:** galvanized steel sheet to ASTM A653 commercial grade, galvanised finish G90 to ASTM A525 on both sides, factory pre-painted on apparent side, with smooth surface, and having the following characteristics:
- .1 Thickness of base metal: minimum 0.61 mm (24 ga) and meeting the **Design Criteria**.
 - .2 Size and profile: 1015 mm width by 10 670mm length with flutes (35 mm depth X 85mm width at base and 25mm width at top) located at 338 mm c/c.,
 - .3 Physical properties: as per CSA S136-07.
 - .4 Colours – See **drawings** for location:
 - .1 "type 1": "Deep water green"
 - .2 "type 2": "Pacific turquoise"
 - .3 "type 3": "White White"
- .2 **Accessories**
- .1 Backing Fasteners: Galvanized steel, commercial grade Z275 zinc plated, thickness required as per strength calculations.
 - .2 Sealants: in accordance with **Section 07 92 00** - Joint Sealants.
 - .3 Thermal break tape at the junction of the "Z" bars (sub-girt).
 - .1 Self-adhesive tape on one or both sides, depending on requirements and location, in EVA polyethylene for thermal breakage and water tightness of joints.
 - .2 Thickness 3 mm.
 - .4 Touch-up paint: as recommended by the cladding manufacturer.
 - .5 Flashing, Stop Moulding, Steel Closure moulding, Steel Casing and Closure, as per 2.5.1.
 - .6 Fasteners: Stainless steel, with hexagonal screw head finished in the same colour as the cladding panels, Factory Mutual compliant and recommended by the manufacturer, of appropriate length to the structure. All fasteners will have a conical neoprene washer.
 - .7 Butyl gasket: butyl-polyisobutylene tape, 100% solid, 3 mm x 13 mm.
 - .8 Rubber closures matching the cladding profile, where shown on the drawings and as recommended by the cladding manufacturer.
 - .9 Metal closures as profile of metal coating, where shown in drawings and as recommended by manufacturer.
 - .10 Flat metal sheets, factory pre-painted, smooth-surface grade metal sheet, for vertical or

horizontal installation, in accordance with CGSB 93.4, sheet of commercial grade steel with zinc designation Z275 on each face, pre-painted at the factory on all visible sides. Base metal minimum 0.61 mm (24 ga) thick and meeting **Design criteria**, galvanization and factory pre-painted finish must be the same material and colour as the adjacent cladding (6 colours in total), and must be compatible with each other and supplied by the same manufacturer. Colour selected by the Departmental Representative. See **drawings** for location.

2.2 Composite cement panels, Type 4:

- .1 **Composite cement panels:** 10 mm cement panel manufactured under pressure, pre-cut, pre-pierced and coloured in a workshop environment by the manufacturer, composite core made of synthetic fibers, cement and active adhesives.
 - .1 Thickness: 10mm
 - .2 Size: See **drawings** for dimension and location (Single whole sheet required at all locations: no joint accepted)
 - .3 Physical properties:
 - .1 Impact resistance as per ASTM D 1037
 - .2 Thermal expansion as per ASTM C 531
 - .3 Density: +1.500g/m³
 - .4 Compression resistance: 950N
 - .4 Colour coating:
 - .1 Flexible water based hardened urethane enamel, stoved under infra-red, with the following characteristics after an ageing period of 14 days at 25° C
 - .1 Substrate adhesion as per ASTM D-3359B
 - .2 Hardness as per ASTM D-523
 - .3 Direct impact resistance as per ASTM D-4426
 - .4 Colour : "Gray"
- .2 **Accessories**
 - .1 Interface ribbon: 37 mm width by 7mm thick self-adhesive ribbon with acrylic aggressive adhesive, same color as composite cement panels made of vinyl closed cells with the following properties:
 - .1 Density.....224 kg/m³
 - .2 Compression à 25 %2.7 N / cm²
 - .3 Residual deformation under constant constraint: 3 %
 - .4 Inflammability: auto-extinguible
 - .2 Fasteners: Self drilling stainless steel screw, with 'wafer head' design, grade # 10, with 12 mm nylon sleeve, provided by the composite cement panels manufacturer. Pre-painted with same color and quality product than panels.
 - .3 Steel sub-girts (Z bars), see **Section 05 41 00**.

