

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 07 21 19 - Foamed-in-Place Insulation.
- .3 Section 07 27 00.01 - Air Barriers and Vapour Retarders.
- .4 Section 07 92 00 - Joint Sealants.
- .5 Section 08 80 50 - Glazing.
- .6 Section 09 21 16 - Gypsum Board Assemblies.
- .7 Section 09 91 00 - Painting.

1.02 REFERENCES

- .1 American National Standards Organization (ANSI) / Steel Door Institute (SDI)
 - .1 ANSI/SDI A250.3-2007 (R2011), Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
 - .2 ANSI/SDI A250.8-2003 (R2008), Recommended Specifications for Standard Steel Doors and Frames.
 - .3 ANSI/SDI A250.10-1998 (R2011), Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M 11, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - .2 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
 - .3 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
 - .4 ASTM A924 / A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

- .5 ASTM B29 03(2009), Standard Specification for Refined Lead.
- .6 ASTM B749 03(2009), Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .7 ASTM C553-11, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications
- .8 ASTM C578-12b, Specification for Rigid, Cellular Polystyrene Thermal Insulation
- .9 ASTM C591-12b, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation
- .10 ASTM C592-12, Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
- .11 ASTM C1289-13e1, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- .12 ASTM D1622-08, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- .13 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
- .14 ASTM D6386-10, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- .15 ASTM D7396-08, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.
- .3 CSA International
 - .1 CAN4 S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies
 - .2 CSA G40.20/G40.21 04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).
 - .4 CSA W59 03 (R2008), Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, 2012.
 - .2 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.

- .3 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA (Fire) 80, Standard for Fire Doors and Other Opening Protectives, 2013 Edition.
 - .2 NFPA (Fire) 252, Fire Tests of Door Assemblies, 2012 Edition.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S104-10, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC S105 09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104.
 - .3 CAN/ULC S701 11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .4 CAN/ULC S702 09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).
 - .5 CAN/ULC S704 11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.03 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
 - .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
 - .3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC S104 to ratings specified or indicated.
 - .4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN/ULC S104, and listed by nationally recognized agency having factory inspection services.

1.04 ACTION AND INFORMATION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for each type of door and frame specified.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazing, arrangement of hardware, fire rating, and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, fire rating and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .5 Submit test and engineering data, and installation instructions.
- .4 Samples:
 - .1 Submit one 300 x 300 mm corner sample of each type of frame. Show butt cutout and glazing stops.
- .5 LEED Submittals: Submit in accordance with Section 01 35 21 - LEED Requirements:
 - .1 Submit LEED submittal forms for Credit MR 4 - Recycled Content in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
 - .1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
 - .2 Submit LEED submittal forms for Credits MR 5 - Regional Materials in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:

- .1 Regional Materials: use building materials or products that have been extracted, harvested, recovered and processed within 800 km, or 2400 km if shipped by rail or water, of the final manufacturing site.
- .3 Submit LEED submittal forms for Credits EQ 4.2 - Low Emitting Materials, Paints and Coatings in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
 - .1 Submit product data for site applied touch-up primer for interior applications verifying compliance with GC-03, Green Seal Environmental Criteria for Anti-Corrosive Paints, for VOC content.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS

- .1 Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein.
- .2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of 35°C to 35°C.
- .3 Maximum deflections for exterior steel entrance doors under wind load of 1.2 kPa not to exceed 1/175th of span.
- .4 Steel fire rated doors and frames: Label and list fire rated doors and frames by an organization accredited by the Standards Council of Canada in conformance with CAN/ULC S104 and CAN/ULC S105 for ratings specified or indicated. Fire labels must be factory applied by the manufacturer.

- .5 Be responsible for securing approval from Departmental Representative, and authorities having jurisdiction for materials, fabrication and installation of fire rated oversized door and frame assemblies.

2.02 MATERIALS

- .1 Steel:
 - .1 Interior Doors and Frames: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, ZF180; stretcher levelled.
 - .2 Exterior Doors and Frames and Interior High Humidity Area: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, Z275 hot dip galvanized; stretcher levelled.
- .2 Nominal Base Metal Thickness Requirements:
 - .1 Frames: refer to frame fabrication requirements specified in this section.
 - .2 Doors: refer to door fabrication requirements specified in this section.
 - .3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
Pivot Hinge:	4.20	4.20
Mortise Hinge:	3.51	3.51
Mortise or Bored Lock or Deadbolt:	1.98	1.98
Flush or Surface Bolt Front:	1.98	1.98
Surface or Concealed Closer:	2.74	2.74
Strike Reinforcements:	1.98	1.98
Hold Open Arm:	1.98	1.98
Electronic Hardware Reinforcements:	1.98	1.98
Pull Plates and Bars:	1.30	1.30
Mortar Box:	--	0.84
Surface Exit Devices:	1.98	1.98
Door Surface Hardware Reinforcements:	1.30	1.30

Hardware Reinforcement	Door (mm)	Frame (mm)
Frame surface hardware reinforcements:	2.74	2.74

2.03 DOOR CORE MATERIALS

- .1 Door Core Materials:
 - .1 Honeycomb: Structural small cell 25 mm maximum. kraft paper honeycomb:
 - .1 Weight: 36.3 kg/ream minimum.
 - .2 Density: 16.5 kg/m³ minimum.
 - .3 Sanded to required thickness.
 - .2 Polystyrene: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.
 - .3 Temperature Rise Rated (TRR): core composition shall provide the fire-protection rating and limit the temperature rise on the unexposed side of door at 250oC for 30 or 60 minutes as determined by National Building Code of Canada, 2010. Core shall be tested as part of a complete door assembly in accordance with CAN/ULC S104 covering the Standard Method of Tests of Door Assemblies and shall be listed by a nationally recognized testing agency having a factory inspection service.

2.04 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Interlocking Edge Seam Adhesive: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.05 PRIMER

- .1 Touch up primer: Commercial rust inhibitive primer, shop prime coat doors and frames before delivery; grey or red coloured primer; in accordance with Section 09 91 00 - Painting. Clear primer not acceptable; provide primer for field touch-up.

2.06 PAINT

- .1 Field paint steel doors and frames in accordance with Section 09 91 00 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes. Finish colours selected by Departmental Representative.

2.07 ACCESSORIES

- .1 Door silencers (bumpers): Black neoprene, to ANSI/BHMA A156.16 Type 6-180; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; screw fastener applied. Stick on bumpers are not acceptable.
- .2 Exterior top and bottom caps: factory-installed PVC; flash at top, recessed at bottom.
- .3 Interior top caps: rigid polyvinylchloride extrusion, to ASTM D4726.
- .4 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners, and fastened to frame sections with counter sunk oval head sheet metal screws.
- .5 Make provisions for glazing as indicated and provide necessary glazing stops.
 - .1 Provide removable glazing beads.
 - .2 Design exterior glazing stops to be tamperproof.
- .6 Metallic paste filler: to manufacturer's standard.
- .7 Fasteners: type 304 stainless steel screws with countersunk flat head.
- .8 Labels for fire doors and door frame: brass plate, riveted to door and door frame.

- .9 Sealants: to Section 07 92 00 - Joint Sealants. Maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .10 Glazing: Section 08 80 50 - Glazing.

2.08 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Accurately form frames to profiles indicated. Construct frames straight and free from twist or warp.
- .3 Exterior frames: 1.98 mm minimum welded construction. 50 mm face standard frame profile, throat and frame width to suit wall construction.
- .4 Interior frames: 1.6 mm minimum for single doors; 1.98 mm for frames with opening width in excess of 1220 mm; welded type construction; 50 mm face standard frame profile, throat and frame width to suit wall construction.
- .5 Blank, drill, reinforce and tap frames to receive mortised, templated hardware, security and electrical devices, using templates provided by finish hardware supplier. Reinforce frames for installation of closers. Install stiffener plates or two angle spreaders where required to prevent bending of frame and to maintain alignment when setting. Weld reinforcement in place.
- .6 Protect mortised cutouts with steel guard boxes where required (masonry/concrete construction).
- .7 Provide three resilient bumpers per single door at the strike jamb. Provide two resilient bumpers per door leaf at the head of double doors.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Provide fire labelled frames for those openings requiring fire protection ratings, as indicated in as scheduled on Drawings.

2.09 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Where frames terminate at finished floor, supply floor plates for anchorage to slab. Check depth of extension of finished floor to structural slab and provide jamb extension anchorage as required. Provide 50 mm minimum adjustment
- .3 Locate wall anchors immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb. Provide three anchors per jamb for frames up to 2300 mm. Add one anchor per jamb for each additional 760 mm or fraction thereof in frame height.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.10 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Cut frame mitres accurately and weld on inside of frame profile. Fill frame corners, exposed surface depressions and butted joints with air drying paste filler. Sand to a smooth uniform finish. Touch up damaged galvanized finish with zinc rich primer.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19 - Foamed-in-Place Insulation.

2.11 DOOR FABRICATION GENERAL

- .1 Fabricate steel doors rigid, neat in appearance, and free from defects including warp and buckle; 45 mm thickness of types and sizes indicated on drawing, and as follows:
 - .1 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
 - .2 Form edges true and straight with minimum radius suitable for thickness of steel used.
 - .3 Bevel lock and hinge edges 3 mm in 50 mm; confirm requirement with builder's hardware or door swing that could dictate a different bevel.
 - .4 Top and bottom of doors shall be provided with inverted, recessed, nominal 1.60 mm steel end channels welded to each face sheet at 150 mm on centre.
 - .5 Equip exterior doors with factory installed flush PVC top caps. Equip fire labelled exterior doors with factory installed flush steel top caps.
 - .6 Provide fire labelled doors for those openings requiring fire protection ratings and temperature rise ratings.
 - .7 Fabricate doors with the following clearances:
 - .1 Clearance between door and frame and between meeting edges of doors swinging in pairs shall not exceed 3 mm.
 - .2 Clearance between the bottom of door and floor shall not exceed 19 mm or as required to accommodate specified hardware.
 - .3 Clearance between bottom of door and a raised non combustible sill in accordance with NFPA 80.
 - .4 Clearance between bottom of door and nominal surface of combustible floor coverings in accordance with NFPA 80.
- .2 Fabricate doors with longitudinal edges locked seamed, adhesive assisted. Seams: not visible, grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Bevel both stiles of single doors 1 in 16.
- .3 Exterior Doors: Flush, lock seam construction, insulated doors fabricated in accordance with CAN/CGSB 82.5, and as follows:

- .1 Face Sheets: Minimum 1.60 mm base steel sheet thickness.
- .2 Insulation Stiffened Core: Insulated and sound deadened with polystyrene or polyisocyanurate at choice of manufacturer, core laminated under pressure to each face sheet.
- .4 Interior Doors: Flush, lock seam construction, hollow steel doors fabricated in accordance with CSDMA Manufacturing Specifications for Doors and Frames, and as follows:
 - .1 Face sheets: Minimum 1.30 mm base steel sheet thickness.
 - .2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.
- .5 Fire Rated Doors: Flush, lock seam construction, hollow steel doors fabricated in accordance with CAN4 S104 and NFPA 80, and as follows:
 - .1 Face sheets: Minimum nominal 1.60 mm base steel sheet thickness.
 - .2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet, or Stiffened, insulated and sound deadened with manufacturer's proprietary Temperature Rise Rated (TRR) core material, as required by NBC.
 - .3 Equip pairs of fire labelled doors with minimum 2.74 mm steel surface mounted flat bar astragal, welded to door face; plug welded on face and stitch welded to butt edge of door.
 - .4 Labelled by Underwriters Laboratories of Canada, ITS/Warnock Hersey, or other testing laboratory approved by the authority having jurisdiction.
- .6 Oversized Doors: Flush, welded construction, hollow steel door fabricated in accordance with CSDMA Manufacturing Specifications for Doors and Frames, and as follows:
 - .1 Face sheets: Minimum base steel sheet thickness as recommended by manufacturer to achieve required stiffness.
 - .2 Internally steel stiffened with continuous vertical steel stiffeners at 150 mm on centre, continuous welded to both face sheets; fill voids with glass fibre insulation.

- .3 Fabricate doors as a single unit; multiple door units scabbed together will not be considered as an acceptable assembly.
- .4 Blank, reinforce and mortise doors for factory installed three-point latching system; provide additional reinforcing for oversize doors in accordance with manufacturer's recommendations.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.03 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of air-vapour barrier.

3.04 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors, finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor, non-combustible sills and thresholds: 6 mm.
- .3 Adjust operable parts for correct function.

3.05 GLAZING

- .1 Install glazing for doors in accordance with Section 08 80 50 - Glazing.

3.06 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.07 FIELD PAINTING

- .1 Prepare surfaces for field painting to ASTM D6386 and ASTM D7396.
- .2 Field painting: refer to Section 09 91 00 - Painting. Protect weather strips from paint. Provide final finish, free of scratches or other blemishes.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 06 20 00 - Finish Carpentry.
- .2 Section 08 71 00 - Door Hardware.
- .3 Section 08 80 50 - Glazing.

