

1 ASSEMBLY - GENERAL

- 1.1 The work of this section includes the provision of all design, labour, materials, equipment and services required to fabricate and install exterior walls as required for a complete project. The work includes, but is not necessarily limited to, the items referenced herein:
- 1.1.1 Exterior Wall Exterior Skin
 - 1.1.2 Exterior Wall Construction
 - 1.1.3 Exterior Wall Vapour Retarders, Air Barriers, and Insulation
 - 1.1.4 Exterior Wall Interior Skin
 - 1.1.5 Exterior Wall Assemblies
 - 1.1.6 Exterior Louvers, Grilles, and Screens
- 1.2 Refer to Section D30 to coordinate the energy efficiency requirements of the mechanical/electrical disciplines and the Canadian Buildings Incentive Program (CBIP).

2 ASSEMBLY DESIGN CRITERIA

- 2.1 The building envelope is to perform in accordance with the Model Energy Code of Canada and requirements specified under the Canadian Buildings Incentive Program (CBIP) including:
- 2.1.1 The building envelope, including associated glazing installations must represent a design condition heat loss rate of less than *[90 watts]* per linear metre of perimeter wall for each level and each space.
 - 2.1.2 Glazing and metal window framing indoor surface temperatures shall not be lower than *[6 deg. C]* at design conditions. This system must be demonstrated by way of recognized test data.
 - 2.1.3 The glazing must incorporate a shading coefficient in the range of *[0.40]* and a light transmittance factor in the range of *[0.60]*.
 - 2.1.4 Where items within the technical performance specifications conflict with the CBIP requirements, the most stringent shall apply.
- 2.2 The structural system and building envelope for exterior walls should be designed on a modular grid which will permit the future adjustment of interior demising walls at reasonable intervals.
- 2.3 Design wall to provide for thermal movement of component materials caused by ambient temperature range *[from -30° to 80°C]* without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- 2.4 Provide complete enclosure assembly, including exterior skin, inner air/vapour seal membrane, and thermal insulation. Design components sufficiently robust to serve as final interior finish.

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- 2.5 Provide continuous, complementary and compatible air/vapour/thermal barriers throughout building elements.
- 2.6 Design wall components and assemblies to resist air leakage caused by:
- 2.6.1 Static air pressure across wall assembly, including connections to windows, glass, doors and other interruptions to a maximum air leakage rate of $[0.01 \text{ l/s/m}^2]$ when subjected to a pressure differential of $[75\text{Pa}]$.
 - 2.6.2 Dynamic air pressure across wall assembly, including connections to windows, glass, doors and other interruptions to a maximum air leakage rate of $[0.01 \text{ l/s/m}^2]$ when subjected to hourly wind design loads in accordance with OBC, using a 1 in 10 year probability.
- 2.7 Design wall system to accommodate, by means of expansion joints, movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- 2.8 Design members to withstand dead load and wind loads calculated in accordance with OBC and applicable local regulations, to maximum allowable deflection of $[1/180]$ of span.
- 2.9 Water Tightness: design exterior facade and wall panels to the rain screen principles as published by the National Research Council. Prevent water infiltration into the interior systems.
- 2.10 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principles". Discharge drainage water in a manner avoiding staining of finishes, puddling or formation of icicles. Ensure total absence of condensation on interior surfaces under the following minimum conditions: *[Interior: 22 °C, 30% RH, still air. Exterior: -30 °C, 60 km/hr wind].*
- 2.11 Vapour seal building enclosure to withstand, without failure, design RH at design ambient temperature condition, maintained against interior atmospheric pressure of $[250 \text{ Pa}]$.
- 2.12 Provide minimum thermal resistance as required to meet the Model Energy Code of Canada and the CBIP requirements.
- 2.13 Permeance through wall system not to exceed $[3\text{ng}/(\text{Pa}\cdot\text{s}\cdot\text{m}^2)]$.
- 2.14 *[Provide a written guarantee, signed and issued in the name of the Owner stating that the entire building enclosure will be water and weather-tight, structurally sound and free from distortion; that the exterior finish will not craze, peel or otherwise corrode, or discolour; that the exterior cladding will not develop excessive fading or non-uniformity of colour and will be free from blemishes, or distortion due to thermal movement of the wall or normal movements of the building structure; that gaskets, tape and sealant will be free from deterioration from sunlight, weather or oxidation and from permanent deformation and free of leaks under load; for a period of ten (10) years from the date of final date of Substantial Performance.]*

3 ASSEMBLY COMPONENTS

3.1 Brick Masonry

3.1.1 **General:**

3.1.1.1 Submittals: Submit the following samples in accordance with Section 01340:

3.1.1.1.1 Two of each type of masonry unit.

3.1.1.1.2 One of each type of masonry accessory, masonry reinforcement and tie proposed for use.

3.1.1.1.3 As required for testing purposes.

3.1.1.2 Performance Verification:

3.1.1.2.1 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

3.1.1.2.2 For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption for units proposed for use.

3.1.1.3 Mock-up: Construct mock-up panel of exterior masonry wall construction 3600 wide x 3600mm high showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.