2.3 Wall Metal Tiles Type 5, 6, 7:

- .1 **Exterior metal tiles wall cladding system**, factory pre-painted galvanised steel tiles, with 4 plies on interlocking shores, with concealed fasteners, 45 degrees installation.
 - .1 Thickness of base metal: minimum 0.61 mm (24 ga) and meeting **Design Criteria**.

- .2 Size and profile: 343 X 343 mm.
- .3 Physical properties as per CSA S136-07.
- .4 Flexibility to bend as per 2-T (1) ASTM D 4145 (NCCA 11-19)
- .5 Acceptable impact test as per (2) ASTM D 3359 (NCCA 11-5)
- .6 Abrasion resistance as per ASTM D-968 Method A
- .7 Robust polyvinylidene fluoride paint coating finish (PVDF), see drawings for colours locations. Colours:
 - .1 "type 5": "Charcoal Grey"
 - .2 "type 6": "Dove Grey"
 - .3 "type 7": "Acost White"

.2 Accessories

- .1 All exposed trims and fittings such as recessed corner and protruding corner pieces, counter flashing, trim strips, bibs, starter strips, sill and sill trim, and door trim and trim of window must be of the same material and color as the cladding and must be compatible with each other and supplied by the same manufacturer.
- .2 The corner mouldings should be related with the adjacent tiles colour, see **drawings** for the colour gradient (two (2) darks and (2) two pale corners).
- .3 Provide factory-made half tiles for the starting row at the bottom. No cutting made on the construction site will be accepted.
- .4 Fasteners, concealed fastener clips, sealants, brake formed flashings, where shown in drawings and as recommended by manufacturer.

2.4 Insulated Metal panels, Type 8:

- .1 **Insulated metal panels** with a foamed-in place Class 1 rigid polyisocyanurate (25psi) panel core, double tongue and groove offset design side joint, fasteners completely concealed within the side joint.
 - .1 254 mm thickness, refer to **drawings** for panel width and length.
 - .2 Thermal transmissions as per AST C514/C1363
 - .3 Structural strength as per ASTM E72 with a deflection not to exceed L/180.
 - .4 Weather tightness as per ASTM E 283 Air Infiltration method and ASTM E 331 Water Penetration method.
 - .5 The panel core shall have a flame spread maximum of 25 and smoke developed maximum of 450 as tested in accordance with the ASTM E 84 test method.
 - .6 The panel shall have Factory Mutual Class 1 Approval for wall and roof/ceiling construction in accordance with the full scale FM 4880 test program with no height restriction.
 - .7 The panels shall have Factory Mutual Class 1 Exterior Wall System Approval for Windstorm in accordance with FM 4881.
 - .8 Metal facing:
 - .1 exterior: 24 gauge galvanized steel as per G90 Galvanized or AZ50 Galvalume steel, panel exterior profile lightly planked mesa ribs on 56mm centers. Steel

coated with a 30 year 70% PVDF finish with a total dry film thickness of 1.0 mil including primer.

.1 Colour : Pearl Grey

.2 interior : 26 gauge galvanized steel as per G90 Galvanized or AZ50 Galvalume steel, panel interior profile lightly planked mesa ribs on 56mm centers. Steel coated with a polyester finish with a dry film thickness of 1.0 mil including primer.

.1 Colour : Imperial White.

.2 Accessories

.1 Fasteners, concealed fastener clips, sealants, brake formed flashings, where shown in drawings and as recommended by panel's manufacturer.

.2 Sealant Type J, as per **Section 07 92 00**.

.3 Flashings as per 2.5.1.

2.5 Accessories

.1 **Metal flashings and copings, factory pre-painted**, Smooth-surface grade metal sheet, for vertical or horizontal installation, in accordance with CGSB 93.4, sheet of commercial grade steel with zinc designation Z275 on each face, pre-painted at the factory on all visible sides. Base metal minimum 0.61 mm (24 ga) thick and meeting **Design criteria**, galvanization and factory pre-painted finish must be the same material and colour as the adjacent cladding (6 colours in total), and must be compatible with each other and supplied by the same manufacturer. Colour selected by the Departmental Representative.

.2 **All cladding accessories** such as alignment bars, brackets, clips, inserts, shims, trims, flashings, fillers, sills, rib closures, as required and of the same material as the flashings and copings, or as indicated on drawings.