1.02 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009, Particleboard.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC/AWI Architectural Woodwork Standards, 2nd Edition, 2014.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.
- .4 Canadian Hardwood Plywood and Veneer Association (CHPVA)
 - .1 CHPA Official Grading Rules for Rotary Cut Face Veneers.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
 - .2 CAN/CSA O132.2 Series-90 (R1998), Wood Flush Doors.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
 - .3 FSC Certified Bodies
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2014.
- .8 Underwriters Laboratories (UL).
 - .1 UL 2761, Sustainability for Sealants and Caulking Compounds.(formerly CCD 045)

1.03 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Shop Drawings:
 - .1 Submit shop drawings.
 - .2 Indicate door types and cutouts for lights, sizes, core construction, transom panel construction and cutouts.
- .4 LEED Submittals:
 - .1 Submit LEED submittal forms for Credit MR 4 - Recycled Content in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
 - .1 Recycled Content: provide listing of products incorporating recycled content. Include details of percentages of post-consumer and pre-consumer recycled content for materials and products. Indicate material and product costs.
 - .2 Submit LEED submittal forms for Credits MR 7 - Certified Wood in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
 - .1 Wood based materials and products have been certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria. Provide chain-of-custody certificates for wood based products.
 - .3 Submit LEED submittal forms for Credits EQ 4.4 - Low Emitting Materials, Composite Wood and Laminate Adhesive in accordance with Section 01 35 21 - LEED Requirements. Indicate the following:
 - .1 Composite wood products including core materials must contain no added urea-formaldehyde resins.
 - .2 Adhesives used to fabricate laminated assemblies must contain no urea-formaldehyde.

1.04 SAMPLES

- .1 Submit samples:
 - .1 Submit one 300 x 300 mm sample of each type wood door finish.

- .2 Show door construction, core, glazing detail and faces.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.05 AESTHETIC CRITERIA

- .1 Wood doors along a corridor or within a room shall be Set Matched; pairs of doors, Pair Matched.
- .2 Veneer Leaves shall be Slip Matched.
- .3 Trim and moulding shall be selected for continuity and uniformity of finished appearance, AWMAC premium grade, meeting Blueprint Matching criteria.

1.06 QUALITY ASSURANCE

- .1 Fabricate doors in accordance with the AWMAC/AWI Architectural Woodwork Standards, Section 9 - Doors, Premium grade.
- .2 Single Source: wood doors shall be supplied by a single manufacturer.
- .3 Regulatory Requirements:
 - .1 Wood fire rated doors: labelled and listed by an organization accredited by Standards Council of Canada.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Deliver doors and panels to minimize storage on site and when site conditions conform to requirements for storage.

- .2 Storage and Protection:
 - .1 Store and handle doors and panels in accordance with AWMAC requirements, and as follows:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well-ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage.
 - .4 Store doors away from direct sunlight.

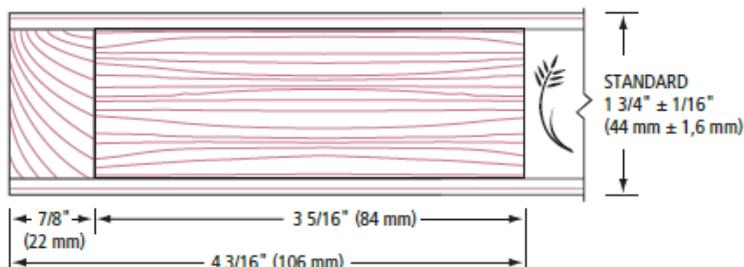
1.08 WARRANTY

- .1 Provide warranty issued in the name of Departmental Representative stating that doors are warranted against defects in materials and workmanship for the life of the original installation.
- .2 Warranty to include coverage for reasonable amount to remove, replace, refinish, and re-hang doors that do not meet accepted AWMAC tolerances.

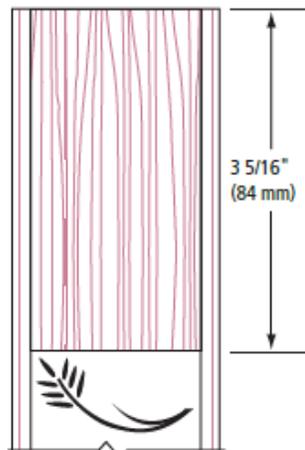
Part 2 Products

2.01 SOLID CORE DOORS

- .1 Flush wood doors: solid core to AWMAC Standard, premium grade, and to CAN/CSA O132.2.1. Dry lumber to an average moisture content of between 6 and 12% maximum at time of manufacture.
- .2 Construction:
 - .1 Stiles: 85 mm laminated strand lumber (LSL), including a 22 mm piece of hardwood, matched with faces, for a total width of 107 mm. Wood components shall be bonded with type-1 water-resistant adhesive to ASTM D1037 and ASTM D198. FSC certified, No Added Urea Formaldehyde.



- .2 Top and Bottom Rails: 85 mm laminated strand lumber (LSL). Wood components shall be bonded with type-1 water-resistant adhesive to ASTM D1037 and ASTM D198. FSC certified, No Added Urea Formaldehyde.



- .3 Agrifibre core (No Added Urea Formaldehyde).
.4 Door Thickness: 44 mm \pm 1.6 mm overall.
.5 Faces: Hardwood; veneer grades: Grade I (Premium), Maple species, rotary cut, minimum 0.50 mm thick. FSC certified, No Added Urea Formaldehyde.
.6 Lock Block: integrated.
.7 Glue: Type 1 PVA Cross-link, No Added Urea Formaldehyde.
- .3 Wood Door Frames: Refer to Section 06 20 00 - Finish Carpentry, Maple species, finish to match door.

2.02 GLAZING

- .1 Glazing: to Section 08 80 50, clear tempered safety glass, 6 mm thick.

2.03 SIDE PANELS

- .1 Construction: to match adjacent door.
.2 Meeting edges of doors and side panels: checked.
.3 Veneer of doors and transom panels: Maples species, rotary cut.

2.04 FABRICATION

- .1 Fabricate doors in accordance with AWMAC section 9.
.2 Vertical edge strips to match face veneer.

- .3 Prepare doors for glazing. Provide hardwood Maple species glazing stops with mitred corners.
- .4 Doors shall be pre-fitted, bevelled and machined at the factory for all mortise hardware items as per templates and approved hardware schedules provided.
- .5 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

2.05 FINISHES

- .1 Factory-finish doors: AWMAC Premium Grade, water-based oil modified polyurethane, amber tone, minimum 3-coat application system.
 - .1 Sand in direction of grain between coats per finish manufacturer's printed directions.
- .2 Factory-seal top and bottom of door edges.
- .3 Provide materials for touch-up of finishes.

Part 3 Execution

3.01 EXAMINATION

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

3.02 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, datasheets, standard details, and specifications.

3.03 INSTALLATION

- .1 Unwrap and protect doors in accordance with AWMAC.
- .2 Coordinate with the work of Section 06 20 00 - Finish Carpentry.
- .3 Install doors and hardware in accordance with manufacturer's printed instructions and AWMAC.
- .4 Adjust hardware for correct function.
- .5 Install glazing in accordance with Section 08 80 50 - Glazing.
- .6 Secure side panels by means of stops, concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

3.04 ADJUSTMENT

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.06 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work of this section.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 Submittal Procedures: Section 01 33 00
- .2 Closeout Submittals: Section 01 78 00
- .3 Common Product Requirements: Section 01 61 00
- .4 Gypsum Board Assemblies: Section 09 21 16
- .5 Duct Accessories: Section 23 33 00
- .6 Plumbing Specialties and Accessories: Section 22 42 01

1.02 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

1.03 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit one (1) sample of each type of hand entry access door.
- .3 Submit one 300 x 300 mm corner sample of each type of body entry door.

1.04 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for cleaning and maintenance of stainless steel finishes for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.
- .3 Leave protective covering in place until final cleaning of building.

2 PRODUCTS

2.01 ACCESS DOORS

- .1 Sizes: Except as indicated otherwise, to be minimum sizes as follows:
 - .1 For body entry: 600 x 600 mm. (except 900 x 900mm for special location noted below)
 - .2 For hand entry: 300 x 300 mm.
 - .3 Access doors to be sized large enough to serve intended purpose.
- .2 Construction:
 - .1 Galvanized steel. Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180. Provide fire-rated access doors where penetrating fire-rated construction.
- .3 Materials
 - .1 Tiled or marble surfaces and other special areas: Stainless steel with brushed satin or polished finish as directed by the Departmental Representative.
 - .2 Other areas: galvanized steel.
 - .3 Acceptable Manufacturers: Acudor; Buensod; Lettage; Zurn.

2.02 EXCLUSIONS

- .1 Lay in tile ceilings: use unobtrusive identification locators.

3 EXECUTION

3.01 INSTALLATION

- .1 Installation:
 - .1 Drywall surfaces: to Section 09 21 16 - Gypsum Board Assemblies.
 - .2 Where installed in fire separations, maintain fire rating integrity.

3.02 LOCATION

- .1 Location: verify equipment is within view and accessible for operating, inspecting, adjusting, servicing without using special tools.
- .2 Provide adequately sized galvanized steel access doors for all devices requiring inspection, maintenance or cleaning.
- .3 Install access doors or panels wherever valves, water hammer arresters, plumbing cleanouts, trap primers, drain points,

automatic and manual air vents, controllers, controlled devices, volume dampers, duct access doors and panels and where any equipment and system components requiring servicing, inspection or adjusting etc. are not accessible. Where equipment may be required to be removed for repair or servicing, adequate access must be provided.

- .4 Special Location: none.
- .5 Locate access doors before and after coils, filters, fans, automatic dampers, at fire dampers, fresh air and exhaust air plenums, bottoms of risers, and where required elsewhere.
- .6 Remove lay-in tiles to obtain access to space above lay-in tile ceilings.
- .7 Doors to open greater than 90 degrees, have concealed hangers, anchor straps and screwdriver cam locks.
- .8 Doors in block walls or in tile shall be sized to suit masonry unit module.
- .9 In fire rated walls and ceilings, access doors and panels must be fire rated.
- .10 Provide stainless steel access doors for tile, marble or terrazzo surfaces.
- .11 Access doors to be tight fitting with sealing gaskets and suitable quick fastening locking devices. Insulate access doors where they are installed in insulated ductwork or plenums.
- .12 Gasketed panels (patches) minimum size 300mm x 300mm and fabricated from the same material as the duct and fastened with sheet metal screws are permitted if the access is for cleaning only; otherwise access doors shall be provided.
- .13 Interrupt duct coverings at all duct access doors to allow for easy opening.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 06 10 00 - Rough Carpentry.
- .3 Section 06 20 00 - Finish Carpentry.
- .4 Section 08 71 00 - Door Hardware.
- .5 Section 09 21 16 - Gypsum Board Assemblies.

1.02 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA-DAF-45, Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA 609.1-93, Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .3 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M 13, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - .2 ASTM A666 10, Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
 - .3 ASTM B209/B209M 10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - .4 ASTM B221/B221M 13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - .5 ASTM A924/A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada 2009 Rating System, LEED Canada for New Construction and Major Renovations.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Coordinate with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty.

1.04 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings containing plans, elevations, sections, details, numbered panel installation sequence, attachments to other work, and including the following:
 - .1 Indicate assembly and instruction details, dimensions of fabrication, required clearances materials, finishes, [egress doors,] [electrical connections,] and hardware.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of grille finish as required for initial selection, and confirmation of finishing process and finished appearance.
- .5 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

- .6 Sustainable Design Submittals:
 - .1 LEED Canada-Section 01 35 21 - LEED Requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.05 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: Submit manufacturer's written instructions for operation and maintenance procedures, include name of original installer and contact information in accordance with Section 01 78 00 - Closeout Submittals, and as follows:
 - .1 Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - .2 Hardware, track, carriers, and other operating components.

1.06 QUALITY ASSURANCE

- .1 Single Source Responsibility: Manufacturer shall be responsible for all components it supplies for the complete folding door system.
- .2 Regulatory Requirements: Provide materials and assemblies tested and labelled indicating flame spread and smoke developed ratings acceptable to the Authority Having Jurisdiction.

1.07 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's guidelines, Section 01 61 00 - Common Product Requirements and as follows:
 - .1 Deliver materials to job site in sealed, unopened cartons or crates. Protect unit from damage. Store materials under cover, protected from weather and construction activities.

1.08 SITE CONDITIONS

- .1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where overhead coiling grilles are required to fit within openings; coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .2 Established Dimensions: Establish dimensions and proceed with fabricating overhead coiling grilles without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

1.09 WARRANTY

- .1 Submit manufacturer's warranty against defects in materials and workmanship.
- .2 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.01 MATERIALS

- .1 Aluminum Extrusions: ASTM B221/B221M, alloy 6063-T5.
- .2 Anodized aluminum sheet metal: anodizing quality, colour and finish to match automatic entrances.

2.02 DOOR CURTAIN

- .1 Door Curtain: Manufacturer's standard construction as follows:
 - .2 Rods: Aluminum.
 - .3 Sleeves: Aluminum.
 - .4 Horizontal Links: Aluminum.
 - .5 Frame: constructed of 148 mm wide sections; each section suspended from roller assemblies by full-height cold rolled steel shafts. Each section fabricated of 127 mm wide inside frame x 102 mm hanger spaced every other panel and connected by T-hinges with 8 mm diameter rods between frames.

- .6 Panels: perforated aluminum panels, 188 mm wide x 1.3 mm thick perforated aluminum inserts. Top and bottom of each section shall be fitted with aluminum panels to accept roller assemblies attached with cold rolled steel shafts. Each perforated metal insert shall be framed with PVC gaskets and fitting to interlocking, full-height aluminum hinge.
- .7 Finish: Anodized Aluminum, to match automatic entrances.

2.03 COMPONENTS

- .1 Track: overhead track shall be of extruded aluminum 33 mm wide x 40 mm high.
- .2 Locking: Lead top and bottom locking post equipped with concealed locking devices operable from both sides engaging 11 mm steel pins into a dust proof floor socket and hole in top track. Steel pins automatically retract into locking post when activated by key.
- .3 Floating end post to be self locking at top and bottom inside the storage pocket.
- .4 Cylinders: Applicable locking posts to be equipped with manufacturer's standard 25 mm mortise cylinders.
- .5 Keying: to Section 08 71 00 - Door Hardware.