3.1.1.4 Operations & Maintenance Manuals: provide material and product data for incorporation into Section 01730.

3.1.2 **Design:**

3.1.2.1 Brick masonry to match and/or coordinate colour, texture and finishes of existing campus buildings [*existing Buildings 'J', 'N' and 'P'*] should be considered.

3.1.2.2 Design masonry walls in accordance with [*CSA A37 1-M94*], Masonry Construction for Buildings.

3.1.2.3 Design masonry walls as double wythe insulated cavity wall or masonry veneer/steel stud cavity wall:

3.1.2.3.1 Exterior wythe: brick, cut stone, precast architectural concrete.

3.1.2.3.2 Interior wythe: concrete block or steel stud.

3.1.2.4 Design masonry walls for maximum deflection of [*1/720*] under design wind loads.

3.1.3 **Materials / Finishes:**

3.1.3.1 Mortar and grout for masonry to [*CSA A179-94*].

- 3.1.3.2 Use same brands of materials and source of aggregate for entire project.
- 3.1.3.3 Colour: ground coloured natural aggregates or metallic oxide pigments.
- 3.1.3.4 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass or integrally coloured masonry cement, to produce coloured mortar.
- 3.1.3.5 Connectors: to [CSA A370-M94] and [CSA S304-M84 (R1994)].
- 3.1.3.6 Corrosion protection: to [CSA S304-M84 (R1994)], galvanized.
- 3.1.3.7 Burned clay brick: to CAN/CSA A82.1-M87 (R1992):
 - 3.1.3.7.1 Type: FBX, Grade: SW.
 - 3.1.3.7.2 Size: metric modular
 - 3.1.3.7.3 Acceptable materials (or equal): [*Shaw Smooth Red Range 1100-M or 1XL 103 Maroon Smooth. (To match existing Building 'J', 'N' and 'P')*].
- 3.1.3.8 Cut Stone/Burnished Concrete Masonry Units:
 - 3.1.3.8.1 Renaissance masonry unit: to [ASTM C568 and C616], high density, severe weathering, calcium silicate masonry unit, pressure formed and autoclaved.
 - 3.1.3.8.2 Colour: [*AM white*]. Texture: [*press hammer*].
 - 3.1.3.8.3 Acceptable material (or equal): [*Renaissance masonry units by Arriscraft Corporation. (To match existing Building 'J', 'N' and 'P')*].
- 3.1.3.9 Burnished concrete masonry units to [CAN3-A165.1-M85] plain face units, block conforming to [ASTM C90], Type 1. Acceptable material: [*Belstone masonry units, colour 230-A or Trendstone masonry units, LF light Karmel unfilled. (To match existing Building 'J' and 'N')*].
- 3.1.3.10 Anchors, cramps, and dowels: stainless steel type 304.
- 3.1.3.11 Asphalt emulsion: to [CAN/CGSB-37.2].
- 3.1.3.12 Water repellent: to masonry manufacturer's recommendations.
- 3.1.3.13 Masonry flashing:
 - 3.1.3.13.1 Modified bitumen membrane reinforced with propriety glass scrim with prefinished metal flashing drip edge. Acceptable material: [Bakor Blueskin AG]
 - 3.1.3.13.2 Butyl rubber sheet or specially compounded plasticized polyvinylchloride permanently bonded to 10 x 10mm woven glass fiber mesh, 1mm thick. Acceptable material: [*Lexsuco FR40*] with lap adhesive recommended by flashing manufacturer.

3.1.3.14 Weep hole vents, purpose-made, galvanized steel designed to drain cavities to exterior.

3.1.4 **Fabrication / Installation**

3.1.4.1 Do masonry work in accordance with *[CSA A371-M94]*.

3.1.4.2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.

3.1.4.3 Make cuts straight, clean, and free from uneven edges.

3.1.4.4 Build in items required to be built into masonry. Check plumb, location and alignment frequently, as work progresses.

3.1.4.5 Built masonry to tie in with stabilizers, with provision for vertical movement.

3.1.4.6 Construct continuous control joints and build-in continuous expansion joints as required.

3.1.4.7 Do masonry mortar and grout work in accordance with *[CSA A179-94]* except where specified otherwise.

3.1.4.8 Do masonry reinforcement in accordance with *[CSA A370-M94]*, *[CSA A371-M94]*, *[CAN/CSA-A23.1-94]* and *[CAN3-S304-M84]*.

3.1.4.9 Install flashings in masonry in accordance with *[CAN3 A371-M84]*. Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, horizontal fire stops and steel angles over openings. Install flashings under weep hole courses.

3.1.4.10 In double wythe walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 200mm.

3.1.4.11 Install prefinished metal drip flashing under membrane and extend metal to form positive drip edge.

3.1.4.12 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600mm o.c.