.3 Assembly for heated roof vent pipes:

.1 Prefabricated roof vent insulation shell, consisting of isocyanurate foam, covered with a protective metal coating.

.1 Coordinate dimensions according to pipe types and their dimensions. Refer to mechanical drawings and mechanical sections of the Specifications.

.2 Pre-molded aluminum vent pipe flashing (sleeve), with inclined base to adjust to roof slope, and cap.

.1 Coordinate dimensions according to pipe types and their dimensions. Refer to architectural and mechanical drawings and mechanical sections of the Specifications.

.2 Provide appropriate cap for sleeve size.

.3 Preformed flexible EPDM pipe flashing: 1-piece composite conical pipe flashing for roof openings, with the following characteristics:

.1 Conical fluted body of EPDM rubber.

.2 Flexible, corrosion resistant base collar to be site-fitted to conform to profile of roof cladding panel flutes.

.3 Pipe diameter markings on cone to facilitate accurate fitting. Coordinate dimensions according to pipe types and their dimensions as well as to roof vent insulation shell. Refer to mechanical drawings and mechanical

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- sections of the Specifications.
 - .4 Adjustable to any roof pitch.
 - .5 Continuous service temperature from -53 °C to 121 °C.
 - .4 **Assembly for chimney and hood exhaust :**
 - .1 Pre-molded galvanized steel chimney flashing (sleeve), with inclined base to adjust to roof slope, and flashing storm collar.
 - .1 Coordinate dimensions according to chimneys types and their dimensions. Refer to architectural and mechanical drawings and mechanical sections of the Specifications.
 - .2 Provide appropriate flashing storm collar for chimney size.
 - .5 **Insulating strip for metal work, self-adhesive:** cross-linked waterproof polyethylene EVA strip to provide a thermal or electrolytic break and/or water-tightness, with adhesive on one or both faces, depending on location and required use, 3 mm thick.

2.6 Fabrication of Metal Panels

- .1 Fabricate and finish in accordance with CSMBI requirements, manufacturer's standard procedures and the performance requirements specified herein. Panels, trims, and flashings shall be pre-cut in factory.
- .2 Form elements square, plumb and level, with precision and in strict conformity to profiles, levels, and dimensions shown on the architectural drawings, and reviewed shop drawings, and free of all distortions and other defects that may alter, appearance or performance.
- .3 Deburr, smooth and round off raw edges of plates and sheet material prior to forming during fabrication.
- .4 Fabricate panels for control of condensation, including proper inclusion of seals and provisions for venting, weeping and draining.
- .5 Provide for expansion of the various materials.

3.0 EXECUTION

3.1 General

- .1 Verify all dimensions on site before commencing fabrication and installation and report all discrepancies to Departmental Representative. Where dimensions required are not available before work starts, required dimensions shall be agreed upon between the various trades concerned and approved by the Departmental Representative.
- .2 Examine other work upon which the work of this Section depends and report all errors and discrepancies to the Departmental Representative. The work of this Section shall not commence before all defects are corrected.
- .3 Where required, neatly cut, reinforces, adjust and render work adequate in such a way as to

ensure a perfect fit of all components.

- .4 Ensure exposed raw edges of plates and sheet material are deburred, smoothed and rounded off prior to installation.
- .5 Where required, repair or replace panels and louvres damaged during installation with identical products.
- .6 Plan work and coordinate with other trades.
- .7 Install cladding straight, plumb, and level in strict accordance with the configurations, levels and dimensions shown on the drawings and reviewed shop drawings.
- .8 Do work as per CSA and CSMBI standards.
- .9 Coat incompatible metals with an isolating bituminous coating to prevent electrolytic reaction.

3.2 Pre-installation Requirements

- .1 See **Sections 07 10 00** and **07 20 00** and **Mechanical**, to ensure uninterrupted air/vapour/water weather tightness.