2.04 FINISH

- .1 Aluminum Extrusion Finish:
 - .1 Clear natural anodized (AA-M12-C22-A23 clear).

Part 3 Execution

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets, illustrations, and guide specifications.

3.02 EXAMINATION

- .1 Examine flooring, structural support, and opening for compliance with requirements for installation tolerances and other conditions affecting performance of grilles.

- .2 Examine surfaces of openings and verify dimensions. Verify rough openings are level, plumb, and square, with no unevenness, bowing, or bumps on the floor.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

- .1 Install side folding grilles, operating equipment and required hardware, lock cylinders, jamb and head moulding strips, anchors, inserts, hangers, and equipment supports in accordance with shop drawings, manufacturer's written instructions and as specified.
- .2 Key cylinder to Section 08 71 00 - Door Hardware.
- .3 Adjust operating components to ensure smooth opening and closing of side coiling grilles and closures.

3.04 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection, and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within three days of review and submit.

3.04 CLEANING

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.05 PROTECTION

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

3.06 DEMONSTRATION

- .1 Demonstration: Provide training to Departmental Representative performed by manufacturer's authorized site representative of moveable components and setting out and maintenance of side folding grille components

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 07 27 00.01 - Air Barriers and Vapour Retarders.
- .2 Section 07 92 00 - Joint Sealants.
- .3 Section 08 71 00 - Door Hardware.
- .4 Section 08 80 50 - Glazing.
- .5 Division 26 - Electrical: Basic electrical materials and methods for electrical conduit, wiring, boxes, wiring devices and connections to operators and remote power units, and from: operators to controls; and controls to power units.

1.02 REFERENCES

- .1 American Architectural Manufacturer's Association (AAMA)
 - .1 AAMA 101: Appendix Dissimilar Materials.
 - .2 AAMA 1303.5-76, Voluntary Specifications for Forced-Entry Resistant Aluminum Sliding Glass Doors.
- .2 Aluminum Association Designation System for Aluminum Finishes (AA)
 - .1 Aluminum Design Manual, 2015 Edition.
- .3 American National Standards Institute (ANSI)
 - .1 ANSI Z97.1-2015: Safety Glazing Materials Used in Buildings - Methods of Test.
- .4 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.10-2017, Power Operated Pedestrian Doors.
 - .2 ANSI/ BHMA A156.19-2013, Power Assist and Low Energy Power Operated Doors.
- .5 ASTM International (ASTM)
 - .1 ASTM B221/B221M-14, Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.

- .6 Canada Green Building Council (CaGBC)
 - .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.
- .7 CSA International
 - .1 CSA A440-11(R2016), NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014), Update No. 2 (2017).
 - .2 CSA A440S1-17, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights.
 - .3 CSA B651-12, Accessible Design for the Built Environment.
- .8 Green Seal Environmental Standards (GS)
 - .1 Standard GS-11, Paints, Coatings, Stains, and Sealers, Edition 3.2, October 26, 2015.
- .9 National Research Council of Canada (NRC)
 - .1 National Energy Code of Canada for Buildings -[2015] (NECB).
 - .2 National Building Code of Canada [2015] (NBC).
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2016, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2011, Adhesives and Sealants Applications.
- .11 Underwriters' Laboratories of Canada (ULC)
 - .1 ULC C305-72, Panic Hardware.
 - .2 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop Systems.
 - .3 CAN/ULC S524-14, Standard for the Installation of Fire Alarm Systems.
 - .4 CAN/ULC S533-15, Egress Door Securing and Releasing Devices.
- .12 Underwriters' Laboratories (UL)
 - .1 UL 325-13, Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.04 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for doors, hardware, and accessories, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings.
 - .2 Indicate layout, dimensions, elevations, detail sections of members and sill conditions, materials, finishes, recesses, hardware including mounting heights, anchors and reinforcements, provisions for expansion and contraction, methods of joining sheet metal and joint locations, glass types and glass thicknesses, glazing details, types of sealants, details of other pertinent components of the work, and adjacent construction to which work of this section is attached.
 - .3 Identify installation tolerances required, assembly conditions, routing of service lines, locations of operating components, controls and boxes.
 - .4 Indicate door signs.
- .4 Samples:
 - .1 Submit 2 300 x 300 mm samples of each type of glass.

- .5 Manufacturers Reports:
 - .1 Manufacturer's Field Reports: submit manufacturer's written reports within [3] days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

- .6 Sustainable Design Submittals:
 - .1 LEED Canada Submittals: in accordance with Section 01 35 21 - LEED Requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
 - .4 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants and primers, paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit project record documents that accurately record locations of concealed and remote equipment, services, and conduit.
- .3 Operation and Maintenance Data: submit operation and maintenance data for door system for incorporation into manual.
- .4 Parts List:
 - .1 Submit manufacturer's parts lists ; include servicing frequencies, instructions for adjustment and operation applicable to each type of component or hardware, and name, address and telephone number of nearest authorized service representative.

- .5 Maintenance Contract:
 - .1 Supply complete service and maintenance of operating equipment for 1 year from date of substantial performance of the work.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Supply wrenches and tools required for maintenance of equipment.

1.07 QUALITY ASSURANCE

- .1 Coordinate with other trades as required to maintain schedule. Coordinate supports, blocking and other work as required for complete installations.
- .2 Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.
- .3 Regulatory Requirements:
 - .1 Conform to National Building Code for automatic release of control drive unit to permit manual operation of emergency exit doors.
 - .2 Conform to National Building Code for release of automatic locks to permit manual operation of emergency exit doors and to CAN/ULC S524 where required to be integrated with building's fire alarm system.
 - .3 Meet or exceed the requirements of UL325 (Canada); labour and material shall meet or exceed the requirements of CSA A440 and CSA A440S1.
 - .4 Installed equipment shall comply with ANSI A156.10 and CSA B651.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.08 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect automatic entrance doors and frames from damage and nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Cover exposed metal surfaces with pressure sensitive heavy protection paper or strippable plastic coating.
 - .1 Use materials of type which will not leave residue or become bonded when exposed to sun.
 - .2 Use padded blankets or approved protective wrapping for decorative metal work and similarly finished exposed elements.

1.09 WARRANTY

- .1 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.
- .2 Warranty: include coverage of repair or replacement of components or entire units which fail in materials workmanship. Failures include but are not necessarily limited to, structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation of operators speed control and hardware, deterioration of metals, metal finishes, and other materials beyond normal weathering.

2 PRODUCTS

2.01 SYSTEMS

- .1 Design Requirements:
 - .1 Design automatic entrance doors indicated as emergency exits, as required means of egress from the building, and to comply with National Building Code 2010.
 - .2 Design automatic entrances to comply with applicable requirements of ANSI/BHMA A156.10.
 - .3 Design power assist and low energy power operated doors to applicable requirements of ANSI/BHMA A156.19.
- .2 Opening Force Requirements for Emergency Egress:
 - .1 Slide-swing panels shall require no more than 222 N of force to swing open. Slide-swing panels shall be capable of swinging out 90° from any position of slide movement.
 - .2 Slide-swing panels and swing-out sidelights shall have torsion spring designed to re-close panel if pushed open in the direction of egress.
 - .3 If power fails, slide panels can be manually slid open with no more than 222 N of force.
 - .4 Units shall be UL-listed as an exit.
- .3 Closing Force Requirements:
 - .1 Maximum force required to prevent sliding panel from closing = 124 N Adjustable Reversing Circuit will reopen door unit if closing path is obstructed.
- .4 Header shall be capable of supporting:
 - .1 Bi-parting: Up to 136 kg per slide panel over spans up to 4877 mm without intermediate supports.

2.02 EQUIPMENT

- .1 Traffic Movement: two-way traffic and disabled persons access.
- .2 Manufactured Automatic Door Units: Shall include operator, header with roller track, carrier assemblies, framing (jambs, sliding door panel), sidelights, activation, safety devices and accessories required for complete installation.
 - .1 Configuration: Single Slide or Bi-parting
 - .2 Mounting Type:
 - .1 Perimeter mounted within rough opening with sliding panels sliding along sidelight.

- .1 Automatic Lock Fail Secure: If power fails the lock engages.
- .2 Monitored Power Fail Options (battery back-up):
 - .1 Software Selectable Power Fail Close: If power fails the door slides closed.
- .5 Heavy-Duty Slide Headers: 150 mm deep by 200 mm high, heavy-duty aluminum construction with removable face plate and extruded brackets for dead load and lateral strength.
- .6 Carrier Assemblies and Header Roller Tracks: Carrier assemblies shall support door panels with minimum four rollers per panel. Rollers will be non-metallic high quality ball bearing wheels 50 mm diameter. Anti-derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel. Overhead header roller track shall be continuous aluminum and replaceable.
- .7 Sliding Panels and Sidelights: Shall be aluminum, 44 mm deep with narrow stile rails. Standard bottom rail shall be 100 mm tall. Sliding panels shall have concealed bottom guides to stabilize slide travel.
 - .1 Weather-stripping to be along perimeter of sliding panels and swing-out sidelights. Weatherstripping material captured in extruded aluminum door panel. Surface applied self-adhesive weatherstripping not acceptable. Adjustable spring-loaded double astragal weather-stripping at lead edge, double mohair at interlock rails.
 - .2 Glazing preparation to be for 25 mm double insulating glass units, to Section 08 80 50 - Glazing.
 - .3 Sliding Panel and Sidelight shall be:
 - .1 Medium stile construction: 95mm wide vertical rails with 165 mm tall bottom rail. Note: Medium stile construction will reduce slide opening.
- .8 Breakout Panels: Slide-swing panels can swing out 90° from any position of slide movement and require no more than 222 N of force applied at the lock stile to open. Slid-swing panels and swing-out sidelights shall utilize spring loaded ball detent.
 - .1 Slide-swing panels and swing-out sidelights shall have torsion spring designed to re-close panel if pushed open in the direction of egress.

- .2 Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop during emergency egress.
- .3 Slide-swing panels shall include intermediate horizontal rail.
- .4 Units with breakout feature shall be UL-listed as an exit.

- .9 Jamb/Frames: Shall be aluminum. Jamb dimensions to be 44 mm deep by 100 mm.
- .10 Thresholds: Shall be aluminum and comply with CSA B651, minimum width 100 mm.
- .11 Hardware: ANSI A156.5, Grade 1, 2-Point Locking provided and installed in strike rail shall include:
 - .1 Hookbolt Latch, 16 mm laminated stainless steel, latching into jamb or adjacent strike rail.
 - .2 10 mm hex-bolt into breakout carrier frame.
 - .3 Keyed 29 mm cylinder mounted on exterior side with 25 mm backset
 - .4 Thumbturn mounted on interior side.
 - .5 Required Hardware Options:
 - .1 3-Point locking for bi-parting doors
 - .2 Flush Panic Exit Device recessed in 6 ½" muntin bar.
 - .3 Lock Position Indicator.
 - .4 Cylinder Guard.
 - .5 Cylinder Escutcheon.

2.03 RELATED EQUIPMENT

- .1 Sensor System: Shall be 24 VDC, class 11 circuit and shall be adjusted and installed in compliance with ANSI A156.10. System shall include the following:
 - .1 Activation Sensors: Microwave or active infrared sensor shall be header-mounted each side of door unit for detection of traffic from each direction.
 - .2 Threshold Presence Sensors:
 - .1 Header mounted sensors shall provide active infrared presence detection on each side of the door unit and shall remain active throughout the entire door opening and closing cycle.

- .2 Hold-open beams: Two-pulsed infrared photoelectric beams to be mounted in vertical rails of sidelight or in jambs. Sender/receiver arrangement parallels door opening.

2.04 RELATED WORK REQUIREMENTS

- .1 ELECTRICAL: 120 VAC, 50/60 cycle, single phase, dedicated 20 amp circuit per operator.
- .2 GLASS AND GLAZING: Glass stops, glazing vinyl and setting blocks for field glazing in accordance with Safety Glazing standard ANSI Z97.1.2. Contractor to coordinate acquisition of glass in thickness and type in accordance with manufacturer's recommendations for prescribed design.

2.05 MATERIALS, FINISHES AND FABRICATION

- .1 Extruded Aluminum: ASTM B221, 6063-T5 alloy and temper, anodized:
 - .1 Structural Header Sections: Minimum 5 mm thickness.
 - .2 Structural Frame Sections: Minimum 3 mm thickness.
 - .3 Structural Panel Sections: Commercial grade.
- .2 Finishes:
 - .1 Architectural Class 2 Clear Anodized Coating, AA-MI2C22A31.
- .3 Panel Construction:
 - .1 Corner block type with 5 mm steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets.
 - .2 Slide-swing doors to be supplied with adjustable glass setting block to allow for adjusting of door to meet site conditions eliminating the need for additional shims.
- .4 Frame Construction: Butt joints, mechanically secured with screws and formed alum. corner brackets.
- .5 Operator Construction: Electromechanical, modular type construction.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for automatic entrances installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative Consultant.

3.02 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's printed installation instructions, technical datasheets, details and guide specifications.
- .2 Install doors, frames and sidelights in accordance with shop drawings and manufacturer's instructions.
- .3 Coordinate installation of components with related and adjacent work. Attach and seal air vapour barrier materials to perimeter framing.
- .4 Set work plumb, square, level, free from warp, twist and superimposed loads.
- .5 Securely anchor work in required position. Do not restrict thermal movement.
- .6 Brace frames rigidly for building-in. Supply temporary horizontal spreaders at third points of door openings to maintain frame width. Vertically support at centre, heads of openings over 1.2 m wide. Remove temporary bracing after framing is set.
- .7 Apply isolation coating to separate aluminum and primed or galvanized steel surfaces at points of contact with cementitious materials.

