

1 General

1.1 **SUMMARY**

.1 Section Includes

- .1 Labour, Products, equipment and services necessary to complete the Work of this section.
- .2 This section shall be read in conjunction with Appendix A City of Toronto Corporate Building System Design Requirements. Appendix A shall take precedence where there is a conflict in this Section.

1.2 **REFERENCES**

.1 Conform to the latest edition of the following:

- .1 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass
- .2 CAN/CGSB-12.10-M, Glass, Light and Heat Reflecting
- .3 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint
- .4 CAN/CSA G40.20/ G40.21-M, Welded Structural Quality Steel/Structural Quality Steels
- .5 CAN/CGSB 19.24-M, Multi-Component, Chemical-Curing Sealing Compound
- .6 ASTM A446/A446M, Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hop Dip Process, Structural (Physical) Quality
- .7 NAAMM AMP-505, The National Association of Architectural Metal Manufacturers, Applied Coatings
- .8 NAAMM AMP-501, The National Association of Architectural Metal Manufacturers, Finishes for Aluminum
- .9 AODA - Accessibility for Ontarians with Disabilities Act
- .10 NECB, "National Energy Code of Canada for Buildings"
- .11 ASHRAE 90.1, "Energy Standard for Sites and Buildings Except Low-Rise Residential"
- .12 OBC SB-10, "Energy Efficiency Requirements"
- .13 GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's Glazing Manual."
- .14 AAMA Publications: AAMA GD5G-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
- .15 IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
- .16 IGMA Publication for Insulating Glass: IGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- .17 NFRC 100, "Procedure for Determining Fenestration Product U-Factors"

- .18 NFRC 200, "Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and VLT

1.3 **SUBMITTALS**

.1 Samples

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit duplicate sample sections of all component parts of entrances, curtain wall, windows, glass and spandrel panels, finished in specified colours. Sizes of samples as follows:
 - .1 Extruded shapes: 300 mm
 - .2 Each type of glass: 300 mm square

.2 Shop Drawings

- .1 Submit in accordance with Section 01 33 00.
- .2 Show fabrication and erection details of all components and accessories. (Prior to review by the Consultant, submit Shop Drawings and calculations to structural silicone sealant manufacturer for review and approval.) Show the following on the Shop Drawings:
 - .1 Interface conditions with adjoining works.
 - .2 Sealant locations and joint detail including joint back-up.
 - .3 Interior structure and/or reinforcements.
 - .4 Extruded framing system for all members (plans and sections, in half full size, if not of the manufacture specified and drawn). Show thermal breaks and what material.
 - .5 Glazing and glass stop details, vinyl or neoprene mouldings (in half full size), and all anchorage and assembly fixings.
 - .6 Ventilator details showing hardware locations and a note confirming that operating hardware is accessible for unobstructed hand operation.
 - .7 List of materials used for every component.
- .3 Indicate how thermal expansion and contraction are to be accommodated and to what degree. Show connections to adjacent construction and provision made for structural deflections, contractions, expansion and other normal movement..

1.4 **GENERAL DESIGN**

- .1 Make thorough examination of all Drawings and details, check interfacing with Work of other Contracts and other factors influencing the engineering design and performance of the Work and be fully cognizant of requirements.
- .2 Drawings and Specifications do not intend to identify or solve the requirements of thermal, structural, vapour and air movement, methods of anchorage, flatness and other requirements. Be responsible for all of these aspects. Base design on the "rainscreen principle" as advocated by National Research Council of Canada (NRC).
- .3 Design to withstand without failure, the positive and negative forces imposed by wind, earthquake, temperature and shrinkage stress, deflections of the supporting or adjacent

structures, all within deflection limitations governed by the design of the supporting structure. Calculate external pressure of suction due to wind on part or all of the surface of the units in accordance with the Ontario Building Code.

- .4 Design in such a way that completed installation is free from rattles, wind whistles and noise due to thermal and structural movement and air pressure.