3.3 Installation of Wall Claddings

- .1 Install panels as indicated on drawings, in accordance with manufacturer's written instructions.
- .2 Install liner panels on the structural girts.
- .3 Install metal sub-girt, square and level, on structure, respecting panel dimensions as shown on drawings.
- .4 Install siding panels on sub-girt system, or wall framing system, or directly on structural members, as indicated.
- .5 Install continuous starter and edge strips, inside and outside corners, as well as flashings and other trims as indicated.
- .6 Form accessories in recommended lengths, making allowance for expansion at joints.
- .7 Neatly finish and deburr all on-site saw cutting.
- .8 Joints in flashings shall be "S" type and allow for movement, and shall be caulked according to manufacturer's recommendations, to ensure watertight installation.
- .9 Carefully install outside corners, fillers and closure strips and curved panels so that finished work matches profiles indicated on drawings.
- .10 Provide pre-formed metal top closures and joint covers, or foam closures to stop direct water

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- penetration at vertical profiles of exterior siding. Ensure continuity of "pressure equalization" per rain screen principle.
- .11 Anchor panels and other components securely in place, with provision for thermal/structural movement.
 - .12 Locate end laps, at least 100 mm wide, directly on structural supports. No open joints shall be accepted.
 - .13 Maintain tight fitting, hairline joints in exterior cladding, true to line.
 - .14 Install panels using type of fasteners recommended by the manufacturer and comply to maximum vertical and horizontal tolerances.
 - .15 Align screws in a rectilinear pattern, regularly spacing according to manufacturer's recommendations.
 - .16 Screws caps shall be same colour as the siding panels.
 - .17 Install shims to obtain square, straight and level work to allowed tolerances.
 - .18 Install thermal breaks uninterrupted by girt, on interior and exterior faces of the sub-girt system.
 - .19 Install wall metal tiles in accordance with the requirements of CGSB 93.5 and the written instructions of the metal tiles manufacturer.
 - .20 Avoid metal-to-metal contact to reduce the noise from internal movements within the panel system; use Type J sealant between overlapping panels, in accordance with **Section 07 92 00** and as per the written instructions of the panels' manufacturer.
 - .21 Ensure all horizontal and vertical joints between interior metal liner panels are entirely caulked with Type J sealant or tape preformed sealant, and that vertical joints are mechanically fastened at max. 610 mm spacing. Seal fastener heads.
 - .22 Install prefabricated gaskets, membrane flashing and caulking to both exterior cladding and interior liner panels, as indicated and as required in order to seal the wall assembly, especially around ducts and pipes through the walls. Ensure complete air and water tightness.
 - .23 On all exterior side surfaces, caulk junctions with adjoining work, around openings and where required, with a sealant Type A, in accordance with **Section 07 92 00**.
 - .24 Install all accessories as indicated and as recommended by the claddings manufacturers.

3.6 Installation of Roof Accessories

- .1 As per manufacturers' instructions. See **Mechanical**. Ensure complete isolation of different metals, to avoid galvanic action.

3.7 Installation of Roof Cladding

- .1 See also **Section 07 20 00** for the installation of the insulation.
- .2 Attach support straps roof system with fasteners suitable for the prescribed nailing base, so that the assembly can withstand upward forces due to wind as per **Design Criteria**.
- .3 Install insulation in layers, as indicated on drawings. Ensure all joints are tight and properly secured around the support straps. The insulation shall be installed in continuous layers without interruptions. Ensure that the joints of the first layer are staggered relative to the joints of the second layer. For areas where it is impossible to use semi-rigid insulation, use flexible insulation.
- .4 Install cladding on the support fasteners, as per manufacturer's installation instructions. Ensure that lateral joints are well fitted over the entire length of the roof and cladding covers the whole roof surface without interruption. Miter joints where necessary and install a "knee cap" batten on the miter joint.
- .5 Fasten overlaps at panels ends, to ensure a perfect seal. Non-concealed fasteners shall be the same color as the roof panels.
- .6 Install formed and notched closure strips to seal panel ends and roof edges, and at places where there is a variation in height, as required.
- .7 Provide all flashings, moldings and other accessories required to complete the work properly.
- .8 See wall cladding installation for additional requirements.

3.8 Cleaning and Protection

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 As work progresses and at completion, remove all foreign substances from the work and remove all stains, paint marks, dirt and mastic smudges, drops of sealant, etc. which may be difficult or impossible to remove prior to acceptance of work by the Departmental Representative.
- .3 Remove protective film coating (where applicable such as for metal wall tiles) as work progresses. Clean with a mild detergent at the end of work, using clean and soft rags.
- .4 Replace damaged panels or accessories that cannot be repaired by touch-ups or other minor interventions to Departmental Representative's satisfaction.
- .5 If necessary, wash exposed exterior surfaces using warm water and domestic mild soap, with clean soft cloths.
- .6 Remove from site all surplus materials, debris, excess of sealants and broom clean the work area.