- .8 Pack fibrous insulation or foamed-in-place in shim spaces at perimeter of assembly and void spaces between members to maintain continuity of thermal barrier.
- .9 Maintain clearances between head members and structure to ensure that structural loads are not transmitted to frames.
- .10 Install hardware using templates provided. Refer to Section 08 71 00 - Door Hardware for installation requirements.
- .11 Install door operator system in accordance with manufacturer's instructions, including piping, controls, control wiring. Install remote power units.
- .12 Set tracks, header assemblies, operating brackets, rails and guides level and true to location, with adequate anchorage for permanent support.
- .13 Install glass in accordance with Section 08 80 50 - Glazing using exterior dry glazing method.

3.03 SEALANT APPLICATION

- .1 Install perimeter sealant Type S-10 to Section 07 92 00 - Joint Sealants, and back-up materials, to ensure weather tight seal at outside and air, vapour seal at inside.
- .2 Comply with requirements of Section 07 92 00 - Joint Sealants and 01 35 21 - LEED Requirements for sealants, fillers and gaskets to be installed during installation of doors and frames.
- .3 Conceal sealant within aluminum work except where exposed use is permitted by Departmental Representative].
- .4 Set sill members in bed of sealant.

3.04 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.

- .2 Manufacturer's Field Services: submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Ensure manufacturer's representative is present before and during critical periods of installation and testing.
- .4 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Once during progress of Work at 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

3.05 ADJUSTING

- .1 After repeated operation of completed installation equivalent to three days of use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum, smooth operating condition and safety and for weather tight closure. Lubricate hardware, operating equipment and other moving parts.
- .2 Adjust revolving doors to ensure tight fit at contact points with enclosure.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove traces of primer, caulking; clean doors and frames.
 - .3 Clean aluminum surfaces promptly after installation. Exercise care to avoid damage to coatings.
 - .4 Clean glass and glazing materials with approved non-abrasive cleaner.
 - .5 Remove protective material from prefinished aluminum surfaces.
 - .6 Wash exposed surfaces with mild solution of detergent and warm water, using soft, clean wiping cloths. Remove dirt from corners. Wipe surfaces clean.
 - .7 Remove excess sealant by moderate use of solvent, of type acceptable to sealant manufacturer.

- .8 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.07 DEMONSTRATION

- .1 Demonstrate operation, operating components, adjustment features, and lubrication requirements to Owner in accordance with Section 01 79 00 - Demonstration and Training.

3.08 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 07 21 13 - Board Insulation.
- .3 Section 07 21 16 - Blanket Insulation.
- .4 Section 07 21 19 - Foamed-in-Place Insulation.
- .5 Section 07 27 00.01 - Air Barriers and Vapour Retarders.
- .6 Section 07 92 00 - Joint Sealants.
- .7 Section 08 42 29 - Automatic Entrances.
- .8 Section 08 80 50 - Glazing.

1.02 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA CW-10-04, Care and Handling of Architectural Aluminum From Shop to Site.
 - .2 AAMA CW-11-85, Design Wind Loads and Boundary Layer Wind Tunnel Testing.
 - .3 AAMA T1R-A1-04, Sound Control for Fenestration Products.
 - .4 AAMA 501-05, Methods of Test for Exterior Walls.
 - .5 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
 - .6 AAMA 612-02, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.
 - .7 AAMA 2603-02, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - .8 AAMA 2604-05, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

- .3 ASTM International (ASTM)
 - .1 ASTM A36/A36M-08, Specification for Carbon Structural Steel.
 - .2 ASTM A123/A123M-09, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A167-99(2009), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .4 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM B209-07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .6 ASTM B221-08, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .7 ASTM E283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .8 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .9 ASTM E331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .10 ASTM E413-04, Classification for Rating Sound Insulation.
 - .11 ASTM E1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .4 Canada Green Building Council (CaGBC)
 - .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.
- .5 CSA Group (CSA)
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11 - NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
 - .2 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

- .3 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.
- .4 CAN/CSA S157/S157.1-05, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.
- .5 CSA W59.2-M1991(R2008), Welded Aluminum Construction.
- .6 Environmental Choice Program (ECP)
 - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
 - .2 CCD-047-98(R2005), Architectural Surface Coatings.
 - .3 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .7 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .8 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2010 (NBC).
- .9 Society for Protective Coatings (SSPC)
 - .1 SSPC - Paint 20-02(R2004), Zinc Rich Coating, Type I - Inorganic and Type II - Organic.
 - .2 SSPC - Paint 25-97(R2004) BCS, Zinc Oxide, Alkyd, Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.03 DESIGN RESPONSIBILITY

- .1 Drawings and details are diagrammatic and are intended to show design concept, configuration, components and arrangements; they are not intended to identify nor solve completely the problems of thermal and structural movements, air pressure equalization, air and vapour barriers, assembly framing, fixings and anchorages, moisture disposal, water penetration, orientation of walls, shading factors, size and shape of glazing, location of convectors, location of blinds, and problems at the glass line associated with glazing installation, movements, pressure fracture or thermal shock and weather seal.

- .2 The design, engineering, procurement, fabrication and erection of the curtain wall assemblies as required to meet specifications shall be the complete responsibility of the Contractor.

1.04 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: coordinate work of this Section with installation of air barrier placement, vapour retarder placement, and flashing placement.
- .2 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.05 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and technical data sheets.
 - .2 Submit product data indicating construction details, material descriptions, dimensions of individual components and profiles, finishes, anchorage and fasteners, glass and infill, internal drainage details.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island, Canada.
 - .2 Indicate system dimensions, door hardware, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

- .4 Samples:
 - .1 Submit samples of materials for Departmental Representative's verification of specified finishes including; but not limited to, the following:
 - .1 300 mm x 450 mm for sheets, plates and glass;
 - .2 300 mm long for extrusions and formed or rolled shapes;
 - .3 300 mm long for tapes and gaskets;
 - .4 150 mm long for sealants;
 - .5 Samples shall fully represent physical and chemical properties, finish, and colours of materials to be supplied.
 - .2 Submit for initial selection prior to ordering a sample of each door hardware item that is to be supplied under this section; order only items approved by Departmental Representative.
 - .3 Submit two samples 610 x 610 mm in size illustrating window frame section, insulation, vapour barrier, glass, spandrel panels, vents and sealant.
- .5 Delegated Design Submittals:
 - .1 Include framing member structural and physical characteristics, calculations, dimensional limitations, special installation requirements.
- .6 Test Reports:
 - .1 Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and supportive data.
- .7 Sustainable Design Submittals:
 - .1 LEED Canada-Section 01 35 21 - LEED Requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
 - .4 Low-Emitting Materials:

- .1 Submit listing of adhesives and sealants and paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.06 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazed aluminum curtain wall for incorporation into manual.

1.07 QUALITY ASSURANCE

- .1 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Supply 3 x 3 metre mock-up including intermediate mullion, corner mullion, sill muntin, vision glass light, and spandrel panel.
 - .1 Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.
 - .3 Locate mock-up where directed by Departmental Representative.
 - .4 Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with work.
 - .5 When accepted, mock-up will demonstrate minimum standard of quality and materials for work of this Section.
 - .6 Mock-up may remain as part of finished work.

1.08 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Handle work of this Section in accordance with AAMA CW-10.
- .2 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .3 Store and protect aluminum glazed curtain wall components from damage and nicks, scratches, and blemishes.
- .4 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- .5 Replace defective or damaged materials with new.

1.09 AMBIENT CONDITIONS

- .1 Install sealants when ambient and surface temperature is above 5 degrees C minimum.
- .2 Maintain this minimum temperature during and for 48 hours minimum after installation of sealants.

1.10 WARRANTY

- .1 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

2 PRODUCTS

2.01 SYSTEMS

- .1 Description:
 - .1 Vertical glazed aluminum curtain wall system includes thermally broken tubular aluminum sections with self-supporting framing, shop fabricated, factory prefinished, vision glass, insulated spandrel infill; related flashings, anchorage and attachment devices.
 - .2 Assembled system to permit re-glazing of individual glass (and infill panel) units from exterior without requiring removal of structural mullion sections.
 - .3 Walls of aluminum frames shall be not less than 1.8 mm thick, suitable alloy and proper temper for extruding and adequate structural characteristics; and suitable for finishing as specified.
 - .1 Frame depth: 152 mm; width: 50 mm.

- .2 Designed for double-glazed insulating glass units, 25 mm thick.
 - .3 4-sided captured system, with insulating glass units and glazed spandrel panels.
 - .4 System include glazed aluminum entrances; 300 mm bottom rail, 90 mm vertical stiles, and 90 mm top rail; designed for double-glazed insulating glass units, 25 mm thick.
- .2 Performance Requirements:
- .1 General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - .1 Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following:
 - .1 Thermal stresses transferring to building structure.
 - .2 Glass breakage.
 - .3 Loosening or weakening of fasteners, attachments, and other components.
 - .2 Meet the requirements of the National Building Code 2010 plus amendments and the National Energy Code of Canada for Buildings (NECB).
 - .2 Retain a professional engineer registered in province of Work, experienced in structural design in glass and aluminum window units, connections to door units and connections to building, to ensure the adequacy of the structural aspects of the design, manufacture, and installation of complete assembly.
 - .3 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with Climatic Data included in National Building Code 2010 plus amendment, 1:50 year probability.
 - .4 Design and size components to withstand seismic loads and sway displacement as calculated in accordance with National Building Code 2010 plus amendments.
 - .5 Structural-Test Performance: Test according to ASTM E330 and TAS 202 as follows:

- .1 When tested at positive and negative wind load design pressures, assemblies do not evidence deflection exceeding $L/175$ of clear span.
- .2 A static air load of 1915 Pa shall be applied in the positive and negative direction.
 - .1 When tested at 150% of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2% percent of clear span.
 - .2 Minimum test duration according to ASTM E330 is 10 seconds.
- .6 Size glass units and glass dimensions to limits established in CAN/CGSB 12.20.
- .7 Provide system to accommodate, without damage to components or deterioration of seals:
 - .1 Movement within system.
 - .2 Movement between system and perimeter framing components.
 - .3 Dynamic loading and release of loads.
 - .4 Deflection of structural support framing.
 - .5 Shortening of building concrete structural columns.
 - .6 Creep of concrete structural members.
- .8 Sound attenuation through wall system (exterior to interior): STC 30, measured in accordance with ASTM E90 and ASTM E1425.
- .9 Limit air infiltration through assembly to 0.3 L/s/m² maximum of wall area, measured at a reference differential pressure across assembly of 300 Pa as measured in accordance with ASTM E283.
- .10 Vapour seal with interior atmospheric pressure of 25 mm sp, 22 degrees C, 40% RH: No failure.
- .11 Water leakage: none, when measured in accordance with ASTM E331, at differential pressure across assembly of 720 Pa.
- .12 Ensure interior surfaces have no condensation before exposed edges of sealed units reach dew point temperatures.
- .13 Thermal Transmittance (U-factor): Glass and framing areas shall have U-factor of no greater than 0.33 with 25 mm High Performance (HP) Glass as determined according to NFRC 100-2010.

- .14 Temperature Index (I-value), to CSA A440: ≥ 65 . During testing, equilibrium conditions of $-30 \pm 1^\circ\text{C}$ for the weather-side air temperature and $20 \pm 1^\circ\text{C}$ for the room-side air temperature shall be maintained. Variations in determining I-value will be considered if equilibrium conditions are similar, with a temperature delta of 50 ± 2 degrees Celsius.
- .15 Ensure interior surfaces do not develop condensation before exposed edges of sealed units reach dew point temperatures.
- .16 Ensure curtain wall system can withstand temperature differential of 85 degrees C and is able to accommodate interior and exterior system expansion and contraction without damage to components or deterioration of seals.
- .17 Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.
- .18 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapour retarder.
- .19 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.
- .20 Tolerances:
 - .1 Design and install the curtain wall to accommodate tolerances of related work not included in this section. This requirement is in addition to building structure movements and deflections.
 - .2 Fabricate components to provide a plumb, square, level and true installation, and to accommodate allowable tolerances for work of other sections upon which work of this section depends.

2.02 MATERIALS

- .1 Aluminum Materials:
 - .1 Extruded aluminum: to CSA HA-Series 6063 alloy, T5 or T6 temper, free from perceptible distortions, waves, twists, buckling or other deficiencies of appearance or performance.
 - .2 Sheet, unexposed: utility sheet to CSA HA-Series 6063 alloy, T5 or T6 temper.
 - .3 Sheet, exposed: to ASTM B209/B209M, anodizing quality to AA-1100 series.
 - .4 Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC-3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC-3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - .5 Sheet and plate: to ASTM B209/B209M, anodizing quality, alloy and temper suitable for purpose and finish required, special hardness for flat panel application, re-squared saw cut edges, free from perceptible distortions, waves, twists, buckling or other deficiencies in appearance or performance.
 - .1 Panels, copings, soffits, sills, trims, closures and other such components shall be minimum 3 mm thick; 1.5 mm thickness may be used for flashings. Finish to match exterior curtain wall finish.
 - .6 Extruded bars, rods, profiles, and tubes: In accordance with ASTM B221/B221M, and AA-6063-T5 or T6 temper, anodizing quality.
 - .7 Aluminum extruded structural pipe and tubes: In accordance with ASTM B429, and AA6063-T6 temper, anodizing quality.
 - .8 Structural Profiles: In accordance with ASTM B308/B308M, anodizing quality.
 - .9 Aluminum welding: to CSA W59.2.
- .2 Steel: to CSA G40.20/G40.21, 300W hot dipped galvanized after fabrication to ASTM A653/A653M, minimum coating of 600 g/m² shapes to suit mullion sections.
- .3 Galvanizing, unless otherwise specified: hot dipped galvanizing, with minimum zinc coating of 600 g/m² to ASTM A653/A653M.