1.5 **DESIGN REQUIREMENTS**

- .1 Be responsible for the design of components and accessories thereof and connections in accordance with the requirements of the Ontario Building Code.
- .2 Design to prevent accumulation of condensate on interior side of window frame under the following service conditions:
 - .1 Interior temperature: 25°C (77°F).
 - .2 Exterior temperature: -20°C (-4°F).
 - .3 Interior RH: 40%.
- .3 Restrict air infiltration/exfiltration, through window assembly to 0.25 m³/h/m⁻¹ and doors to 2.79 m³/h/m⁻¹ at reference pressure differential of 75 Pa, when measured in accordance with ASTM E283.
- .4 No water infiltration when tested to ASTM E331 with pressure differential of 720 Pa (15.0 psf).
- .5 Design glass in accordance with CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .6 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 (under uniformly distributed positive design wind load), and 10 mm maximum regardless of span.
- .7 Design anchorage inserts for installation as part of other sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

1.6 **DELIVERY, HANDLING AND STORAGE**

- .1 Transport materials to the job site storage compound in such a manner as to prevent in-transit damage. These measures shall include, but not limited to, crating, polyethylene wrapping system, etc.
- .2 Store in a dry, protected area on site, in original undamaged containers with manufacturers labels and seals intact.
- .3 Provide interleaving protection between glass. Keep glass and interleaving dry and store cases in clean, cool, dry areas with temperatures above the dewpoint. Circulation of cool, dry air in storage areas is essential. Open cases and inspect units periodically for moisture accumulation. Do not store glass in direct sunlight without an opaque protective covering over same.
- .4 Remove damaged or unsatisfactory materials from the site and replace with new materials to the satisfaction of the Consultant at no cost to the Owner.

1.7 **QUALITY ASSURANCE**

- .1 Have a senior, qualified representative of the silicone sealant manufacturer present at the job site to supervise the butt glazing Work at all times.

1.8 **TESTING AND INSPECTION**

- .1 The Owner may retain an independent inspection company approved by the Consultant to inspect Work of this section and to perform additional shop and field inspection as required. Inspections and tests will be paid for by the Owner except that the Contractor will be required to pay for inspection tests which show results not meeting the requirements of the Specifications or Drawings and for subsequent inspections made necessarily thereby.
- .2 The inspection company will verify that Shop Drawings show that the Work of this section has been designed in accordance with established building envelope design principles.

1.9 **PROTECTION**

- .1 Protect the Work of this trade from damage. Protect Work of other trades resulting from the Work of this section.
- .2 Install at the factory, strippable coatings on all exposed surfaces of aluminum. Leave coating and protective wrappings on the surfaces through the period that other trades work proceeds on the building. Remove on completion of the Work.
- .3 Comply with unpacking procedures as recommended by framing and glass manufacturers.
- .4 Make good all damaged Work caused by failure to provide adequate protection. Remove unsatisfactory Work and replace at no expense to the Owner.

1.10 **WARRANTY**

- .1 Warrant Work of this section against defects and deficiencies for the periods specified below from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- .2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.
- .3 Warrant the Work as follows:
 - .1 Work in general: Ten (10) year warranty against defects and failure of system, and to remain completely weathertight and air and water leakproof within the tolerances and limits specified.
 - .2 Warrant the Work of this section from defects in materials and workmanship and weather tight for a minimum period of Ten (10) years,
 - .3 Finish: warrant for a period of twenty (20) years
 - .4 Manufacturer's warranty: Twenty-five (25) manufacturer warranty for framing, gaskets, seals and assembly components) from the date of acceptance of the Contract Work by the Owner.
 - .5 Hardware: Twenty (20) years against breakage, premature wear and/or operational difficulties such as inability or increased difficulty to operate products,

including an increase in operating force beyond the values in AAMA/WDMA/CSA 101/I.S.2/A440 Table 6.

2 Products

2.1 **MATERIALS**

.1 Aluminum Extrusions: Alloy and temper recommended by aluminum-framed entrance door manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090" wall thickness at any location for the main frame and door leaf members.

.2 Aluminum

- .1 Extrusions: AA6063-T5 alloy, anodizing quality, conforming to ASTM B221.
- .2 Plate and sheet: AA1100-H14 alloy, anodizing quality unless otherwise indicated minimum 3 mm thick, conforming to ASTM B209.
- .3 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off marks", or other blemishes, whether left unfinished or finished.

