

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07270 : Air/Vapour Barrier System
- .2 Appendix A : Testing Curtain Wall and Air Barrier Membrane System

1.2 SYSTEM DESCRIPTION

- .1 Wind Loads: Design and install curtain wall system to withstand positive and negative wind and service pressure loads normal to wall plane, to requirements of the building code.
- .2 Thermal Movement: Provide for thermal movement caused by design temperatures required by the building code and an 82°C surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
- .3 Curtain Wall System Performance Criteria: Comply with the following performance requirements, demonstrated by testing manufacturer's assemblies in accordance with test methods indicated.
 - .1 Elastic Deflection Limits of Vertical Mullions: Tested in accordance with ASTM E330. Deflection limits shall be such that the integrity of the glass and air seals are maintained at design loading. Permanent deformation of members due to applied loads are not permitted. Deflection limitation shall be lesser of the following:
 - .1 L/175 of clear span for spans up to 4.1 m; L/240 of clear spans plus 6 mm for spans greater than 4.1 m.
 - .2 An amount that restricts edge deflection of individual glazing lites to 19 mm.
 - .2 Elastic Deflection Limit of Horizontal Mullions: Limited to amount not exceeding that which reduces glazing bite to less than 75% of design dimension and which reduces edge clearance between framing members and glazing or other fixed components to less than 3 mm, as tested to ASTM E330.
 - .3 Air Infiltration/Exfiltration: Tested in accordance with ASTM E283, maximum 0.3 L/s/m² (0.06 cfm/ft²) at a static air pressure differential of 300 Pa (6.24 psf).
 - .4 Water Infiltration: No uncontrolled water on indoor face of any component when tested in accordance with ASTM E331 at test pressure differential of 380 Pa (8 psf).
- .4 Entrance System Performance Criteria: Comply with the following performance requirements, demonstrated by testing manufacturer's assemblies in accordance with test methods indicated.
 - .1 Air Infiltration/Exfiltration: Tested in accordance with ASTM E 283, at a static air pressure differential of 75 Pa (1.57 psf), based on door leaf module of 900 x 2100 mm (36" x 84").

- .1 Single Door and Frame: Maximum 2.83 m³/h/m (0.50 cfm/ft.) of perimeter crack.
- .2 Pair of Doors and Frame: Maximum 5.66 m³/h/m (1.0 cfm/ft.) of perimeter crack.
- .2 Structural: Door corner structural strength test using a dual moment loading criteria, minimum 132 kg (290 kg).
- .3 Forced Entry Resistance: Tests performed simultaneously with 136 kg (300 lbs) forces applied to the active door panel within 75 mm (3") of the locks in the direction that opens the door and 68 kg (150 lbs) forces applied in both perpendicular directions to the 136 kg (300 lbs) force simultaneously.

1.3 QUALITY CONTROL

- .1 Installer: Trained and approved by the manufacturer and having a minimum five (5) years experience in the installation of the work described in this Section and can show evidence of satisfactory completion of projects of similar size, scope and type. If requested, provide letter of certification from Manufacturer stating that installer is certified applicator of its products, and is familiar with proper procedures and installation requirements required by the Manufacturer.
- .2 Maintenance Seminars: Provide, to the City, training seminars and recommendations on product maintenance procedures.
- .3 Pre-Installation Meeting: Two (2) weeks prior to commencing work of this Section, arrange for Manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Contract Administrator of the date and time of the meeting.
- .4 Manufacturer's Site Inspection: Have the Manufacturer's technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit manufacturer's inspection reports and verification that the work of this Section is correctly installed.