- .4 Stainless steel: to ASTM A167, Type 304 or 316; of one type throughout.
- .5 Anchors: 3-way adjustable hot-dip galvanized cast iron.
- .6 Fasteners: to ASTM A167, stainless steel, type 304 as recommended by curtain wall manufacturer selected to prevent galvanic action with the components fastened, of suitable size to withstand imposed loads.
- .7 Anti-rotation spacers: manufacturer's extruded aluminum spacers with integral gaskets as required at frame transitions and termination points, including at dual-glazed framing to single-pane spandrel panel transitions.
- .8 Grout fill for anchor pockets: non-shrink.
- .9 Primers and Adhesives: as recommended by curtain wall manufacturer.
- .10 Thermal barrier consists of 25 mm separation between the interior and exterior metal members in a typical condition, while maintaining a continuous watertight seal. Thermal barrier assembly shall be tested to the thermal cycling requirements of ASTM E2692 and show no sign of degradation following the test.
 - .1 Thermal separators (thermal break): Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion, of size to conform to the extruded aluminum members or other locations where required, and having a minimum tensile strength of 14 MPa and Durometer A Hardness of 60, ± 5 .
- .11 Concealed flashing: manufacturer's standard corrosion resistant, non staining, non bleeding flashing compatible with adjacent materials.
- .12 Transition membranes: full-length mechanically anchored, extruded silicone rubber transition membrane to perimeter of frame profile to provide continuous air/vapour retarder to adjacent wall construction, compatible with adjacent materials and systems.

- .13 Gaskets: glazing gaskets shall be silicone-compatible EPDM to ASTM C864, with dimensional tolerances and durometer hardness and of suitable size and shape to meet the requirements of the specifications and their specific application, designed to remain flexible at low temperatures, and provides for silicone adhesion; heat-resistant where required due to proximity of heating units.
- .14 Isolation coating: alkali resistant bituminous paint.
- .15 Primer for ferrous metals: CISC/CPMA 2-75.
- .16 Zinc chromate primer, by PPG Industries, Inc. or similar.
- .17 Touch up primer for galvanized steel: organic zinc rich primer, by Sherwin Williams Company of Canada Ltd. or similar.
- .18 Insulation for miscellaneous voids and cavities: to Section 07 21 13 - Board Insulation or Section 07 21 16 - Blanket Insulation, selected as required to suit conditions and location, friction fit, or held in place by miscellaneous metal angle or sheet metal flashing, as required.
- .19 Flexible flashing, flexible air/vapour retarder:
 - .1 Flashing as recommended by the curtain wall manufacturer, compatible with adjacent materials and systems.
 - .2 Adhesive, tapes, primers and sealant: as recommended by the flexible flashing manufacturer.
- .20 Sheet metal air/vapour barrier to be bonded to glazing frame and extended behind mounting frame. Seal to maintain continuity of seal. Install flexible flashing with continuous metal retaining strip to lap to interior wall assembly.
 - .1 Sheet metal for metal air/vapour barriers and air seals: ASTM A653 / A853M, minimum 1 mm sheet steel, galvanized, stretcher levelled, minimum coating weight 380 g/m².
- .21 Sealants, including primer, joint filler: as specified in section 07 92 00, augmented as follows:
 - .1 Sealants used in structural joints shall have adequate strength to retain insulating units to the metal framing or each other under design conditions.

- .2 Sealants shall be from the same manufacturer for all work of this Section.
- .3 Materials used in the work shall be resistant to rodents, vermin, mildew, fungus and algae.
- .4 Components in contact with opacifying coat at glass spandrel panels:
 - .1 Contact the opacifying coating manufacturer for confirmation of compatibility of sealant to the coating.
 - .2 Use neutral cure silicone components only in spandrel cavity. Do not use neoprene gaskets or setting blocks etc..
 - .3 Contact the opacifying coat manufacturer for a list of approved compatible list of sealants and materials, and tapes and gaskets.
- .22 Flashing: matching aluminum flashing as recommended by manufacturer, and as follows:
 - .1 Flashing: roll formed aluminum, 0.5 mm thick, mill finish.
 - .2 Aluminum sheet to conform to Federal Specification QQ-A-359, Alloy 3003.
- .23 Insulating glass units: to Section 08 80 50 - Glazing.
- .24 Joint Sealants: to Section 07 92 00 - Joint Sealants.
- .25 Air barrier and vapour retarder: to Section 07 27 00.01 - Air Barriers and Vapour Retarders.

2.03 INSULATED SPANDREL PANELS

- .1 Spandrel Glass: Specified in Section 08 80 50.
- .2 Back Pan: Aluminum sheet in accordance with ASTM B209, 1.6 mm thickness, formed into a pan shape to fit into glazing throat with back of pan flush with inside face of back section.
- .3 Insulation: Rigid mineral fibre insulation, to Section 07 21 13 - Board Insulation, held in place with manufacturer's standard fixing system to back face of back pan.

2.04 ALUMINUM ENTRANCES

- .1 Aluminum Extrusions: as recommended by curtain wall manufacturer, and not less than 2.3 mm wall thickness at any location for the main frame and sash members.
- .2 Fasteners: Aluminum or nonmagnetic stainless steel aluminum-framed glass door members, trim hardware, anchors, and other components.
- .3 Anchors, Clips, and Accessories: Aluminum or nonmagnetic stainless steel, providing sufficient strength to withstand design pressures.
- .4 Reinforcing Members: Aluminum or nonmagnetic stainless steel, providing sufficient strength to withstand design pressures.
- .5 Weather Seals: Provide weather stripping with integral barrier fin or fins of semi rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- .6 Door stile and rail face dimensions of entrances shall match curtain wall framing. Provide manufacturer's heavy-duty commercial door adaptors.
- .7 Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 29 mm long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
- .8 Major portions of the door members to be 3.2 mm nominal in thickness and glazing molding to be 1.3 mm thick.
- .9 Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
- .10 Provide adjustable glass jacks to help center the glass in the door opening.
- .11 Hardware for Entrances: refer to Section 08 71 00 - Door Hardware and as follows:
 - .1 Door Push/Pulls, Butt Hinges, Mortise Locks: manufacturer's heavy-duty architectural hardware.
 - .2 Weather Seals: Manufacturer's standard replaceable components, and as follows:

- .1 Moulded neoprene meeting ASTM D2000 or moulded PVC meeting ASTM D2287.
 - .3 Door Bottoms/Sweeps: adjustable, automatic retractable door bottom.
 - .4 Keying as indicated in Section 08 71 00.
- .12 Submit hardware samples (1 of each type) to Departmental Representative for initial selection prior to ordering.

2.05 FABRICATION - GENERAL

- .1 Do not start fabrication until samples, shop and erection drawings have been reviewed.
- .2 Insofar as practical, execute fitting and assembly in the shop with the various parts or assemblies ready for erection at the building site.
- .3 Where possible, take field measurements and levels required to verify or supplement those shown on the drawings for the proper layout and installation of the work. Coordinate dimensional tolerances in adjacent building elements and confirm prior to the commencement of the Work.
- .4 Weld aluminum, where required, with inert metal arc equipment. Welders to qualify according to CSA W47.2. Make exposed welds continuous and flush with adjacent surface. Do not mar surface finishes with welds in back of exposed aluminum. Do not deform the exposed metal and finish way by welding.
- .5 Weld steel, where required, to CSA W59. Welded joints to be of adequate strength and durability with jointing tight and flush. Welders to be fully approved by the Canadian Welding Bureau and to comply with CSA W47.1. Where it is necessary to weld components already galvanized, remove galvanizing for 50 mm around weld.
- .6 If curtain wall framing extends up to top of roof parapets, the headrail and glazing cap shall be reinforced to withstand force from window cleaner's suspension chair ropes, which will extend over the top of the parapet and down the face of the building.

- .7 Make provisions in doors and frames to suit requirements of electrically operated hardware and security devices, as applicable, provided under other trades or sections. Blank, drill, reinforce and tap to receive hardware, security and electrical devices. Provide removable plates or knockouts for electrical contacts. Provide fish wires as required.
- .8 Equip perimeter framing with factory installed air and vapour barrier material as required for sealing to building air and vapour barrier, and as follows:
 - .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
 - .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

2.06 FABRICATION - FRAMING MEMBERS

- .1 Fabricate members to the profiles shown on the drawings. Wall thickness of extrusions to be as required to meet the design requirements. Frames that are to receive insulating glass units shall have a continuous thermal break.
- .2 Accurately machine file and fit, and rigidly frame together joints, corners and mitres. Match components carefully to produce perfect continuity of line and design. Make exterior joints watertight and interior joints airtight in accordance with specified allowances. Metal in contact to have hairline joints. Locations of exposed joints to be subject to the approval of the Consultant.
- .3 Sill Trim: Provide continuous extruded "U" trim to inside of bottom rail at each level with provision for receiving steel base and convactor covers, as detailed
- .4 Reinforce frames and assemblies by concealed means as necessary to meet the specified design requirements and as shown. Reinforcing to be hot-rolled mild steel and be securely anchored to horizontal and vertical members by approved positive mechanical means.

- .5 Seal hairline joints at junctions of frame members. Gun-inject sealant from inside ensuring a continuous seal of the joint. Ensure that bead in the glazing space does not impair seating of glazing materials. Remove excess sealant that is forced onto face of frame assembly.
- .6 Location of joints and pressure equalizing drain vents to be subject to consultant's acceptance.
- .7 Provide sheet continuous air/vapour barrier between framing and building structure. Overlap corner joints. Apply barriers and retain with continuous aluminum or galvanized steel plates or bars and non-corrosive mechanical fasteners. Where indicated, fill void between frame and other building components solid with foamed in place polyurethane foam insulation.
- .8 Develop drainage holes with moisture path to exterior.
- .9 Prepare components to receive anchor devices. Fabricate anchorage items.
- .10 Arrange fasteners, attachments, and jointing to ensure concealment from view.
- .11 Cope, notch and drill to provide minimum tolerance throughout system and to fit with hairline joints.
- .12 Conceal interconnecting members and fastenings in completed assembly. Provide pressure-equalizing holes in members and condensation drains.
- .13 Framing members and associated sealing shall combine to form airtight vapour barrier for entire interior skin of curtain wall system. Cooperate and coordinate with other sections to ensure continuous thermal and air barrier seal at interfaces with adjacent materials.
- .14 Provide for vertical expansions and construction joints as necessary and install air cut-offs in continuous vertical members to prevent stack effect of enclosed air columns.
- .15 Jointing and intersections of metals shall be accurately cut, fitted to a tolerance of 0.8 mm, in true planes with adequate concealed beads where required.

- .16 Fabricate expansion joints between mullion sections with formed extruded aluminum internal sleeve sections, secure to permit joint function and maintain true alignment of sections.
- .17 Fabricate sections to accommodate and interface with work of other trades by means of rabbets, interlocks, miscellaneous angles, trim and filler sections as required.
- .18 Fabricate mullions not less than one storey height with fully fashioned expansion joints adequate for expansion and contraction required. Avoid chimney effect inside mullions by stopping voids at each floor level with packing consisting of rigid insulation.
- .19 Brake form parapet caps and sills out of 3 mm thick aluminum sheet.
- .20 Reinforce mullions with structural steel sections where required with adequate anchorage to structure.
- .21 Provide internal reinforcement in horizontal window mullions to satisfy wind loads and to maintain rigidity.
- .22 Perform fitting and assembly of component parts in shop insofar as practicable. Work that cannot be permanently shop assembled shall be fitted, assembled, marked and disassembled to assure proper fitting in field. Identify shop assembled components on shop drawings for location and erection at site.
- .23 Isolate aluminum in contact with other metals, masonry, concrete, plaster or mortar to prevent corrosion.
- .24 Verify wall openings and adjoining air and vapour seal materials are ready to receive work of this section.
- .25 Beginning installation means acceptance of site conditions.
- .26 Provide airtight vapour seals in curtain wall framing.

2.07 FABRICATION - SPANDREL PANELS, FLASHINGS, AND ACCESSORIES

- .1 Spandrels to have insulated backup panels, complete with 75 mm thick insulation consisting of two layers. Secure insulation to aluminum liner with adhesive and spindle clips with black retainer discs, minimum two per board.

- .2 First layer of insulation to be 50 mm thick impaled on clips and secured with retainer discs. Second layer to be black-faced, secured to first with adhesive, uniformly spread over opposing faces. Align panels symmetrically with joints in line and tight together. Cut off ends of spindles just above discs. It is imperative that joints are tight so that edges do not show, if misaligned, caulk with black sealant. Similarly caulk perimeter edges. Appearance from outside shall be a consistent black colour.
- .3 Fabricate liner panel from not less than 1.6 mm thick aluminum sheet, with airtight seams, brake formed at the edges. Isolate dissimilar metal surfaces using isolation coating. Reinforce with aluminum sections as required for rigidity and to meet design criteria, and to eliminate noises due to thermal and air pressure changes.
- .4 Seal perimeter of liner panels with non-permeable sealant to maintain vapour retarder. Install weatherseal, rain deterrent and vent where detailed or recommended by manufacturer.
- .5 Reinforce liner panels where necessary to prevent undue deflection.
- .6 Provide sloping sills with high backs, to terminate curtain wall system at bottom. Brake form to detailed profiles.
- .7 Fabricate panels in manner to maintain complete thermal and vapour barrier seal at inner panel, yet to ensure moisture is drained to exterior.
- .8 Form aluminum flashings, copings and cap flashings as required. Reinforce edges of copings and caps.