2.2 **SYSTEM DESCRIPTION:**

.1 Exterior Entrance: Thermally broken aluminum extrusions, factory anodized finish, with related flashings, hardware, anchorage, weatherstripping and attachment devices. To match existing conditions.

~~.2 Interior Vestibules: aluminum extrusions, factory anodized finish, sealed single pane tempered safety glass with related hardware, anchorage, and attachment devices. Extend vertical framing to underside of structural framing and provide required support.~~

2.3 **ALUMINUM ENTRANCE FRAMES**

.1 Non-thermally Broken, Single Glazed Systems

- .1 Extruded aluminum frame: conforming to ASTM B221, 6063 alloy, flush glazing stops, anodizing quality for exposed surfaces.
- .2 Refer to Section 08 80 00 Glazing.

.2 Thermally Broken, Double Glazed Systems

- .1 Extruded aluminum sections, dimension to match existing condition, thermally broken. Provide complete with flush glazing stops, internal drainage system where required.
- .2 Refer to Section 08 80 00 Glazing.

2.4 **DOORS**

.1 Extruded aluminum sections, flush glazing stops, top rail and stiles, bottom and mid-rail or as indicated on Drawings. Door to match existing conditions.

.2 Door thickness: 44 mm

.3 Door size as indicated on Drawings

.4 Door Hardware. Provide manufacturer's standard and recommended hardware as required for door system applications. Provide complete sets including rails, hangers,

supports, bumpers, floor guides, and accessories indicated. Refer to Hardware schedules.

2.5 **ACCESSORIES**

- .1 Perimeter sealant: One part silicone neutral cure low modulus sealant. Colour as selected by the Consultant from standard colour selection.
- .2 Screws, bolts and fasteners: Self tapping electrozinc plated or cadmium plated steel for aluminum to aluminum contact and stainless steel for aluminum to steel contact.
- .3 Steel reinforcements and anchors: Conforming to CAN/CSA-G40.20/G40.21-M, Grade 300W hot-dip galvanized to CSA G164-M requirements.
- .4 Isolation coating: Henry "410-02" bituminous paint or zinc chromate paint.
- .5 Thermal break material: Polyvinylchloride, of semi-rigid durometer hardness of 80, plus or minus 5, located on the external side of the glass pane.
- .6 Door weatherstripping: Heavy duty mohair pile material designed for easy removal and replacement when worn, complete with adjustable fixing to ensure a full "wipe" of the threshold below.
- .7 Compressible filler: Ceramar by W.R. Meadows or CPD Closed Cell Foam.
- .8 Loose insulation: Loose fibreglass or mineral wool.
- .9 Temporary strips: 25 mm wide, light reflecting, easily removable, pressure sensitive tape applied over all glass. Doors shall have two cross stripes at eye level, windows and curtain wall shall have corner to corner cross stripes from aluminum frames.
- .10 Door track:
 - .1 Top and Bottom Track: Surface mounted, extruded aluminum single track profile.
 - .2 Side Track: Single Surface mounted, extruded aluminum track reinforced to take locking hardware.

2.6 **FABRICATION**

- .1 General
 - .1 Form all sections true to detail, free from defects impairing appearance, strength and durability.
 - .2 Fabricate frames with thermal breaks.
 - .3 Mullions and frames shall be tubular extruded shapes with sharp, well defined corners.
 - .4 Overall assembled profiles shall be as detailed on the Drawings. Curtain wall glazing shall be replaceable from the exterior while window glazing shall be replaceable from the interior.
 - .5 Make provision at all sealed horizontals to lead moisture accumulation to the exterior. Provide drainage leads in the pressure plates and horizontal snap-on covers for this purpose.
 - .6 Pressure plates shall be of extruded aluminum with integrally aligned sockets to receive and hold the latch bulbs of the snap-on face caps.