1.4 SUBMITTALS

- .1 Shop Drawings: Submit Shop drawings bearing the seal and signature of a Professional Engineer registered in the Province of Manitoba. Include plans, elevations, sections, details, hardware, attachments to other work, and the following:
 - .1 Mullion details, including reinforcement and stiffeners.
 - .2 Joinery details.
 - .3 Expansion provisions.
 - .4 Flashing and drainage details.
 - .5 Thermal-break details.
 - .6 Glazing details.
 - .7 Cleaning provisions.
- .2 Structural Analysis Report: Bearing signature and seal of Professional Engineer registered in the Province of Manitoba responsible for its preparation and used to determine the following:

- .1 Structural test pressures and design pressures from basic wind speeds.
- .2 Deflection limitations of glass framing systems.
- .3 Samples: Submit sample sections of component parts of curtain wall system including frame, sash, sill, glazing, and waterproofing method.
- .4 Product Test Reports: Submit report from an independent testing laboratory, indicating products meet or exceed performance requirements.
 - .1 Base report on evaluation of comprehensive tests performed within the last four (4) years by a qualified testing agency, for each type, grade, and size of Aluminum curtain wall system. Test results based on use of down-sized test units will not be accepted.
- .5 Maintenance Data and Operating Instructions: On completion of work, supply three (3) copies of maintenance and glazing instructions for insertion in maintenance manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store in a dry, protected area on Site, in original undamaged containers with Manufacturer's labels and seals intact.
- .2 Factory apply strippable coating or protective wrappings on exposed surfaces of aluminum. Do not remove protection until completion of building.

1.6 WARRANTIES

- .1 Warrant the work of this Section in accordance with the requirements of the Contract Documents.
- .2 Warrant the following:
 - .1 The curtain walls will be structurally sound and free from distortion, deflection, misalignment and will be weathertight.
 - .2 The metals will not warp, buckle, oil can, distort and their finishes will not crack, peel, rust, pit, or otherwise corrode, discolour or fade.
 - .3 The gaskets, tapes and sealants will be free from deterioration or dislocation from sunlight, weather or oxidation. The gasketing shall be free from permanent deformation under load.
 - .4 The air/vapour barrier will be continuous with the building air/vapour barriers.

Part 2 Products

2.1 MANUFACTURERS

- .1 Specified Products: The design for the work of this Section is based on the products named. Products by other manufacturers similar in function, design, performance, and construction complying with requirements of this Section may be incorporated into the Work subject to Contract Administrator's acceptance.
 - .1 Curtain Wall Framing: Thermally broken, 1600 Series by Kawneer, 2500E Series by Alumicor or equal

2.2 MATERIALS

- .1 Aluminum Association Alloy AA6063-T5 for extruded shapes, commercial quality AA1100-H14 Aluminum sheet for formed shapes.
- .2 Steel: CAN3-G40.21-M Grade 300W.
- .3 Flashing: Aluminum, finished to match framing, minimum 24 gauge.
- .4 Bolts, Screws, Anchors and Fasteners: Stainless steel or Aluminum for Aluminum connections; cadmium plated steel may be used at interior side of air barriers; galvanized steel elsewhere.
- .5 Slip washers: Teflon coated steel or Aluminum washers.
- .6 Loose Insulation: Glass fibre or mineral wool, CSA A101-M, Type I, Loose, light density insulation.
- .7 Foam Insulation: Enerfoam by Dow Chemical.
- .8 Temporary Strips and Safety Markings: Supply 25 mm (1") wide, light reflecting, easily removable, pressure sensitive tape applied over glass lites in windows. Windows shall have corner to corner cross stripes from Aluminum frames.
- .9 Rust Inhibiting Primer: CAN/CGSB-1.40-M.
- .10 Isolation Coating: CAN/CGSB-1.108-M, acid and alkali resistant.

2.3 METAL AIR/VAPOUR BARRIERS (SPANDREL BACK PANS)

- .1 Sheet Metal: Minimum 20 gauge sheet steel, galvanized, complying with ASTM A653/653M, zinc coating Z275.
- .2 Spandrel Insulation: Mineral fibre board insulation, Cavity Rock by Roxul or CW50 by Fibrex, complete with compatible fire retardant insulation adhesive.
- .3 Stick Clips: 25 mm (1") diameter perforated disc base with integral [3 mm|1/8"] square sharpened pin of moulded polyvinylchloride in lengths to suit insulation thickness.
 - .1 Insulation Retainers: 25 x 25 mm (1" x 1") galvanized sheet steel, punched to catch on pins.
 - .2 Adhesive for apply clips: High-strength, resilient adhesive having a drying time of 0 to 30 minutes (rapid initial set), and 24 hours final set. Adhesive shall be compatible with the specified insulation adhesive, insulation and galvanized steel.
- .4 Gun Welded Pins: Alternative at the Contractor's option to stick clips, 3 mm (1/8") diameter galvanized steel pins with cup heads, of length to suit insulation thickness and suitable for gun shot welding to the back pans.
- .5 Stiffeners: Hot or cold rolled steel or galvanized sheet steel sections, to the requirements of this Section.