2.08 FINISHES

- .1 Aluminum finishes:
 - .1 Exposed aluminum: refer to Exterior Materials and Finish Schedule.
 - .1 Anodized finishes: to Aluminum Association (AA) Architectural Class I.
 - .2 Unexposed aluminum: Mill finish.

- .2 Steel exposed to exterior conditions on cold-in-winter side of vapour barrier, but not exposed to view, shall be blast cleaned and hot dip galvanized in accordance with CAN/CSA G164, minimum coating mass 381 g/m². Thread dimensions to be such that nuts will thread over bolts without re-threading or chasing galvanized threads.
- .3 Galvanize after fabrication where possible. Follow standard precautions to avoid making the base metal brittle by over pickling, overheating or during galvanizing.
- .4 Colour appearance to be uniform with no variations detectable by the naked eye at a distance of 1525 mm under natural lighting.
- .5 Shop and touch up primer for steel components: SSPC 25 Paint red oxide.
- .6 Touch up primer for galvanized steel surfaces: SSPC 20 Paint zinc rich.
- .7 Concealed steel items: galvanized in accordance with ASTM A123 to 600 gm/m².
- .8 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum curtain wall installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Verify dimensions, tolerances, and method of attachment with other work.
 - .3 Verify wall openings and adjoining air barrier and vapour retarder materials are ready to receive work of this Section.
 - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 PREPARATION

- .1 Coordinate dimensions, tolerances, and method of attachment with other work.
- .2 Supply anchorage devices and inserts to the appropriate sections where required for building in or casting-in-place and instruct as to proper location and position. Anchors shall have three-way adjustments.
- .3 Remove dust and other loose material from openings.
- .4 Verify that surfaces are ready to receive work and floor-to-floor dimensions are as indicated on shop drawings.

3.03 INSTALLATION

- .1 Compliance: comply with AAMA CWG-1-89 and ASTM E2112 recommendations, and manufacturer's printed installation instructions, standard and job-specific details, and data sheets.
- .2 Use only concealed fasteners, type 304 or 316 stainless steel, unless otherwise specified.
- .3 Erect all work plumb and true and in proper alignment and relationship to established lines and grades.
- .4 Devices for anchoring the frame assemblies shall have sufficient adjustment to permit correct and accurate alignment. After alignment, positively secure anchorage devices to prevent movement other than those designed for expansion and contraction. Take into consideration climatic conditions prevailing at time of installation.
- .5 Perform welding and drilling of concrete as required to install fixings. Repair, concrete chipped by drilling or fixing operations.

- .6 Group components with shop applied finishes so that those that relate most closely to one another, with regard to colour and appearance, shall be installed adjacent to each other.
- .7 Coordinate work of this section with, and provide connection for, compartmentalization of air spaces provided under other sections.
- .8 Provide thermal insulation and air/vapour barriers compatible and continuous with adjacent thermal and air/vapour barrier systems.
- .9 Apply continuous butyl sealing tape between sheets at lap and between steel and other materials. Screw sheets to each other and metal framing with type 304 stainless steel sheet metal screws, 150 mm on centre maximum. Continuously seal perimeter of panels with tape and sealant. Place type 304 stainless steel washers over rubber washers under screw heads and cover with sealant to make fastenings air and vapour tight.
- .10 Seal joints of metal, apertures and protrusions of any kind with specified sealant to produce homogeneous air/vapour barrier seal. Joints shall be air, water and weathertight.
- .11 Apply a continuous bead of sealant to all joints and air/vapour barrier junctions with adjacent construction. Liberally butter screw fastenings with sealant.
- .12 Apply silicone sealant and foam rubber joint plugs (end dams) as required at frame corners to fill and seal the joinery.
- .13 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to concrete and masonry with adhesive and retain with continuous aluminum or stainless steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.
- .14 Provide airtight seals at penetrations in air/vapour barriers.
- .15 Apply insulation to the cold in winter side of air/vapour barriers. Ensure tight butt joints.

- .16 Adhere stick clips to metal air/vapour barriers at 300 mm on center both ways. As an alternative, gun weld pins to metal substrates in lieu of stick clips, provided clips do not easily break off and weld burn-through does not occur.
- .17 Support adhesive-applied clips in place until adhesive has set.
- .18 Isolate metal air/vapour barriers with thermal breaks and spacers.
- .19 Locate vapour barrier on the warm-in-winter side of the insulation.
- .20 Ensure a uniform, continuous thermal and vapour barrier effect. Where adjacent insulation and vapour barriers are to be provided under other sections, coordinate the work such that thermal and vapour barrier continuity is achieved. Ensure compatibility with adjacent thermal and air/vapour barrier systems. Ensure compatibility between tapes, sealants and air/vapour barriers.
- .21 Cut insulation as required and fit snugly to penetrations, obstructions, openings and corners. Butt insulation boards tightly. Cut out back of board insulation as required to accommodate substrate irregularities and build up over cut out areas on the other side as required to ensure thermal barrier uniformity unless otherwise approved.
- .22 Install insulation to thicknesses shown on the Drawings, or as required to achieve continuity of thermal insulation performance.
- .23 Press insulation boards firmly to barrier or substrate impaling them on clips without bending clips. Butt insulation boards tightly. Install retainers to clips.
- .24 Fill irregular shaped voids within assemblies with slag/rock mineral fibrous packing insulation to maintain continuity of thermal barrier.
- .25 Protect exterior finished surfaces by installing Snap-On caps only when building is closed in, and when the possibility of damage due to construction has been minimized, to the approval of the Consultant.

- .26 Provide structural steel framing and supports required to support work of this Section unless indicated to be supplied under other Sections. Provide structural steel support or reinforcement for anchorage of railings.
- .27 Supply and install galvanized formed steel coping supports.
- .28 Supply and install sheet waterproofing membrane at copings and parapets as indicated. Lap, adhere, and seal joints in membrane in accordance with recommendations of the membrane manufacturer to provide a watertight, continuous membrane.
- .29 Gun-apply three continuous beads of sealant under extruded aluminum thresholds. Make bead diameter sufficient to ensure a full width seal. Remove excess sealant.
- .30 Entrances:
 - .1 Comply with Drawings and manufacturer's printed installation instructions for installing aluminum swing entrance doors, manufacturer's architectural hardware, accessories, and other components.
 - .2 Install aluminum swing entrance doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
 - .3 Set sill threshold in bed of sealant, as indicated, for weather tight construction.
 - .4 Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.04 FIELD GLAZING

- .1 Install glass and insulating glass units to Section 08 50 00 - Glazing.

3.05 SEALANTS

- .1 Joint Sealants: to Section 07 92 00 - Joint Sealants.

3.06 SITE TOLERANCES

- .1 Erection tolerances for frame assemblies relate to the structural grid of the building and apply to each individual assembly as follows:
 - .1 Vertical position: +3 mm.
 - .2 Horizontal position: +3 mm.

- .3 Deviation from plumb: 3 mm maximum each plane.
- .4 Racking of face: 6 mm maximum.
- .5 Racking in elevation: Nil.
- .6 Offset from true alignment between two identical members abutting end to end in line: 0.8 mm.
- .7 Tolerances shall not be accumulative.
- .8 Erection tolerances for operable elements: consistent with smooth operation and weatherproof performance.

3.07 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written reports from manufacturers of curtain wall and glass verifying compliance of Work in handling, installing, applying, protecting and cleaning of products, and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.
 - .2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Ensure manufacturer's representative of curtain wall and of glass is present before and during critical periods of installation and construction of field joints.
 - .4 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Once during progress of Work at 50% complete.
 - .3 Upon completion of Work after cleaning is carried out.

3.08 ADJUSTING

- .1 Adjust operating entrances, hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.
- .2 Replace defective materials and materials damaged due to faulty installation, careless handling or other causes resulting from work of this section.

- .3 Upon completion of the work and just prior to final review, or at a time as directed, inspect units for damage and correct same immediately.
- .4 Test and adjust hardware and replace or repair faulty items.
- .5 Adjust weather-stripping to leave each opening unit in its most watertight position.
- .6 Test operable elements and ensure easy and smooth operation.

3.09 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove protective material from prefinished aluminum surfaces.
 - .3 Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
 - .4 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
 - .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 06 20 00 - Rough Carpentry.
- .2 Section 07 27 00.01 - Air Barriers and Vapour Retarders.
- .3 Section 07 61 00 - Sheet Metal Roofing.
- .4 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 - Joint Sealants.
- .6 Section 08 50 80 - Glazing.

1.02 REFERENCES

- .1 ASTM International (ASTM)
 - .1 B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .2 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED® Canada 2009 Rating System, LEED® Canada for New Construction and Major Renovations.
- .3 CSA Group (CSA)
 - .1 CAN/CSA A440.4-07 (R2016), Window, Door, and Skylight Installation.
 - .2 CSA A440-11 (R2016), NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014), Update No. 2 (2017).
 - .3 CSA A440S1-17, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2011, Adhesives and Sealants Applications.

1.03 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for skylight, frame, fasteners, and caulking and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings and indicate size and description of components, materials, attachment devices, description of frame and finish, construction details, methods of tying-in and connecting to adjacent assemblies, and how continuity of air barrier, vapour retarder and waterproofing will be achieved.
- .4 Samples for Selection: Manufacturer's color charts showing a full range of colours available for each type of skylight glazing and aluminum finish.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturers Reports:
 - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.
- .7 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .8 Sustainable Design Submittals:
 - .1 LEED Canada- Section 01 35 21 - LEED Requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

- .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
- .4 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants and paints and coatings used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for skylights for incorporation into manual.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect skylights and frames from damage and nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.07 WARRANTY

- .1 For the work of this Section, the 12 month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- .1 General: Provide unit skylights capable of withstanding all loads as defined by National Building Code of Canada and authorities having jurisdiction.
- .2 Units shall be tested to CSA A440 and CSA A440S1, and shall be demonstrated to meet or exceed National Building Code and National Energy Code requirements; provide units meeting or exceeding the following minimum Performance Grade: PG80.

2.02 MATERIALS

- .1 Curb Frame: Bright white high performance PVC with Bronze cap stock and minimum effective external wall thickness of 1.5 mm. Provide integral condensation gutter system with corners fully welded for waterproof quality.
- .2 Retainer Frame: Extruded aluminum alloy 6063-T5 (minimum), to ASTM B221, with minimum effective thickness of 1.5 mm.
- .3 Curbs: Minimum 38 mm wide field-built or pre-fabricated curb.
- .4 Thermal Break: Fabricate skylight units with thermal chambered PVC frame.
- .5 Fasteners: to ASTM F1667, double hot dipped galvanized steel or Type 316 stainless steel.

2.03 INSULATING GLASS SKYLIGHT UNITS

- .1 General: Factory-assembled, curb-mounted unit consisting of insulating glass, gaskets, and inner frame designed to mount on separate curb.
- .2 Products: Provide Model GSM meeting the requirements of this section.

- .3 Curb: Minimum 38 mm wide field-built or pre-fabricated curbs.
- .4 Condensation Control: Fabricate skylight units with integral internal gutters to collect condensation.
- .5 Thermal Break: Fabricate skylight units with thermal chambered PVC.
- .6 Shape and Size: as indicated.
- .7 Insulating Glass: Type 'SKL' in accordance with Section 08 80 50.

2.04 FABRICATION

- .1 Framing Components: As follows:
 - .1 Factory fit and assemble components.
 - .2 Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - .3 Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.
 - .4 Fabricate components to ensure that glazing is thermally and physically isolated from framing members.
 - .5 Fit and secure PVC frame joints by thermal welding.
 - .6 Fit and secure aluminum retainer joints with corner keys.

2.05 ACCESSORIES

- .1 Joint Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168, and complying with Section 07 92 00 - Joint Sealants.

2.06 ALUMINUM FINISHES

- .1 General: Comply with NAAMM "Metal Finishes Manual" recommendations for application and designations of finishes.
- .2 Finish designations prefixed by AA conform to the system for designations of aluminum finishes established by the Aluminum Association.
 - .1 Clear-Anodized Finish, Class I: AA-C22A41 complying with AAMA 611.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for plastic skylights installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 INSTALLATION

- .1 Compliance:
 - .1 Comply with manufacturer's printed preparation and installation instructions, technical datasheets, assembly and installation illustrations, and guide specifications.
 - .2 Installation shall meet or exceed CAN/CSA A440.4 guidelines.
- .2 Coordinate with installation of roof deck, other substrates to receive skylight units, and adjacent construction.
- .3 Coordinate with installation of vapour retarders and air barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- .4 Counterflashing: install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- .5 Erect components plumb, level and in proper alignment.
- .6 Ensure continuity of enclosure air barrier and vapour retarder systems.

- .7 Secure preformed curb assembly to structure, or build in place as required.
- .8 Adjust and seal assembly with provision for expansion and contraction of components.
- .9 Secure and seal frame to curb.