3.2 Precast Architectural Concrete

3.2.1 **General:**

3.2.1.1 Submittals: submit shop drawings in accordance with *[CAN3-A23.4-M78]* and *[CAN3-A23.3-M84]*. Each drawing submitted shall bear stamp and signature of qualified professional engineer registered the Province of Ontario. Include the following items:

3.2.1.1.1 Design calculations for items designated by manufacturer.

3.2.1.1.2 Tables and bending diagrams of reinforcing steel.

3.2.1.1.3 Formwork

- 3.2.1.1.4 Finishing schedules.
- 3.2.1.1.5 Methods of handling and erection.
- 3.2.1.1.6 Openings, sleeves, insert and related reinforcement.
- 3.2.1.2 Quality Assurance: provide Owner with certified copies of quality control tests related to this project as specified in [CAN3-A23.4-M78].
- 3.2.1.3 Manufacturers and erectors of precast concrete elements to be certified by CSA as meeting requirements of [CSA A251-M1982] for Category AC products.
- 3.2.1.4 Submit duplicate 300 x 300 x 25 mm sample of each type and colour of precast concrete finish. Show maximum colour variation expected.
- 3.2.1.5 Operations & Maintenance Manuals: provide material and product data for incorporation into Section 01730.
- 3.2.1.6 Warranties: The [Design Builder] hereby warrants that the precast architectural elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, but for five years.
- 3.2.2 **Design:**
 - 3.2.2.1 Precast architectural concrete to match colour, texture and finishes of existing campus buildings [existing Buildings 'J', 'N' and 'P'] should be considered.
 - 3.2.2.2 Design precast architectural concrete elements to carry handling and required service loads.
 - 3.2.2.3 Design loads in accordance with O.B.C. and applicable codes for wind, temperature and earthquake.
 - 3.2.2.4 Do precast concrete work in accordance with [CAN3-A23.4-M78] and [CAN3-A23.3-M84].
 - 3.2.2.5 Do welding in accordance with [CSA W59-M1984] for welding to steel structures and [CSA W186-M1981] for welding of reinforcement.
- 3.2.3 **Materials / Finishes:**
 - 3.2.3.1 Cement, white cement, aggregates water, admixtures: to [CAN3-A23.4-M78].
 - 3.2.3.2 Exposed aggregate to match selected, approved finish sample.
 - 3.2.3.3 Use same brands and source of cement and aggregate for entire project to ensure uniformity of coloration and other mix characteristics.
 - 3.2.3.4 Reinforcing steel: to [CSA G30.16-M1977], epoxy coated.
 - 3.2.3.5 Anchors and supports: to [CAN/CSA-G40.21-M87], [Type 300W], galvanized after fabrication.
 - 3.2.3.6 Welding materials: to [CSA W48.1-M1980].

- 3.2.3.7 Galvanizing: hot dipped galvanizing with minimum zinc coating to [CSA G164-M1981].
- 3.2.3.8 Steel primer: to [CGSB 1-GP-40M-79].
- 3.2.3.9 Epoxy coating: to [ASTM A775/A775M-86].
- 3.2.3.10 Air entrainment admixtures: to [CAN3-A266.1-M78].
- 3.2.3.11 Zinc-rich primer: to [CGSB 1-GP-181M-77+Amdt-Mar-78].
- 3.2.3.12 Surface retardant: to [CAN3-A266.2-M78].
- 3.2.3.13 Weep hole tubes: purpose made plastic.
- 3.2.3.14 For face units, use concrete mix designed to produce [25Mpa] compressive cylinder strength at 28 days, with maximum water/cement ratio to [CAN3-A23.1-M77, Table 7] for Class A exposure.
- 3.2.3.15 Sandblasted finish: in order to expose aggregate face, sandblast surface to depth of 1.5mm. Protect fluted, smooth or exposed surfaces with 2 coats of clear sealer.
- 3.2.4 **Fabrication / Installation**
 - 3.2.4.1 Do precast concrete work in accordance with [CAN3-A23.4-M78] and [CAN3-A23.3-M84].
 - 3.2.4.2 Do welding in accordance with [CSA W59-M1984] for welding to steel structures and [CSA W186-M1981] for welding of reinforcement.
 - 3.2.4.3 Erect elements within tolerances. Non-cumulative tolerances in accordance with [CAN3-A23.4-M78, Section 10]

3.3 Preformed Metal Cladding

- 3.3.1 **General:**
 - 3.3.1.1 Submittals: submit the shop drawings for preformed metal cladding, product data and/or catalogue illustrations in accordance with Section 01340. Indicate dimensions, wall openings, head, jamb, sill and mullion detail, materials and finish, anchor details, compliance with design criteria and requirements of related work. Each shop drawing submitted shall bear stamp of Qualified Professional Engineer registered in Province of Ontario.
 - 3.3.1.2 Submittals: submit the following samples in accordance with Section 01340: duplicate 600 x 1200mm samples of siding material, of colour and profile specified.
 - 3.3.1.3 Mock-up: Construct mock-up panel of preformed metal cladding construction 2400 wide x 2400mm high showing colours and materials, use of reinforcement, through-wall flashing, jointing, connectors and workmanship.