- .7 Form continuous sills, stools and flashings with intermediate clips, anchorages and reinforcing and as much as possible, be shop assembled. Furnish all filler and closure pieces as required.
 - .8 Locate thermal break on the exterior side of the glazing and secure by snap-in methods without the use of any metallic fasteners which could reduce the effectiveness of the thermal barrier.
 - .9 Make provision in the Work for vertical and horizontal expansion and contraction and structural deflections.
 - .10 Mitre and closely fit all corners of formed Work. Apply back-up sealants on the inside of joints. Provide drainage towards the exterior at the bottom of all glazing rebates.
 - .11 Attach all anchorages to the warm side.
 - .12 Carry out all welding with argon shielded electric arcs to ensure complete fusion of the metal.
 - .13 Fabrication Tolerance: to be in accordance with Appendix A, City of Toronto Corporate Building System Design Requirements.
- .2 Doors
- .1 Aluminum doors shall have square snap-on glazing beads designed for EPDM glazing gaskets.
 - .2 Equip doors with full weatherstripping at perimeter. Install weatherstripping throughout the full length and width of the doors at jambs and heads.
 - .3 Fabricate doors and frames complete with all necessary internal reinforcements, cutouts, recesses, mortising or milling operations required for a rigid assembly and to accommodate finish hardware. All connections shall ensure adequate strength.
 - .4 Fabricate frames with joints accurately fitted and securely jointed together in a manner to ensure tightly fitting joints. Internally seal corners of frames and all joints exposed to water penetration using a material compatible to resist flow at the high surface summer temperatures to be experienced by the metal.
- .3 Doors - Barrier Free Access
- .1 Prepare doors where indicated to accommodate power operators and pushbutton controls to allow barrier-free access. Provide a barrier-free logo above pushbutton.
 - .2 Coordinate as required for the satisfactory installation of finish hardware by Section 08 71 05.
- .4 Insulated Spandrel Panel Back-Up
- .1 Form panels with offset edge flange to provide flush surface at edge of pan. Bond insulation to panel back-up with daubs of mastic adhesive.
 - .2 Provide integral reinforcing and stiffeners as required.
 - .3 Weld corners of panels and grind smooth or butter corner joints with butyl sealant.

2.7 **PROTECTION OF METALS**

- .1 Provide protection against galvanic action wherever dissimilar metals are in contact, either by painting the contact surfaces with a heavy coat of zinc chromate primer, or by the application of an appropriate sealant or tape.
- .2 Protect aluminum which is to be in contact with cured concrete with zinc chromate primer or bituminous paint, and wherever crevices between the contact surfaces may entrap moisture or other corrosive elements.

3 Execution

3.1 **INSPECTION OF JOB CONDITIONS**

- .1 Inspect existing conditions upon which Work of this section is dependent. Report to the Consultant in writing any defects or discrepancies. Commencement of Work implies acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Windows

- .1 Set units in their correct location, level, square and plumb and at proper elevations, with the nominal face of the framing aligned in a single vertical plane. Fasten and anchor framing in place.
- .2 Accurately measure glass openings and calculate glass size based on manufacturer's installation tables allowing for proper edge engagement, rabbet width, rabbet depth and expansion.

.2 Assembly and Anchorage

- .1 Anchor component parts securely in place by bolting, welding or other permanent mechanical attachment system, which will comply with performance requirements and permit movement as intended or necessary. Install slip-joint linings where required to ensure movement as per design.
- .2 Allow for complete adjustment in anchorage for levelling and positioning of units during installation.

.3 Erection Tolerances

- .1 Limit variations from plumb, level or dimensioned angle to the following:
 - .1 Plumb: 3.2 mm in 3 m; non-cumulative.
 - .2 Level: 3.2 mm in 6 m; non-cumulative.
 - .3 Alignment: End to end or edge to edge offset of adjoining consecutive element to 1.6 mm.
 - .4 Location and Plane: Limit variation from plane to 1 3.2 mm in 3.6 m; 12.7 mm over total length.
 - .5 Diagonal Measurements: Limit difference between diagonal measurements to 3.2 mm
 - .6 Tolerances shall not be cumulative.

.4 Doors

- .1 Install doors plumb, square, level, free from warp, twist and superimposed loads.
- .2 Secure Work adequately and accurately to structure in the required position, in a manner not to restrict thermal movement.
- .3 Provide compressible filler over aluminum work at locations shown on Drawings.
- .4 Use aluminum or long-life coated steel screws, nuts, bolts, washers, rivets and all other fastening devices, colour to match doors and frames where exposed to view.