3.03 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.
- .2 Manufacturer's Field Services:
 - .1 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .2 Ensure manufacturer's representative is present before and during critical periods of installation construction of field joints and testing.
 - .3 Schedule site visits:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove protective film from plastic surfaces.
 - .3 Clean interior and exterior plastic surfaces in accordance with manufacturers' instructions.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

PSPC

Green Gables-Phase 2

New Visitors Centre

Queens Co., PEI

Project No. R.081199.001

Section 08 63 25

FIXED-CURB METAL-FRAMED SKYLIGHTS

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- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.05 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 06 10 00 - Rough Carpentry.
- .3 Section 07 84 00 - Fire Stopping.
- .4 Section 08 11 00 - Metal Doors and Frames.
- .5 Section 08 14 16 - Flush Wood Doors.
- .6 Section 08 35 16 - Side Folding Grilles.
- .7 Section 08 42 29 - Automatic Entrances.

1.02 REFERENCES

- .1 ANSI A117.1 - American National Standard for Accessible and Useable Buildings and Facilities.
- .2 ANSI/BHMA A156.1, "Butts and Hinges" (copyrighted by BHMA, ANSI approved).
- .3 ANSI/BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches.
- .4 ANSI/BHMA A156.4 - American National Standard for Door Controls - Closers.
- .5 ANSI/BHMA A156.6, "Architectural Door Trim" (copyrighted by BHMA, ANSI approved).
- .6 ANSI/BHMA A156.7, "Template Hinge Dimensions" (copyrighted by BHMA, ANSI approved).
- .7 ANSI/BHMA A156.8, "Door Controls - Overhead Holders" (copyrighted by BHMA, ANSI approved).
- .8 ANSI/BHMA A156.13 - American National Standard for Mortise Locks and Latches Series 1000.
- .9 ANSI/BHMA A156.15 - Life Safety Closer/Holder/Release Devices.
- .10 ANSI/BHMA A156.16 - Auxiliary Hardware.
- .11 ANSI/BHMA A156.18 - Materials and Finishes.

- .12 ANSI A156.28 - American National Standard for Keying Systems
- .13 NFPA 80 - Standard for Fire Doors, Fire Windows.
- .14 NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- .15 Underwriters Laboratories (UL). - Fire Resistance Directory.
- .16 ANSI/UL 10C - Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.
- .17 NBC - National Building Codes or Canada

1.03 PERFORMANCE REQUIREMENTS

- .1 Fire Rated Openings: Provide door hardware listed by UL or Intertek Testing Services (Warnock Hersey Listed), or other testing laboratory approved by applicable authorities.
 - 1. Comply with NFPA 80 for fire ratings indicated, based on testing according to NFPA 252.
 - 2. Comply with UL10C, Positive Pressure Fire Tests of Door Assemblies.
- .2 Accessibility Requirements: Comply with requirements of Local building code, and Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities.

1.04 ACTION AND INFORMATION SUBMITTALS

- .1 Submit under provisions of Section 010000.
- .2 Product Data: Manufacturer's catalog cuts on each product to be used.
- .3 Shop Drawings: Indicate locations and mounting heights of each type of hardware, schedules, electrical characteristics and connection requirements.
- .4 Schedule:
 - 1. Submit schedule indicating each type of hardware for each door.
 - 2. List manufacturer's name with each manufacturer's hardware number together with finishes in US standards.
 - 3. Show door number/location, handing, door and frame material, manufacture and catalog numbers, all finishes and keying information. Explain fully all abbreviations.

- .5 Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware.
 - 2. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cut-outs for hardware.
 - 3. Detail any conditions requiring custom extended lip strikes, or any other special or custom conditions.
 - 4. Wiring diagrams including point to point and riser diagrams, function statements and system descriptions for all electrical hardware

- .6 Verification Samples: For each finish product specified.
 - 1. If required by the Architect, submit one sample of each type of typical hardware required illustrating style, color, and finish.
 - 2. Approved samples may be incorporated into Work.

- .7 Closeout Submittals:
 - 1. Project Record Documents: Schedule showing actual locations of installed cylinders and their master key code.
 - 2. Parts lists and maintenance instructions including data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 3. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.05 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: A manufacturer with a minimum of ten years experience manufacturing door hardware.

- .2 Supplier Qualifications: A supplier with a minimum of two years demonstrated experience in the sale and distribution of builders' hardware for commercial projects and who has successfully completed at least three projects of similar complexity to the project specified.

- .3 Hardware Supplier Personnel: Employ Architectural Hardware Departmental Representative (AHC) or equally qualified person to supervise and prepare all schedules, details, and services required for the project.

- .4 Hardware Supplier: to provide 3 job site visits for inspection of the hardware. One is before the hardware is installed, the second one is during the install and the last one is on completion of the install. Each inspection is to have a certified AHC complete the inspection and report any issues at the time of inspection.

1.06 DELIVERY, STORAGE, AND HANDLING

- .1 Package hardware items individually with necessary fasteners and installation templates when necessary; label and identify each package with door opening code to match hardware schedule.
- .2 Store products in manufacturer's unopened packaging until ready for installation.
- .3 Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- .4 Store materials in a dry, warm, ventilated weathertight location.

1.07 PROJECT CONDITIONS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- .1 Provide factory warranty against defects in material and workmanship as follows:
 - 1. Overhead Surface Closers, Grade 1, 25 Year Warranty.
 - 2. Mortise locks, Grade 1, 10 Year Warranty.

1.09 MAINTENANCE MATERIALS

- .1 Provide special wrenches and tools applicable to each different or special hardware component.

1.10 COORDINATION

- .1 Coordinate work with other directly affected components involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
- .2 Coordinate work with other directly affected components involving electrical wiring and components.

2 PRODUCTS

2.01 HINGES AND PIVOTS

- .1 Hinges: ANSI A156.1, full mortise template type complying with following general requirements unless otherwise scheduled.
 1. Widths: Sufficient to clear trim projection when door swings 180 degrees.
 2. Number: Furnish minimum three hinges to 90 inches (2286 mm) high, four hinges to 120 inches (3048 mm) high for each door leaf.
 - a. Fire Rated Doors to 86 inches (2184 mm) high: Minimum three ball bearing hinges.
 - b. Residential Wood Doors: Furnish minimum two hinges.
 3. Size and Weight: 4-1/2 inch (114 mm) heavy weight typical for 1-3/4 inch (44 mm) doors.
 - a. Doors over 40 inches (1 016 mm) wide: Extra heavy weight ball or oilite bearing hinges.
 - b. Doors 1-3/8 inch (35 mm) Thick: 3-1/2 inch (89 mm) size.
 - c. Doors 2 inch (50 mm) Thick: 5 inch (125 mm) extra heavy weight ball or oilite bearing.
 - d. Doors over 48 inches (1 220 mm) wide: 5 inch (125 mm) extra heavy weight ball or oilite bearing.
 4. Pins: Furnish nonferrous hinges with non-removable pins (NRP) at exterior and locked outswinging doors, non-rising pins at interior doors.

2.02 MORTISE LOCKSETS AND DEADBOLTS

- .1 Lockset: ML9000 Series.
 1. Standards:
 - a. ANSI Conformance - ANSI A156.13, Operational Grade 1, Security Grade 1.
 - b. U.L. and C.U.L. listed for use on 3-hour fire-rated doors and for all positive pressure applications.

- c. U.L. and C.U.L. listed for UL 10B/10C.
- d. Lever trim meets A117.1 and ADA requirements.
- 2. Features:
 - a. Stainless steel latch.
 - b. Stainless steel dead bolt.
 - c. Hardened steel rollers in dead bolt.
 - d. Security spacer between inside and outside lever.
 - e. Steel lock case and internal components.
 - f. Full length face plate.
 - g. All trim through-bolted through the lock case.
 - h. Accepts interchangeable core cylinders.
- 3. Function:
 - a. As noted on the hardware schedule attached to this section.

2.03 KEYING

- .1 Keying:
 - 1. Keying: Provide master keyed Dorma Series as directed by architect.
 - 2. Construction keyed
- .2 Keys:
 - 1. Nickel silver. Stamp keys with "DO NOT DUPLICATE".
 - 2. Supply keys in the following quantities:
 - a. 15 construction keys.
 - b. 2 keys for every cylinder.
 - c. 6 master and sub-master keys

2.04 SURFACE DOOR CLOSERS

- .1 Closers used in conjunction with overhead stops and holders shall be templated and coordinated to function properly. Properly detail closers to meet application requirements by providing drop plates, brackets, etc. to meet application and installation requirements as indicated.
- .2 8900/8600 Series: ANSI A156.4, Grade 1, heavy duty surface door closer.
 - 1. Model 8916 for interior and exterior applications features adjustable spring sizes from 1 to 6 and meets ANSI A117.1 and ADA for barrier-free accessibility.
 - 2. Compliant with UL10C for positive pressure.
 - 3. Certified to 10 million cycles by a recognized test lab.
 - 4. Non-handed.

5. Featuring full range spring power adjustment and backcheck, with a narrow projection full cover and flatform style arm.
6. Door control also features a backcheck positioning adjustment for parallel arm applications, to maintain an ANSI backcheck range similar to regular and top jamb applications.
7. Independent sweep and latch non-critical closing speed adjustment.

2.05 MISCELLANEOUS TRIM

- .1 Push/Pulls: ANSI A156.6; push plates minimum 0.050 inch (1.27 mm) thick.
 1. Type:
 - a. Provide as indicated on the Schedule.
 2. Size: Push plates shall be ANSI J302, size 4 inches (102 mm) by 16 inches (406 mm), thickness .050 inch.
 3. Size: Pull plates shall be ANSI J405, size 4 inches (102 mm) by 16 inches (406 mm), thickness .050 inch.
 4. Cut plates for cylinder or thumb piece when used with deadlock.
 5. Provide with through bolts to secure from opposite door face.
 6. Finish: As specified in the Door Hardware Schedule.
- .2 Flush Bolts: ANSI A156.16 Grade 1 top and bottom flush bolts, with dust-proof floor strike.
 1. Provide as indicated on the Schedule.
 2. Finish: As specified in the Door Hardware Schedule.
- .3 Kickplates, Mop Plate, Armor Plates: ANSI A156.6, metal; height indicated in Schedule by 1 inch (25 mm) less than door width:
 1. Provide as indicated on the Schedule.
- .4 Stops: Provide for all doors to control the desired limit of opening helping to prevent damage to adjacent walls, columns, equipment, the door or its hardware
 1. Provide floor or wall stops when overhead stops have not been listed except in areas where their location would impede traffic. Stops of correct height shall be used on exterior and interior doors.
 2. Doors with surface closers may be provided with S-DS or S-IS dead stop arms

3. Use roller type stops in areas where the interfering swing of one door may cause damage through contact with another door.
4. Wall Stops: ANSI A156.1, Grade 1, with no visible screws:
 - a. Provide as indicated on the Schedule.
 - b. Finish: As specified in the Door Hardware Schedule.
5. Floor Stops: ANSI A156.1 Grade 1:
 - a. Provide as indicated on the Schedule.
 - b. Finish: As specified in the Door Hardware Schedule.

3 EXECUTION

3.01 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 Verify doors and frames are ready to receive door hardware and dimensions are as indicated on shop drawings.
- .3 Verify electric power is available to power operated devices and is of correct characteristics.
- .4 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Coordinate mounting heights with door and frame manufacturers. Use templates provided by hardware item manufacturer.
- .3 Install with fasteners provided by hardware item manufacturer.
- .4 Adjust hardware for smooth operation.

3.03 PROTECTION

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

3.04 DOOR HARDWARE SCHEDULE

Hardware Group 1, (E100)

2-Continuous Hinges, LS300 32D (sized to suit)
2-Exit Devices, 9400 YL114A09C 630
2-Cylinders SFIC, type to suit
2-Door Closers, 8916 AF89J BP89 689
2-OH Stops, 1022 32D
2-Kickplates, CBH 903 32D (10in x size to suit)
1-Threshold, DS178N (sized to suit)
1-Weather Seal, DS130C (size to suit)
1-Meeting Style, DS163C (sized to suit)
2-Door Sweeps, DS148C (size to suit)

Hardware Group 2, (E100A)

6-Hinges, PBB BB81 4-1/2x4 652
2-Exit Devices, 9400 YL114A23 630
2-Door Closers, 8616 AF86 689
2-Floor Stops, CBH 157 26D
2-Kickplates, CBH 903 32D (10in x size to suit)

Hardware Group 3, (E101)

6-Hinges, PBB BB81 4-1/2x4 652
2-Flush Bolts, 1855S
1-Lockset, M9080 L114A 626
1-Cylinder SFIC, type to suit
1-Door Closer, 8616 AF86 689
2-Floor Stops, CBH 157 26D

Hardware Group 4, (E102, E105)

3-Hinges, PBB BB81 4-1/2x4 652
1-Lockset, M9080 L114A 626
1-Cylinder SFIC, type to suit
1-Door Closer, 8616 AF86P 689 (mounted inside room area)
1-Smoke seal, DS44D (sized to suit)
1-Floor Stop, CBH 157 26D

Hardware Group 5, (E103)

3-Hinges, PBB BB81 4-1/2x4 652
1-Lockset, M9080 L114A 626
1-Cylinder SFIC, type to suit
1-Door Closer, 8616 SISJ 689
1-Floor Stop, CBH 157 26D

Hardware Group 6, (E104, E108, E116A)

3-Hinges, PBB BB81 4-1/2x4 652
1-Privacy Indicator Lockset, M9996 L114A 626
1-Kickplate, CBH 903 32D (10in x size to suit)
1-OH Stop, 1022SA 32D

Hardware Group 7, (E109A, E109B, E113A, E113B, E115A, E118A, E119A, E120A)

3-Hinges, PBB BB81 4-1/2x4 652
1-Lockset, M9070 L114A 626
1-Cylinder SFIC, type to suit
1-Door Closer, 8616 AF86P 689 (mounted inside room area)
1-Floor Stop CBH 157 26D

Hardware Group 8, (E122A)

6-Hinges, PBB BB81 4-1/2x4 652
2-Door Pulls, M9001 L114A 626
2-Roller Latches, 1891 32D
2-OH Stops, 4423 32D

Hardware Group 9, (E111B, E144A, E114B)

1-continuous Hinge, A110HD AL
1-Exit Device, CD9700 Z11403R 630
1-Door Closer, 8916 SISJ BP89 689
1-Threshold, DS5000 (sized to suit)
1-Weather Seal, DS130C (size to suit)
1-Door Sweep, DS148C (size to suit)

Hardware Group 10, (E110A, E110B)

1-Cylinder SFIC, type to suit
All other hardware items supplied by door supplier.