- 3.3.1.4 Warranties: the *[Design Builder]* hereby warrants that preformed metal cladding work will be water and weather-tight, structurally sound and free from distortion; that the exterior finish will not craze, peel or otherwise corrode, or discolour; that the exterior cladding will not develop excessive fading or non-uniformity of colour and will be free from blemishes, or distortion due to thermal movement of the wall or normal movements of the building structure; that gaskets, tape and sealant will be free from deterioration from sunlight, weather or oxidation and from permanent deformation and free of leaks under load; for a period of five (5) years.
- 3.3.1.5 Operations & Maintenance Manuals: provide material and product data for incorporation into Section 01730.
- 3.3.2 **Design:**
- 3.3.2.1 The use of preformed metal cladding is intended to be limited to mechanical penthouses, and other related minor building elements.
- 3.3.2.2 Design system to accommodate specified erection tolerances of structure.
- 3.3.2.3 Design system to permit easy replacement of components.
- 3.3.3 **Materials/Finishes:**
- 3.3.3.1 Metal panels exposed to exterior:
- 3.3.3.1.1 Sheet steel, commercial grade to *[ASTM A 526/A 526M-90]* with Z275 zinc coating. Minimum thickness: *[0.95 mm (20ga)]*. Thickness applies to base metal.
- 3.3.3.1.2 Factory finished with 2 coat fluorocarbon finish, colour to match approved design, dry film thickness of *[]* mm on exposed surface, conforming to test procedures of *[CSSBI No. 7]*.
- 3.3.3.1.3 Acceptable material (or equal): *[Vicwest, Stelcolour 5000 series, standard range]*.
- 3.3.3.2 Exterior corners: of same profile, material and finish as adjacent siding, material, and brake formed to required angle, concealed corner brace, hairline exposed joint, pop rivet connections with painted head to match siding.
- 3.3.3.3 Exposed joint (perpendicular to profile): ends shop cut clean and square, backed with tight fitting filler lapping back of joint, exposed components colour matched to siding.
- 3.3.3.4 Accessories: cap flashings, drip flashings, internal corner flashings, copings and closures for head, jamb, sill and corners, of same material, thickness and finish as exterior siding, brake formed to shape.
- 3.3.3.5 Structural Metal Framing:

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- 3.3.3.5.1 Sub-girts: commercial grade to *[ASTM A 526/A 526M-90]* with Z275 zinc coating base material thickness *[1.6mm min.]* with profiles to suit wall design and to accommodate design criteria, to accept liner (where applicable) and exterior sheet with structural attachment to building frame.
 - 3.3.3.6 Bridging channels, clips, etc.: to *[CSA S 136-94]* and *[ASTM A 446/A 446M-93]*.
 - 3.3.3.7 Accessories:
 - 3.3.3.7.1 Screws: cadmium plated steel to *[CSA B35.3-62]*, head colour same as exterior sheet. Hex coloured nylon head with hardened carbon steel shank with heavy cadmium plating and a chromate finish.
 - 3.3.3.7.2 Gaskets: soft pliable arctic grade vinyl.
 - 3.3.3.8 Touch-up paint: as recommended by panel manufacturer.
 - 3.3.3.9 Isolation coating: alkali resistant epoxy resin.
 - 3.3.3.10 Acoustical sealant: to *[CAN/CGSB-19.21-M87]*.
 - 3.3.3.11 Insulating strip: rubberized, moisture resistant, 12 mm wide x 3 mm thick foam strip, with self sticking adhesive on one face.
 - 3.3.4 **Fabrication / Installation**
 - 3.3.4.1 Install cladding in accordance with *[CGSB 93-GP-5M]*, and manufacturer's written instructions.
 - 3.3.4.2 Accurately fit and rigidly frame together joints, corners and mitres. Match components carefully to produce perfect continuity of line and design. Make joints and connections toward exterior weather-tight. Materials in contact shall have hairline joints. Coordinate location of visible joints.
 - 3.3.4.3 Maintain following installation tolerances: Maximum variation from plane or location shown on shop drawings: *[10 mm per 10m]* of length and up to *[20 mm per 100 m]*. Maximum offset from true alignment between two adjacent members abutting end to end, in line: *[0.75 mm]*.
 - 3.4 Exterior Metal Studs
 - 3.4.1 **General:**
 - 3.4.1.1 Submittals:
 - 3.4.1.1.1 Submit shop drawings for exterior metal studs systems for review. Indicate dimensions, wall openings, head, jamb, sill detail, materials and finish, anchor details, compliance with design criteria and requirements of related work. Each shop drawing submitted shall bear stamp of Qualified Professional Engineer registered in Province of Ontario.