- .7 Protect completed work from damage, which could result from other work, until end of construction.

End of Section

1.0 GENERAL

1.1 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A1008/A1008M - 12a, Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
 - .2 ASTM C920 - 11, Standard Specification for Elastomeric Joint Sealants
 - .3 ASTM D2240 - 05(2010), Standard Test Method for Rubber Property - Durometer Hardness
 - .4 ASTM D2794 - 93(2010), Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 - .5 ASTM D4060 -10, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
 - .6 ASTM D4541 - 09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
 - .7 ASTM E84 - 12c, Standard Test Method for Surface Burning Characteristics of Building Materials
 - .8 ASTM E119 - 12a, Standard Test Methods for Fire Tests of Building Construction and Materials
 - .9 ASTM E605 - 93(2011), Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
 - .10 ASTM E736 - 00(2011), Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
 - .11 ASTM E761 - 92(2011), Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
 - .12 ASTM E814 - 11a, Standard Test Method for Fire Tests of Penetration Fire Stops Systems
 - .13 ASTM E859 - 93(2011), Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
 - .14 ASTM E2174 - 10ae1, Standard Practice for On-Site Inspection of Installed Fire Stops
- .3 Canadian Standards Association (CSA)
 - .1 CSA S136-07(R2012), Commentary on North American specification for the design of cold-formed steel structural members
- .4 UL-Underwriters' Laboratories/ULC-Underwriters' Laboratories of Canada (UL/ULC)
 - .1 CAN/ULC-S101-07-EN, Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .2 CAN/ULC-S115-11- EN, Standard Method of Fire Tests of Firestop Systems
 - .3 CAN/ULC-S702-09-AM1- EN, Standard for Thermal Insulation Mineral Fibre, for Buildings

1.2 Design Criteria

- .1 All applications of fire and smoke protection assemblies to be as per tested assemblies.
- .2 Fire and smoke stopping assemblies will correspond to or be similar to the tested assemblies, shown on **drawings**, if applicable.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with **Section 01 33 00** and the following requirements:
 - .1 **Shop drawings** : indicate the homologated assemblies corresponding to the applicable assemblies.
 - .2 **Certificates of conformity** : confirm the integrity of each firestopping and fireproofing assembly and their installation in conformity with drawings, specifications and the reference standards mentioned herein, and with homologated applicable assemblies.
 - .3 **Test reports** :
 - .1 Submit test results in accordance with CAN/ULC-S101, CAN/ULC-S102, ULC S115 and ASTM E119 for firestopping and fireproofing materials.
 - .2 For assemblies not tested and rated, submit proposals based on related designs using accepted design criteria.
 - .3 Submit test results concerning the following characteristics of the fireproofing materials:
 - .1 Durometer hardness as per ASTM D2240.
 - .2 Adherence resistance as per ASTM E736.
 - .3 Compression resistance as per ASTM E761.
 - .4 Bending resistance as per ASTM E759.
 - .5 Adherence under impact as per ASTM E760.
 - .6 Resistance to air erosion as per ASTM E859.
 - .7 Corrosion resistance as per ASTM E937.
 - .8 Resistance to moisture propagation as per ASTM G21.
 - .9 Resistance to abrasion as per test method of the Bureau of Building Inspection of the City of San Francisco.
 - .10 Penetration under impact as per test method of the Bureau of Building Inspection of the City of San Francisco.
 - .2 **Extra materials**: supply 2 containers of each type of sealant and related primer, and 1 package of each type of fire resistive insulation.

1.4 Delivery, Storage and Handling

- .1 Material shall be delivered in original unopened packages, or containers, each fully identified as to manufacturer, brand or other identifying data, and bearing the proper labels and Fire Resistance Classification by ULC or others.
- .2 Material shall be stored off the ground, under cover, and in a dry location until ready for use. All bags that have been exposed to water before use shall be found unsuitable for use and discarded. Stock of materials is to be rotated and used prior to its expiration date.
- .3 Discard any materials which have come into contact with contaminants before actual use.