Hardware Group 11, (E109C, E119B)

1-Continuous Hinge, LS300 32D (sized to suit)
1-Lockset, M9080 L114A 626
1-Cylinder SFIC, type to suit
1-Door Closer, 8916 AF89J BP89 689
1-OH Stop, 1022 32D
1-Kickplate, CBH 903 32D (10in x size to suit)
1-Threshold, DS178N (sized to suit)
1-Weather Seal, DS130C (size to suit)
1-Door Sweep, DS148C (size to suit)

Hardware Group 12, (E111A, E111C, E114C)

1-Full Breakout Automatic Sliding Door System, ESA300 Bi-Part
1-Keyswitch, RCI960-MA-DMA 28
1-Cylinder SFIC, type to suit
2-Sensing Devices, DX3343-010
1-Threshold, DS6000 (sized to suit)

Hardware Group 13, (E121A, E121B)

6-Hinges, PBB BB81 4-1/2x4 652
2-Flush Bolts, 1855S
1-Lockset, M9080 L114A 626
1-Cylinder SFIC, type to suit
2-OH Stops, 1022 32D

Hardware Group 14, (E117A)

3-Hinges, PBB BB81 4-1/2x4 652
1-Lockset, M9070 L114A 626
1-Cylinder SFIC, type to suit
1-OH Stop, 1022 32D

Hardware Group 15, (E110C, E121C, E121D)

2-Continuous Hinges, A110DH AL
2-Exit Devices, CD9800 Z114A03R
4-Cylinders SFIC, type to suit
2-Door Closers, 8916 SISJ BP89 689
1-Threshold, DS5000 (sized to suit)
1-Weather Seal, DS130C (size to suit)
2-Door Sweeps, DS148C (size to suit)
Meeting Styles provided by door supplier.

Door Number and Hardware Group Schedule

Door #	Hardware Group #
E100	1
E100A	2
E101	3
E102	4
E103	5
E104	6
E105	4
E108	6
E109A	7
E109B	7
E109C	11
E110A	10
E110B	10
E110C	15

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E114C	12
E115A	7
E116A	6
E117A	14
E118A	7
E119A	7
E119B	11
E121A	13
E121B	13
E121C	15
E121D	15
E122A	8

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 05 73 13 - Glazed Decorative Metal Railings.
- .2 Section 08 11 00 - Metal Doors and frames.
- .3 Section 08 14 16 - Flush Wood Doors.
- .4 Section 08 42 29 - Automatic Entrances.
- .5 Section 08 63 25 - Fixed-Curb Metal-Framed Skylights.

1.02 REFERENCES

- .1 ASTM International
 - .1 ASTM C542 05 (2011), Specification for Lock Strip Gaskets.
 - .2 ASTM D790 10, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .3 ASTM D1003 11, Test Method for Haze and Luminous Transmittance of Plastics.
 - .4 ASTM D1929 11, Test Method for Determining Ignition Temperature of Plastics.
 - .5 ASTM D2240 05(2010), Standard Test Method for Rubber Property Durometer Hardness.
 - .6 ASTM E84 11a, Test Method for Surface Burning Characteristics of Building Materials.
 - .7 ASTM E330 02(2010), Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .8 ASTM C1503-08, Standard Specification for Silvered Flat Glass Mirror.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 12.1 M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB 12.3 M91, Flat, Clear Float Glass.
 - .3 CAN/CGSB 12.8 97 AMEND, Insulating Glass Units.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).

- .2 CSA A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14.
- .3 CAN/CSA A440.4-07 (R2012) - Window, Door, and Skylight Installation
- .4 CSA Certification Program for Windows and Doors 2000
- .4 Environmental Choice Program (ECP)
 - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .5 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual (50th Anniversary Edition).
 - .2 GANA Laminated Glazing Reference Manual (2009 edition).
 - .3 GANA Guide to Architectural Glass (2010).

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 2 weeks prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.
- .2 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions.
- .3 Hold project meetings weekly. Ensure key personnel, site supervisor, project manager, and affected subcontractor representatives attend.
- .4 Departmental Representative will submit written notification of change to meeting schedule established upon contract award 48 hours prior to scheduled meeting.

1.04 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300 mm x 300 mm size samples of glass products and insulating glass units.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Submit testing and analysis of glass under provisions of Section 01 45 00 - Quality Control.
 - .2 Submit shop inspection and testing for glass.
- .6 LEED Submittals:
 - .1 At project start-up meeting, submit LEED® Conformance Submittals for the following: Low VOC Content.
 - .2 Submit LEED submittal form for Credit EQ 4.1 - Low Emitting Materials, Adhesives and Sealants in accordance with Submit required documents in accordance with Section 01 33 29 - General LEED Requirements. Indicate the following:
 - .1 Sealants: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.
 - .2 Adhesives: Documentation identifying that VOC content is less than the VOC limits of State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168.

1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.06 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Provide testing and analysis of glass under provisions of Section 01 45 00 - Quality Control.
 - .2 Provide shop inspection and testing for glass if requested by Departmental Representative.

1.07 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect glazing and frames from damage.
 - .3 Protect prefinished aluminum surfaces with wrapping or strippable coating.
 - .4 Replace defective or damaged materials with new.

1.08 AMBIENT CONDITIONS

- .1 Ambient Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

- .1 Provide manufacturers guarantee for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work.
 - .1 Sealed Glass Units: Replace units that exhibit failure of hermetic seal under normal use evidenced by partial or complete obstruction of vision by dust, moisture, or film on interior surface of glass: 2-Years from date of Contract Completion

2 PRODUCTS

2.01 MATERIALS

- .1 Required Edge Treatments:
 - .1 Concealed edges: flat belt ground and seamed.
 - .2 Structural Silicone Glazed (SSG) edges: flat belt ground and seamed.
 - .3 Butt joined edges with silicone seal: flat ground with arris.
 - .4 Exposed edges: flat polish with arris.
- .2 Design Criteria:
 - .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follows:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.
 - .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

.3 Flat Glass:

- .1 Type 'LT': laminated tempered glass. to CAN/CGSB 12.1, transparent, glazing quality, 6 mm minimum thickness overall; 3 mm each pane.
 - .1 Type: 2 tempered laminated.
 - .2 Class: B float.
 - .3 Category: II - 540 J impact resistance.
 - .4 Edge treatment: Polished.
- .2 Type 'T': tempered glass to CAN/CGSB 12.1, transparent, glazing quality, 6 mm minimum thickness.
 - .1 Type: 2 tempered laminated.
 - .2 Class: B float.
 - .3 Category: II - 540 J impact resistance.
 - .4 Edge treatment: Polished
- .3 Type 'SG': spandrel glass, to CAN/CGSB 12.9, glazing quality, 6 mm minimum thickness.
 - .1 Type: 1-Tempered, to CAN/CGSB 12.1.
 - .2 Class: A-Float.
 - .3 Style: 1-Ceramic Frit (on 2nd surface).
 - .4 Form: M-Monolithic.
 - .5 Colour and Pattern: as selected by Departmental Representative from manufacturer's full range; submit colour charts for initial selection prior to ordering materials.
- .4 Type 'M': silvered mirror glass, to ASTM C1503, mirror quality, 6 mm minimum thickness.
 - .1 Type: 3A-Tempered.
 - .2 Tint: clear.
- .5 Type 'LE': Low-emissivity (LOW-E) coating; Design Concept: Low-E coating on 2nd surface, argon gas filled insulating glass units having the following minimum performance values based on clear + clear glass, each pane 6 mm thick, overall thickness 25 mm:
 - .1 Canadian ENERGY STAR® certified.
 - .2 Cradle-to-Cradle Certified^{cm}.
 - .3 Ultraviolet Transmittance: ≤19%.
 - .4 Visible light transmittance: ≥70%.
 - .5 Solar heat gain coefficient (SHGC): ≤0.38.
 - .6 U-Factor:
 - .1 Winter nighttime u-value: ≤0.29.
 - .2 Summer daytime u-value: ≤0.27.
 - .7 Shading coefficient: ≥0.44.
 - .8 Light to Solar Gain (LSG): ≥1.85.

2.02 SEALED INSULATING GLASS

- .1 Type 'INS': Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB 12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA) - submit certification numbers for each unit supplied to Departmental Representative. Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:
 - .1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.
 - .2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.
 - .3 Outboard pane: Type 'T' clear tempered glass, 6 mm thick, with Type LE1(Low-e) coating on 2nd surface.
 - .4 Inter cavity space: 13 mm space with low-conductivity spacers.
 - .5 Inert gas fill: ≥95% argon filled.
 - .6 Inboard pane: Type 'T' clear tempered glass, 6 mm thick.
- .2 Type 'SKL': Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB 12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:
 - .1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.
 - .2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.
 - .3 Outboard pane: Type 'T' clear tempered glass, 6 mm thick, with Type LE1(Low-e) coating on 2nd surface.
 - .4 Inter cavity space: 13 mm space with low-conductivity spacers.
 - .5 Inert gas fill: ≥95% argon filled.
 - .6 Inboard pane: Type 'LT' clear laminated tempered glass, overall 6 mm thick.

2.03 ACCESSORIES

- .1 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .2 Glazing sealant: Type as recommended by glazing manufacturer as required to meet or exceed performance requirements. Verify compatibility with insulating glass unit secondary sealant.
- .3 Sealant for glazing between edges of glass units: one-component silicone base, non-acidic, non-corrosive qualifying to ASTM C920, and commercially manufactured and designed for structural silicone glazing (SSG)
- .4 Setting blocks: Neoprene, 80 90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .5 Spacer shims: Neoprene, 50 60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .6 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10 15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.
- .7 Glazing compound for fire rated glazing materials:
 - .1 Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2%, designed for compression of 25% to effect an air and vapour seal.
 - .2 Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50% in both extension and compression (total 100%); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.
 - .3 Setting Blocks: Hardwood, glass width by 100 mm x 5 mm thick.

- .4 Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
- .5 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.
- .8 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, black colour.
- .9 Glazing clips: manufacturer's standard type.
- .10 Lock-strip gaskets: to ASTM C542.
- .11 Other Glazing Accessories: to CAN/CSA A440.
- .12 Screws, bolts and fasteners: ASTM F738M; Type 304 stainless steel.
- .13 Glass presence markers: easily removable, non-residue depositing.
- .14 Mirror attachment accessories:
 - .1 Stainless steel edge clips, with fastening concealed behind mirror.

2.04 FABRICATION

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass light with maker's name, weight, quality, type and certification number. Do not remove labels until after work has been reviewed by Departmental Representative.
- .3 Accurately size glass to fit openings allowing the clearances shown on the following table:

Glass Thickness	Minimum Edge Clearance	Minimum Face Clearance
2 mm	3 mm*	1.5 mm
3 mm	3 mm*	3 mm
4 mm	3 mm*	3 mm
5 mm	6 mm*	3 mm
6 mm	6 mm	3 mm
over 6 mm	6 mm or 75% of the glass thickness, whichever is greater	

* = where any dimension of glass exceeds 760 mm increase minimum edge clearance by 1.5 mm.

- .4 Bite of glass edge in stop:
 - .1 Up to 1270 mm united size: 10 mm minimum.
 - .2 Over 1270 mm united size: 13 mm minimum.

3 EXECUTION

3.01 COMPLIANCE

- .1 Install work in accordance with the Quality Management provisions specified in this section and manufacturer's written instructions.
- .2 Size glass to Building Code requirements and verify glass for openings are correctly sized and are within allowable tolerances. Install glass with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .3 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

3.02 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
 - .1 Verify that openings for glazing are correctly sized and within tolerance.
 - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
 - .3 Visually inspect substrate in presence of Departmental Representative.
 - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .5 Proceed with installation only after unacceptable conditions have been remedied.
 - .6 Commencement of work means acceptance of conditions.

3.03 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.04 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

- .1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .3 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.
- .4 Place setting blocks at 1/3 points, with edge block maximum 150 mm from corners.
- .5 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- .6 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.
- .7 Trim protruding tape edge.

3.05 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/3 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

- .5 Place glazing tape on free perimeter of glazing in same manner described.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .1 Remove traces of primer, caulking.
 - .2 Remove glazing materials from finish surfaces.
 - .3 Remove labels.
 - .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.12 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 After installation, mark each light with an "X" by using removable plastic tape or paste.
 - .1 Do not mark heat absorbing or reflective glass units.
- .3 Repair damage to adjacent materials caused by glazing installation.

3.13 SCHEDULE

- .1 Interior doors: Type 'T' monolithic glass units.
- .2 Exterior doors and windows: Type 'INS' insulating glass units.
- .3 Curtain wall spandrel panels: Type 'SG' monolithic glass units.
- .4 Skylights: Type 'SKL' insulating glass units.
- .5 Mirrors: Type 'M' monolithic glass units.

END OF SECTION