- 3.4.1.1.2 Submit copies of engineering calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements.
- 3.4.1.1.3 Submit samples of all elements of the system including connectors and fasteners.
- 3.4.1.2 Mock-up: prior to commencement of work, construct a sample wall on the project. Coordinate construction of sample wall with masonry sample walls. Sample wall shall include metal studs, exterior insulation, building paper, batt insulation, flashing, vapour barrier, interior gypsum board and shall include method of sealing to adjacent construction.

3.4.2 **Design:**

- 3.4.2.1 Design exterior stud wall systems to provide structural support for wall cladding and to meet the general guidelines of this section.

3.4.3 **Materials / Finishes:**

- 3.4.3.1 Steel studs: *[152mm deep, 0.91mm (20ga)]* thick minimum with 31mm return. *[152mm]* deep and *[1.22mm (18ga)]* thick galvanized tracks with *[40mm]* flange. The profile and section properties to conform to the requirements of CSA Standard *[S136-M84]* cold-formed steel structural members.
- 3.4.3.2 Steel to meet requirements to *[ASTM A446]* standard specification for steel sheet, zinc-coated (galvanized) by the hot-dip process structural (physical) quality and structural quality specifications *[CSSBI -1-101-M, Minimum grade A, $F_y = 33\text{ksi}$]*.
- 3.4.3.3 Provide brick masonry connectors conforming to *[CAN3-A370-M84]*. All components to be hot-dipped galvanized after fabrication.

3.4.4 **Fabrication / Installation:**

- 3.4.4.1 Erect structural steel stud framing in accordance with engineered shop drawings.
- 3.4.4.2 Erect metal studding to tolerance of *[1: 1000]*.
- 3.4.4.3 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50mm leg ceiling tracks. Use double track slip joint as necessary.
- 3.4.4.4 Install continuous insulating strips to isolate studs from uninsulated surfaces.

3.5 Concrete Unit Masonry

3.5.1 **General:**

- 3.5.1.1 Submittals: submit the following samples in accordance with Section 01340:
 - 3.5.1.1.1 Two of each type of masonry unit specified.

- 3.5.1.1.2 One of each type of masonry accessory specified.
- 3.5.1.1.3 One of each type of masonry reinforcement and tie proposed for use.
- 3.5.1.1.4 As required for testing purposes.
- 3.5.1.2 Quality Assurance: Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
- 3.5.1.3 Mock-up: Construct mock-up panel of exterior masonry wall construction 3600 wide x 3600mm high showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.
- 3.5.2 **Design:**
 - 3.5.2.1 Design masonry walls in accordance with [CSA A37 1-M94], Masonry Construction for Buildings.
 - 3.5.2.2 Design masonry walls as double wythe insulated cavity wall or masonry veneer/steel stud cavity wall:
 - 3.5.2.2.1 Exterior wythe: brick, cut stone, precast architectural concrete.
 - 3.5.2.2.2 Interior wythe: concrete block or steel stud.
 - 3.5.2.3 Design masonry walls for maximum deflection of [1/720] under design wind loads.
- 3.5.3 **Materials / Finishes:**
 - 3.5.3.1 Mortar and grout for masonry to [CSA A179-94].
 - 3.5.3.2 Use same brands of materials and source of aggregate for entire project.
 - 3.5.3.3 Colour: ground coloured natural aggregates or metallic oxide pigments.
 - 3.5.3.4 Bar reinforcement: to [CSA A37 1 -M94] and [CSA G30.12], Grade.
 - 3.5.3.5 Wire reinforcement: to [CSA A37 I -M94] and [CSA G30.3-M 1983].
 - 3.5.3.6 Connectors: to [CSA A370-M94] and [CSA S304-M84 (R1994)].
 - 3.5.3.7 Corrosion protection: to [CSA S304-M84 (R1994)], galvanized.
 - 3.5.3.8 Autocure / bubblecure concrete masonry units to [CAN3-A165 Series - M85 (CAN3-A165.4)].
 - 3.5.3.9 Acoustical concrete block units to [CSA A165 Series-94 (CSA A165.1)]. Purpose made with slots to provide the acoustical characteristics required.