1.5 Environmental and Safety 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 acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of materials including special conditions governing use.
- .3 At outdoor temperatures less than 5°C, ensure that a 5 °C air and substrate temperature is maintained during and for 24 hrs after application.
- .4 Ventilate area of work during installation of materials, as directed by Departmental Representative, by use of approved portable supply and exhaust fans, and as recommended by manufacturers.
- .5 During and after application of fire resistance coatings, ensure that natural or mechanical ventilation, as required, is sufficient to permit complete drying of pulverised products.
- .6 Temporarily isolate the work zone so as to prevent contaminating the air of neighbouring spaces.
- .7 Protect workers as recommended by manufacturers.
- .8 Protect adjacent surfaces from dust and debris produced by fire and smoke resistance materials.

1.6 Waste Management

- .1 Separate waste materials for disposal, re-use and recycling in accordance with **Section 01 74 19**.

2.0 PRODUCTS

2.1 General

- .1 Ensure separation, by means of mutually compatible elements, between substrates forming openings and elements penetrating fire stop assemblies in conditions of service and use as demonstrated by manufacturer and based on tests and experience of the site.
- .2 For each fire stop assembly, provide any components necessary to install filler material. Use exclusively the components specified by the manufacturer and approved by the qualified testing agency for the designated fire stop.
- .3 Fire stopping materials shall be sealed in place (integrated into the concrete) or installed thereafter. Provide sealed-in-place fire stops prior to pouring concrete.

2.2 Manufacturers

- .1 Provide products from the manufacturers and in compliance with the flammability of penetrations and joints listed in the « ULC Fire Resistance Directory - Volume III» or the directory « UL Products Certified for Canada (cUL) Directory »:

2.3 Materials & Accessories

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN- ULC-S115 and not to exceed opening sizes for which they are intended.
 - .2 The fire stop system rating must be in accordance with CNB and as indicated in drawings.
- .2 Materials making up the fire stoppings and smoke seals must have a flame-spread rating of more than 25 when tested in accordance with CAN/ULC S102.
- .3 Service penetration assemblies: systems tested to CAN/ULC-S115 and included in our guides 40 U19.13 and 40 U19.15 of ULC.
- .4 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
 - .1 Do not use an hydraulic binder base seal or a rigid seal at such locations.
- .5 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
 - .1 Do not use an hydraulic binder base seal or a rigid seal at such locations.
- .6 All fire stopping assemblies must have an integrated smoke 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.

3.0 EXECUTION

3.1 Preparation

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
- .2 Ensure that substrates and surfaces are clean, dry and frost free.
- .3 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .4 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 Installation

- .1 Handle, store and install materials in accordance with manufacturer's written instructions.
- .2 Install fire stops and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .3 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.
- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.
- .7 Follow manufacturer's written instruction for application.

3.3 Special Requirements

- .1 Provide flexible fire stopping that allows for movement around pipes and locations subject to vibration, thermal expansion / contraction, moisture, creep and bending of the structure, deformations caused by wind, etc.
- .2 At all the vertical exterior walls and all breaches in the concrete slab, ensure, with the use of fire stopping, a perfectly water and air tight seal.

3.4 Sequence of Operation

- .1 Proceed with installation only when submittals have been reviewed by the Professional.
- .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.
- .5 Ensure pipe insulation installation precedes fire stopping.

3.5 Field Quality Control

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

3.6 Schedule

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated gypsum board partitions and walls.
 - .2 Top of fire-resistance rated gypsum board partitions.
 - .3 Shrinkage and reinforcing joints executed in the gypsum board partitions and walls.
 - .4 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .5 Openings and sleeves installed for future use through fire separations.
 - .6 Around mechanical and electrical assemblies penetrating fire separations.
 - .7 Rigid ducts: greater than 129 cm²: 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.

.8 Where indicated in the drawings.

3.7 Inspection After Application

- .1 Before covering work done under this Section, notify the Departmental Representative that work is ready for inspection.
- .2 Keep areas of work accessible for inspection by applicable Code and Fire authorities.

3.8 Cleaning

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 Clean areas at end of each workshift and on completion.
- .3 Repair or replace adjacent surfaces if damaged due to the work of this Section.
- .4 Remove excess material, overspray, droppings and debris.