2.4 SEALANTS

- .1 Joint Primer, Surface Conditioners and Cleaning Agents: As recommended by respective glazing and sealant compound manufacturer.
- .2 Joint Backing Material: Polyethylene foam rope, closed cell type, out-sized minimum 50% larger than joint width and compatible with joint sealant.
- .3 Sealant: Non-bleeding, non-migrating, non-sagging, capable of supporting their own weight, standard colour.
 - .1 Sealant between Aluminum framing and adjacent structures: CAN/CGSB-19.24-M, Type 2, Class B, multi-component, urethane based.
 - .2 Sealant in concealed-sealing of thin joints in metal work: Non-hardening, polyisobutylene or partially vulcanized rubber base.

2.5 FABRICATION – CURTAIN WALL AND WINDOW FRAMES

- .1 Form work true to detail, free from defects impairing appearance, strength and durability.
- .2 Fabricate aluminum frames with an integral, concealed, low-conductance thermal barrier; located between exterior materials and members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
- .3 Apply sealant to joints within units and components, including junction of frames to provide air/vapour and watertight joints. Do such sealant application in a concealed manner.
- .4 Provide punched louvers or holes through exterior glazing flange for venting and drainage.
- .5 Design mullions and framing members to accommodate glazing units.
- .6 Design, fabricate and install brackets and anchorage devices attached to warm side of thermal break. Make allowance for unevenness and dimensional difference in structure, expansion and contraction of framing members without creating undesirable stresses in components to adequately sustain curtain wall system, movements in structure, and superimposed wind and rain loads.
- .7 Reinforce and prepare curtain wall frames for related hardware where applicable.
- .8 Fabricate system with drained glazing cavity between sealed unit and frame into which it is secured to drain out of curtain wall system to exterior.
- .9 Form continuous sills, stools and flashings with intermediate clips, anchor devices and reinforcement in shop and as far as practical assemble units in shop. Supply filler and closure pieces as required. Fill corners and other open areas within construction with loose insulation.
- .10 Ensure corners of formed work are mitred and closely fitted. Apply back-up sealants designed for this purpose, on inside of joints in Aluminum work by this trade. Provide drainage towards exterior at bottom of glazing rebates.
- .11 Deburr and make smooth sharp milled edges and corners of sash frames.

- .12 Construct and erect work free of exposed fasteners. If unavoidable, ensure fasteners are tamper proof.
- .13 Factory glaze and weatherstrip entrances as far as practicable. Secure weatherstripping properly to prevent shrinkage or movement. Ensure it is easily replaceable without use of special tools and is resistant to deterioration by weathering or aging.
- .14 Apply two (2) shop coats of rust inhibiting primer to steel components. Take other necessary measures to prevent future deterioration due to corrosion and electrolysis during fabrication.
- .15 Welding of component members is permitted providing it does not in any way mar surface appearance. Carry out welding with argon shielded electric arcs to ensure complete fusion of metal. Make joints tight, in true plane, ground and sand smooth, flush with base metal. Do welding on concealed surface.

2.6 FABRICATION –METAL AIR/VAPOUR BARRIERS

- .1 Brake-form sheet metal air/vapour barriers to permit assembly using self-tapping screws, and attachment using power activated or pneumatic fixings or other means of secure fastening.
- .2 Make provision in barrier design to accommodate movement resulting from thermal changes and from structural deflections.
- .3 Cut, fit and form metal air/vapour barriers as required to accommodate framing, anchors, connections, mechanical, and electrical appurtenances and other obstructions.