- 3.5.3.10 Special fire resistant concrete block units to *[CSA A165 Series-94 (CSAA165.1)]*. Classification as modified by fire resistance requirements. Aggregate used in units and equivalent thickness of units to the Supplement to the National Building Code of Canada 1990, Chapter 2 for fire-resistance ratings required.
- 3.5.3.11 Classification: *[H/7.5/A/M]*.
- 3.5.3.12 Size: *[Metric modular]*.
- 3.5.3.13 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as required.
- 3.5.4 **Fabrication / Installation:**
 - 3.5.4.1 Do masonry work in accordance with *[CSA A371-M94]*.
 - 3.5.4.2 Strike flush all joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
 - 3.5.4.3 For paint or similar thin finish coating provide concave joints.
 - 3.5.4.4 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - 3.5.4.5 Make cuts straight, clean, and free from uneven edges.
 - 3.5.4.6 Build in items required to be built into masonry.
 - 3.5.4.7 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - 3.5.4.8 Built masonry to tie in with stabilizers, with provision for vertical movement.
 - 3.5.4.9 Construct continuous control joints and build-in continuous expansion joints as required.
 - 3.5.4.10 Do masonry mortar and grout work in accordance with *[CSA A179-94]* except where specified otherwise.
 - 3.5.4.11 Over openings, install reinforced concrete block, steel or reinforced concrete lintels.
 - 3.5.4.12 Do masonry reinforcement in accordance with *[CSA A370-M94]*, *[CSA A371-M94]*, *[CAN/CSA-A23.1-94]* and *[CAN3-S304-M84]*.
 - 3.5.4.13 Tolerances in notes *[Clause 5.3 of CAN3-A371-M84]* apply.
 - 3.5.4.14 Use dirt-resistant mortar for all exposed masonry work.

3.6 SHEET AIR-VAPOUR BARRIERS

3.6.1 **General:**

- 3.6.1.1 Submittals: submit the following samples in accordance with Section 01340:

- 3.6.1.1.1 Submit two 300 x 300mm size representative samples of materials. Samples should bear name of manufacturer. Submit product data on material characteristics, performance criteria and limitations.
- 3.6.1.2 Mock-up: Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box.
- 3.6.1.3 Testing/Inspections: Carry out inspection and testing of sheet air-vapour barrier using infrared thermographic testing and other testing methods such as smoke/water testing as necessary to ensure complete and continuous installation. Inspection and testing to be carried out by a specialized inspection company experienced in this field of work and costs borne by the *[Design Builder]*. Provide copy of testing and inspection report to the Owner for review.
- 3.6.2 **Design:**
 - 3.6.2.1 Design sheet air-vapour barrier systems to meet the building envelope requirements related to the CBIP and to meet general guidelines of this section.
- 3.6.3 **Materials / Finishes:**
 - 3.6.3.1 Polyethylene: to *[CAN/CGSB-51.33-M89]*, Type 1, 0.15 mm min. thick.
 - 3.6.3.2 Building air/vapour barriers sheet membranes:
 - 3.6.3.2.1 Rubberized asphalt bonded to sheet polyethylene, nominal thickness of *[1 mm]*, and self-adhering membrane.
 - 3.6.3.2.2 S.B.S. modified bitumen membrane, nominal thickness of *[1.5 mm]*, and self-adhering membrane.
 - 3.6.3.3 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, *[50 mm]* min wide.
 - 3.6.3.4 Sealants: for membrane single component rubber based mastic as recommended by air/vapour barrier manufacturer.
 - 3.6.3.5 Tape: compatible with air/vapour barrier membrane, *[0.8mm]* min. thickness.
 - 3.6.3.6 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.
 - 3.6.3.7 Spray in place urethane foam insulation: single component spray polyurethane to *[CGSB5 I -GP-23M, Class 1]*.
 - 3.6.3.8 Accessories and tools: as required and recommended by membrane manufacturer for proper and effective installation of membrane to substrate.
- 3.6.4 **Fabrication / Installation:**
 - 3.6.4.1 Vapour Retarders:

- 3.6.4.1.1 Ensure services are installed and inspected prior to installation of retarder.
- 3.6.4.1.2 Install sheet vapour retarder on warm side of exterior wall assemblies prior to installation of gypsum board to form continuous retarder.
- 3.6.4.1.3 Use sheets of largest practical size to minimize joints.
- 3.6.4.1.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- 3.6.4.1.5 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.
- 3.6.4.1.6 Seal perimeter, lap joints, of sheet vapour barrier. Seal electrical switch and outlet device boxes that penetrate vapour barrier.
- 3.6.4.2 Air Barriers:
 - 3.6.4.2.1 Provide continuity of air seal materials and assemblies. Install materials in accordance with manufacturers' instructions to achieve performance criteria.
 - 3.6.4.2.2 Install membrane to tie into and made continuous with all framed openings in accordance with recommended details by the membrane manufacturer.
 - 3.6.4.2.3 Fastening system and methods shall be in accordance with membrane manufacturer's recommendations, to resist atmospheric pressures.
- 3.7 Sealants
 - 3.7.1 **General:**
 - 3.7.1.1 Submittals: submit the duplicate samples of each type in accordance with Section 01340.
 - 3.7.1.2 Warranties: The Design Builder hereby warrants that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces but for five years.
 - 3.7.2 **Design:**
 - 3.7.2.1 Select sealant to suit particular conditions of the job, with careful adherence to the manufacturer's instructions for application.
 - 3.7.2.2 Do not use sealant to hide or make up for design or construction errors or faults.
 - 3.7.2.3 Provide sealant colour to match adjacent surfaces. Provide sealant resistant to ultraviolet degradation or fading.