End of Section

1.0 GENERAL

1.1 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C834 - 10, Standard Specification for Latex Sealants
 - .2 ASTM C920 - 11, Standard Specification for Elastomeric Joint Sealants
 - .3 ASTM D217 - 10, Standard Test Methods for Cone Penetration of Lubricating Grease
 - .4 ASTM D1751 – 04 (2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .5 ASTM D1752 - 04a (2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

1.2 Performance Requirements

- .1 For exterior work, sealants shall complete the building envelope and ensure the integrity of air/vapour barriers and waterproofing membranes from foundation to roofing.
- .2 For interior work, sealants shall stop travel of air, sound, dust, humidity and migration of vapour between or behind surfaces.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with **Section 01 33 00** and the following requirements:
 - .1 **Product samples:** Cure samples under conditions anticipated at job site during application.
 - .2 **Extra materials:** Supply 2 containers of each type of sealant and related primer.

1.4 Delivery, Storage, and Handling

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water, excess heat and contact with ground.
- .2 Stock of materials is to be rotated and used prior to its expiration date.
- .3 Discard any materials which have come into contact with contaminants before actual use.

1.5 Environmental and Safety 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 acceptable to Labour Canada.

- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work during installation of caulking and sealants, by use of approved portable supply and exhaust fans, as required, as per the manufacturers' instructions, all governing codes and the Departmental Representative's instructions.

1.6 Waste Management

- .1 Separate waste materials for disposal, re-use and recycling in accordance with **Section 01 74 19**.

2.0 PRODUCTS

2.1 General

- .1 Where sealants require primers, use only primers recommended by the manufacturers.
- .2 Where applicable, colours shall be chosen by the Departmental Representative, from the manufacturer's standard range of colours.
- .3 In each application ensures products used are compatible with related substrates and shall not stain adjacent surfaces.

2.2 Sealant Materials and Location

Identification	Standards / Characteristics	Colour	Notes	Application Location wherever indicated, including
Type A Silicone sealant, all-purpose	CAN/19.13-M87 Type S Grade NS Class 25 1 component	to select		<ul style="list-style-type: none"> - at visible joints in the building envelope - between window and door frames and adjacent exterior side surfaces
Type B Silicone building and glazing sealant	CAN/19.13-M87 FDA #21 CFR 117.2600 single component not paintable	to select		<ul style="list-style-type: none"> - for interior glazing installation - for exposed joints of glass partitions or panels
Type C Silicone sealant, mildew resistant	CAN/CGSB-19.13-M87 1 component not paintable	to select		<ul style="list-style-type: none"> - in interior work, at visible joints in humid areas - around washroom accessories, sinks, vanities - around interior door and vision panel frames in humid areas - around built-in furniture - around mechanical and electrical elements and electronic controls on walls and ceilings - for interior glazing installation in

Identification	Standards / Characteristics	Colour	Notes	Application Location wherever indicated, including
				humid areas
Type D Siliconized acrylic latex sealant	ASTM C920 paintable	to select		- in interior work, at interior perimeter of windows, at visible joints in general
Type E Silicone sealant, fire-resistive	ASTM E84 ASTM C-919	--	See Section 07 80 00	- for firestopping and smoke sealing assemblies
Type F Synthetic rubber based acoustical sealant	ASTM C-919 CAN/CGSB 19.21-M87 non-hardening, non-skinning, non-bleeding consistent brass penetration of 290-310	-		- between metal studs or metal tracks and gypsum surfaces, concealed behind the gypsum board
Type G Polyurethane medium modulus sealant, high performance, low VOC content, stable to UV	ASTM C920 Type S Grade NS Class 50 TT-S-00230C, Type II, Class A 1 component	to select		- sealant for moving joints (expansion or construction joint) - at visible joints in the building envelope - between window and door frames and adjacent exterior side surfaces - adheres to wet or fresh concrete
Type H Modified bitumen sealant	CAN/CGSB-37.5-M89 ASTM D4586	-	See Section 07 10 00	- sealant used with bituminous waterproofing membrane - for concealed locations in building envelope and roof work
Type J Synthetic rubber based industrial sealant	CAN/CGSB 19-GP-14M		See Section 07 40 00	- for use with interior liner panels (concealed)
Type L Silicone sealant	CTM 00981 Working ASTM C639			- for joints of non-bituminous air barrier membranes.

2.3 Back-Up Materials and Accessories

- .1 **Polyethylene closed cell foam backing rod:** round, compressible and resilient, oversized 30-50%.
- .2 **Other backing materials:** as recommended by manufacturers of the sealants.
- .3 **Bond breaker tape:** polyethylene bond breaker tape which will not bond to sealant.
- .4 **Joint cleaner:** non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by the sealant manufacturer.
- .5 **Primers for caulking:** as recommended by the sealant manufacturer.