3.3 **GLAZING**

- .1 Use extruded gaskets for door and sidelight glazing. Extruded gaskets shall comply with ASTM C509.
- .2 Thoroughly wipe all surfaces receiving glazing materials with a cloth dampened in xylol to assure a clean surface.
- .3 Use glazing tape for glass and aluminum spandrel panels except at butt glazing, use structural silicone sealant and spacer blocks. Provide temporary pinning at butt glazed joints.
- .4 At horizontal mullions and frames secure lites with screw applied pressure plates into the main grid members. Mitre glazing tape at all end joints, corners and at junctions. Screw fasteners shall be 1/4-20 machine screws. Contain glazing tape on pressure plates with a rigid polyvinyl chloride spacer. Internal seal shall be bulb type silicone extrusions.
- .5 Place setting blocks at quarter points from each corner of glass. Centre glass in opening and press firmly against tape. Roll-in inside resilient extrusion.

3.4 **JOINT SEALANT AND SEALS**

.1 Joint Sealant

- .1 At interior and exterior joints between aluminum framing and adjacent Work of others execute the following Work:
 - .1 Install backer rod as required to provide sealant joints of proper form, thickness-to-width ratios, and to provide bond break at back side of sealant. Where backer rod cannot be used, use bond breaker tape to back side of sealant joint substrate.
 - .2 Clean substrate surfaces to which sealant is to bond and apply sealant primers as recommended by sealant manufacturer.
 - .3 Seal joints continuous to produce weatherproof and visually acceptable joint installation.
- .2 Install backer rod between butt glazed insulating and spandrel glass units, and between units to adjacent structures as shown. Seal joints continuous to produce weatherproof and visually acceptable joint installation.
- .3 Seal all joints required for a weatherproof installation and against air/vapour leakage. Use materials in strict accordance with the manufacturer's printed instructions, and applied only by tradesmen specially trained or experienced in their use. Before applying sealants, completely remove all mortar, dirt, dust, moisture and other foreign matter from surfaces it will contact. Mask adjoining

surfaces when required, to maintain a clean and neat appearance. Total sealing compounds to fill the joint and provide a smooth finished surface.

.4 Refer to and comply with workmanship requirements of Section 07 92 00.

.2 Foamed-In-Place Air Seals

.1 Prior to application, remove mortar, dirt, dust, moisture and other foreign matter from joints to be sealed.

.2 Apply seal in accordance with manufacturer's directions. Fill all joints. Trim off excess seal.

.3 Airseal Transition Membrane

.1 Apply primer and airseal transition membrane in accordance with membrane manufacturer's instructions. Use primer in conjunction with adhesive if part of system.

.2 Re-prime surfaces not covered with transition membrane during the same working day.

.3 Overlap airseal transition membrane 75 mm minimum. Lap in the direction of waterflow. Coordinate the airseal transition with adjacent parts of the Work.

3.5 **FIELD QUALITY CONTROL**

.1 Field Testing in the field by independent inspection agency retained by the City. Testing shall be performed after completing the installation of the Work and before the installation of interior finishes has begun.

.2 Testing and inspecting a representative areas of the Work as installation proceeds to determine compliance of installed assemblies with specified requirements.

.3 Repair or remove and replace Work that is considered defective, does not meet requirements or that is damaged by testing.

3.6 **CLEAN UP**

.1 Maintain the units in a clean condition throughout construction period, so that they will be without deterioration or damage at time of Owner's acceptance. Select methods of cleaning which will promote achievement of uniform appearance and stabilized colours and textures for materials that weather or age with exposure.

.2 Immediately before time of Substantial Performance, wash glass thoroughly, inside and out.

.3 Do not use steel wool, wire brushes or steel scrapers on finished surfaces.

.4 Daily during this Work, and on completion, remove from the job site, all rubbish, debris, broken glass, temporary safety markings and excess materials resulting from this Work.

.5 Remove protective covering and coating from aluminum surfaces, inside and out, and clean all surfaces, remove all labels, temporary stripes and protective devices and polish all glass surfaces, immediately prior to final acceptance of the Work by the Consultant.

End of Section

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