3.7.2.4 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

3.7.3 **Materials/Finishes:**

3.7.3.1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for all joint sealants. Where sealants are qualified with primers, use only these primers.

3.7.3.2 Between aluminium window frames and masonry: *[CAN/CGSB-19.13-M87, MC-2-25-N]*.

3.7.3.3 Between door frames and walls, back of counter tops at walls, interior glazing sealant, perimeter of drinking fountain, mechanical access panels, acoustic seals: *[CGSB 19-GP-5M]*.

3.7.3.4 Perimeter joints, window frames, bedding of thresholds, preformed metal siding components: *[CGSB-19-GP-14M]*.

3.7.3.5 Expansion joints in masonry; horizontal joints in concrete floors: *[CAN/CGSB 19.24-M80]*.

3.7.3.6 Primers: type recommended by sealant manufacturer.

3.7.3.7 Joint fillers:

3.7.3.7.1 General: compatible with primers and sealants, oversized 30 to 50%.

3.7.3.7.2 Polyethylene, urethane or neoprene: extruded closed cell foam, Shore A, hardness 20, tensile strength 140 to 200kPa.

3.7.3.7.3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70.

3.7.4 **Fabrication/Installation:**

3.7.4.1 Install backer rod to provide joint design of 1/3 depth to width ratio.

3.7.4.2 Apply and cure sealant in accordance with manufacturer's instructions.

3.7.4.3 Tool sealant to a smooth concave finish.

3.8 Exterior Gypsum Board

3.8.1 **General:**

3.8.1.1 Operations & Maintenance Manuals: provide material and product data for incorporation into Section 01730.

3.8.2 **Design:**

3.8.2.1 Do work in accordance with *[CSA A82.31-M1980]* or as required.

3.8.3 **Materials / Finishes:**

3.8.3.1 Exterior sheathing: to *[CAN/CSA-A82.27-M91]*.

- 3.8.3.2 Exterior wall sheathing: silicone treated gypsum core faced with inorganic fibreglass mats, front and back, [12.7] mm thick, 1200mm x maximum practical length. Acceptable material (or approved equal): [*Dens-Glass Gold by Georgia-Pacific*].
- 3.8.3.3 Insulating strip: rubberized, moisture resistant, 12 mm wide x 3 mm thick, closed cell neoprene, with self sticking permanent adhesive on one face, lengths as required
- 3.8.4 **Fabrication / Installation:**
 - 3.8.4.1 Install gypsum board in accordance with [*CAN/CSA-A82.31-M31*].
 - 3.8.4.2 Install work level to tolerance of [*1:1200*].
 - 3.8.4.3 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
 - 3.8.4.4 Construct control joints of preformed units or two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
 - 3.8.4.5 Provide continuous polyethylene dust barrier behind and across control joints.
 - 3.8.4.6 Locate control joints at changes in substrate construction, at approximate 10m spacing on long corridor runs and at approximate 10m spacing on ceilings.
 - 3.8.4.7 Construct expansion joints, at building expansion and construction joints. Provide continuous dust barrier.
 - 3.8.4.8 Rigidly secure frames to furring or framing systems.
 - 3.8.4.9 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.9 Exterior Insulation

3.9.1 **General:**

- 3.9.1.1 Submittals: submit shop drawings, product data and/or catalogue illustrations in accordance with Section 01340.
- 3.9.1.2 Operations & Maintenance Manuals: provide material and product data for incorporation into Section 01730.

3.9.2 **Design:**

- 3.9.2.1 Provide insulation as required to achieve designed RSI value for wall assembly.

3.9.3 **Materials / Finishes:**

- 3.9.3.1 Board Insulation:

- 3.9.3.1.1 Expanded polystyrene: to *[CAN/CGSB-51.20-M87, Type 4]*, ship lapped edges, *[R.S.I. 0.87/25.4mm]* thickness.
- 3.9.3.1.2 Semi-rigid: fiberglass board to Type 1A, density of 48.0kg/m³, insulation clips with self-locking washer, *[R.S.I. 0.77/25mm]* thickness.
- 3.9.3.1.3 Insulating sheathing: rigid board composed of resin bonded glass fibres. Board size: 1200 x 2400 x 25mm thick, *[R.S.I. 0.77/25mm]* thickness.
- 3.9.3.1.4 Insulation adhesive: compatible with insulation type, fire-resistant and shall have a flame spread of 4 on cement asbestos board *[(ASTM E -162)]*.
- 3.9.3.2 Batt Insulation:
 - 3.9.3.2.1 Batt and blanket mineral fiber: to *[CSA A101-M1983]*, Type 1, density *[18.4kg/m³, R.S.I. 0.5/25mm]* thickness, preformed friction.
- 3.9.3.3 Accessories:
 - 3.9.3.3.1 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. Impale type as recommended by insulation manufacturer for each application.
 - 3.9.3.3.2 Polystyrene fasteners: plastic or polypropylene sheath, expandable shank and 35mm dia. washer attachment with corrosion resistant hammer driven pin.
 - 3.9.3.3.3 Joint tape for insulating sheathing to manufacturer's recommendations.
- 3.9.4 **Fabrication / Installation**
 - 3.9.4.1 Cavity wall insulation:
 - 3.9.4.1.1 Install mineral fibre insulation boards on outer surface of inner wythe of wall cavity over impaling clips.
 - 3.9.4.1.2 Install polystyrene insulation boards on outer surface of inner wythe of wall cavity. Mechanically fasten boards at 400mm o/c vertically, and 400mm o/c min. horizontally. Leave board joints unbonded over expansion and control joints.
 - 3.9.4.2 Batt Insulation:
 - 3.9.4.2.1 Install insulation after building substrate materials are dry.