3.0 EXECUTION

3.1 General

- .1 Protect installed work of other trades from staining or contamination.
- .2 Provide caulking and sealing, including gaskets, at or for the following:
 - .1 At control joints.
 - .2 All joints in building envelope, control joints, etc.
 - .3 Around exterior window and door frames, louvres, and other accessories on the exterior walls, unless they are part of fire and smoke separation assemblies, in which case fire and smoke protective products shall be used – see **Section 07 80 00**.
 - .4 Around interior door and glazed panel frames.
 - .5 Installation of glazing in interior doors and frames.
 - .6 Around all openings when specified in and executed by other Sections, including openings for mechanical and electrical elements visible in finished areas, as well as, unless otherwise indicated, above ceilings.
 - .7 Saw-cuts and construction joints in concrete slabs, between slabs and adjacent surfaces.
 - .8 Concealed, for acoustic purposes, at perimeter of gypsum partitions and around penetrations through them, unless they are part of fire and smoke separation assemblies, in which case fire and smoke protective products shall be used – see **Section 07 80 00**.
 - .9 Around washroom accessories.
 - .10 Around stainless steel panels.
 - .11 Around built-in furniture.
 - .12 Around all surface mounted items.
 - .13 All locations shown on drawings.
 - .14 All other locations, where sealants can be reasonably foreseen as being required.

3.2 Preparation of Joint Surfaces

- .1 Prepare surfaces in accordance with manufacturer's directions.
- .2 Ensure joint surfaces are dry and frost free.
- .3 Clean bonding joint surfaces of harmful substances including dust, rust, oil grease, and other matter which may impair work.

- .4 Examine joint sizes and conditions to establish correct depth to width relationship for installation of back-up materials and sealants, i.e. depth of joint = $\frac{1}{2}$ the width of joint (min. 6 mm, max. 25 mm width).
- .5 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, paint or other coatings unless tests have been performed to ensure compatibility of materials and adherence of the sealants. Remove coatings if necessary, and apply primer as required, before applying sealants.

3.3 Priming

- .1 Mask adjacent surfaces prior to priming and caulking where necessary to prevent staining.
- .2 Prime sides of joints in accordance with the sealant manufacturer's instructions prior to installation of backer rod.

3.4 Back-Up Material

- .1 Apply bond breaker tape where required as per manufacturer's instructions.
- .2 Ensure that back-up materials are compatible with selected sealant and of type recommended by the sealant manufacturer.
- .3 Install backing rod where indicated, to achieve correct joint depth and shape, with approximately 30% compression.

3.5 Mixing

- .1 Mix materials, if applicable, in strict accordance with sealant manufacturer's written instructions.

3.6 Application

- .1 **Sealant:**
 - .1 Apply sealant in accordance with the manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Ensure the compatibility of sealants with paint or special coatings to which they may be applied.
 - .4 Caulk cracks, splits and joints where required, around door frames, etc. Where they are part of fire and smoke separation assemblies, fire and smoke protective products shall be used – see **Section 07 80 00**.
 - .5 Apply sealant only after painting and coating work is completed; do not paint over

sealants, except modified latex elastomeric sealants, which must be applied before painting and be painted together with the adjacent surfaces.

- .6 Apply sealant using gun with proper size nozzle.
- .7 Use sufficient pressure to fill voids and joints solid.
- .8 Apply sealant in continuous beads. Form surface of sealant smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .9 Tool exposed surfaces before skinning begins to give slightly concave shape. Superficial pointing with skin bead is not acceptable.
- .10 Remove excess compound promptly as work progresses and upon completion.
- .2 **Curing:**
 - .1 Cure sealants in accordance with the sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .3 **Insulation of shim spaces:**
 - .1 Fill shim spaces around exterior door and window frames with **Type G** as indicated, and finish with backer rod and proper sealant from outside and as indicated from inside. Where they are part of fire and smoke separation assemblies, fire and smoke protective products shall be used – see **Section 07 80 00**.

3.7 Clean-Up

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 Clean adjacent surfaces immediately and leave work neat and clean.
- .3 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Remove masking tape after initial set of sealant.

End of Section