2.7 FABRICATION - ALUMINUM TRIM

- .1 Fabricate work and support members in a manner which will provide an installation free of exposed fastenings, with sufficient support and allowance for thermal movement.
- .2 Fabricate trim, sills, corner pieces and filler pieces of 3 mm ($\frac{1}{8}$ ") thick plate Aluminum to profiles shown, by welding prior to application of finish. Make all planes flat, free of visible distortion and with edges straight and true, corners square and bend of minimum radius. Provide concealed clips for fastening plate assemblies in place.
- .3 Reinforce work as required to prevent warpage, oil canning, buckling effect and to meet design requirements. Weld marks shall not telegraph to the finished side.
- .4 Provide inconspicuous weep holes to properly drain to exterior.
- .5 Aluminum Sills: Extrude to size and shape as detailed, complete with end drip deflectors, expansion cover plates and necessary anchors.

2.8 ALUMINUM FINISHES

- .1 Black anodized finish

Part 3 Execution

3.1 INSTALLATION - GENERAL

- .1 Apply isolation coating of approximately 0.76 mm (30 mil) dry film thickness, or other suitable permanent separator on concealed contact surfaces of dissimilar materials, before assembly or installation where there is possibility of corrosive or electrolytic action with concrete, masonry, mortar, or steel.
- .2 Set work in its correct location, level, square and plumb and at proper elevations, with nominal face of framing aligned in a single vertical plane. Fasten and anchor framing in place. Install in accordance with manufacturer's instructions and reviewed shop drawings.
- .3 Anchor component parts securely in place as indicated, by bolting or other permanent mechanical attachment system, which will comply with performance requirements and permit movement as intended or necessary.
- .4 Clean and restore primer and bituminous paint to surfaces disturbed by field welding or other operations.
- .5 Leave final installation water, air and weather tight.
- .6 Set thresholds in bed of mastic and secure.
- .7 Apply foam insulation where detailed.

3.2 INSTALLATION – AIR AND VAPOUR BARRIER

- .1 Metal Spandrel Back Pans (Air/Vapour Barrier): Adhere insulation clips at 300 mm (12") o.c. both ways. Support clips in place until adhesive has set unless welded clips are used. Avoid burn through when welding clips. Notched trowel apply insulation adhesive over entire surface of barrier and around clips held with adhesive.
 - .1 Apply insulation to the cold-in-winter side of the metal air/vapour barriers erected. Cut insulation slightly over-size as required to ensure tight butt joints.
 - .2 Press insulation boards firmly to barrier impaling them on clips without bending clips. Butt insulation boards tightly. Install retainers to clips.
 - .3 Isolate metal air/vapour barriers with thermal breaks and spacers as indicated.

3.3 INSTALLATION - SEALANT

- .1 Prepare and seal joints to provide weathertight seal.
- .2 Apply sealant to joints between windows, sills, and other components in this Section and adjacent construction both inside and outside to provide weather tight seal on exterior and air/vapour seal on interior. Provide toe bead and/or heel bead of sealant around perimeter or sealed unit to prevent air leakage.
- .3 Apply joint backing to achieve correct joint depth and shape in accordance with manufacturer's instructions.
- .4 Mix, apply and cure sealant in strict accordance with manufacturer's instructions.

- .5 Apply sealant in continuous full beads, using gun with proper size nozzle and sufficient pressure to fill voids and joints solid.
- .6 Form surfaces smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces to slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.
- .9 Glazing:
 - .1 Provide heel bead at bottom of interior edge of sealed units and up lower 75 mm (3") of each vertical to provide a vented glazing cavity.
 - .2 Neatly tool glazing compound at an angle sloping away from glass. Remove excess glazing compound from stops and glass.

3.4 ADJUST AND CLEAN

- .1 Maintain work in a clean condition throughout construction period, without deterioration or damage at time of 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. Do not use abrasives.
- .2 Adjust operating devices and leave in perfect working order.
- .3 Immediately prior to cleaning of glass and before building is handed over to City, make good damage and disfigurement. Remove protective covering and coating from Aluminum surfaces, inside and out, and clean surfaces, remove labels, stripes and protective devices and polish glass surfaces, immediately prior to final acceptance.
- .4 Immediately before Substantial Performance, clean work thoroughly, inside and out. Demonstrate proper cleaning methods to City during final cleaning.

END OF SECTION