- 3.9.4.2.2 Install insulation to maintain continuity of thermal protection to building elements and spaces. Do not compress batt insulation to fit into spaces.
- 3.9.4.2.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- 3.9.4.2.4 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures.
- 3.9.4.2.5 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.
- 3.9.4.2.6 Offset both vertical and horizontal joints in multiple layer applications.

3.10 Metal Flashing and Trim

3.10.1 **General:**

3.10.1.1 Submittals: submit shop drawings, product data and/or catalogue illustrations in accordance with Section 01340:

3.10.1.2 Submittals: submit duplicate 50 x 50mm samples of each type of sheet metal, colour and finish in accordance with Section 01340.

3.10.2 **Design:**

3.10.2.1 Proven flashing details should be provided. Roofing membranes should be designed to provide complete waterproof integrity to the wall assembly, without metal flashings. Generally, metal flashings should be regarded as mechanical protection for membrane edges only.

3.10.3 **Materials / Finishes:**

3.10.3.1 Zinc coated steel sheet: commercial quality to *[ASTIM A 526/A 526M-90.]* with Z275 designation zinc coating, *[.55mm]* thickness minimum (thickness applies to base metal).

3.10.3.2 Finish: factory applied coating to *[CGSB 93-GP-3M]*, coating designation G90, Acceptable materials: *[5000 series by Stelco]*.

3.10.3.3 Plastic cement: to *[CAN/CGSB-37.5-M89]*.

3.10.3.4 Underlay for flashing: self-adhering membrane.

3.10.3.5 Cleats: of same material and temper as sheet metal minimum 50 mm wide. Thickness: same as sheet metal being secured.

3.10.3.6 Fasteners: to *[CSA B111]* of same material as sheet metal with length and thickness suitable for application.

3.10.3.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

3.10.3.8 Touch-up paint: as recommended by metal flashing manufacturer.

3.10.3.9 Isolation coatings alkali resistant bituminous paint.

3.10.4 **Fabrication / Installation:**

3.10.4.1 Fabricate and install metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series specifications and as required.

3.10.4.2 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance. Use concealed fastenings throughout.

3.11 Louvres, Grilles and Screens

3.11.1 **General:**

3.11.1.1 Submittals: Submit shop drawings in accordance with Section 01340 Shop Drawings, indicating fabrication and erection details, including anchorage, accessories and finishes.

3.11.1.2 Operations & Maintenance Manuals: Provide operation and maintenance data for maintenance of manually operated louvres.

3.11.2 **Design:**

3.11.2.1 Not applicable.

3.11.3 **Materials / Finishes:**

3.11.3.1 Aluminum extrusions: Aluminum Association alloy AA6063-T5.

3.11.3.2 Acceptable material: *[Construction Specialties Ltd. Model 4130 - Storm Proof Blade]*.

3.11.3.3 Primer: to *[CGSB 1-GP-121M-77]* for aluminum surfaces.

3.11.3.4 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes - 1980. Integral colour anodic finish: designation *[AA-M23-C22-A42]*, colour to match metal siding colour.

3.11.3.5 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative shall meet requirements of *[CGSB 63-GP-2M+Amdt-Apr-86]*, for coating Classes 1, 2 and 3 respectively.

3.11.3.6 Insect screens: 0.3mm diameter aluminum wire 18 x 14 mesh with free area as required, secured to aluminum frame.

3.11.4 **Fabrication / Installation**

3.11.4.1 Construct louvres from aluminium extrusions of minimum 3mm thickness.

- 3.11.4.2 Arrange blades, mullions and frame extrusions as required.
- 3.11.4.3 Install concealed vertical stiffeners spaced to meet required loads.
- 3.11.4.4 Attach bird and insect screens to inside face of louvre.
- 3.11.4.5 Adjustable louvres:
 - 3.11.4.5.1 Construct manually adjustable louvres from aluminium extrusions of minimum 3mm thickness.
 - 3.11.4.5.2 Centre pivot storm-proof type blades with two reinforcing bosses with pinions operating in self-lubricating nylon bearings.
 - 3.11.4.5.3 Arrange blades to be operated by concealed drive arms at each jamb. Connect drive arms by torsion bars operating in nylon bearings.

End of Section