

JOINT SEALING**PART I – GENERAL****1. Related Work**

1. Section 07 62 00 – Sheet Metal Flashing and Trim
2. Section 08 51 00 – Metal Windows and Doors

2. Reference Standards

1. CAN2-19.24-M90 – Multi-component, Chemical-Curing Sealing Compound
2. CGSB-19.13-M87 Sealing Compound, One Component, Elastomeric, Chemical Curing

3. Submittals / Mock-Ups

1. Submit manufacturer's printed technical data sheets and application instructions for all proposed materials, including cleaners and primers.
2. Submit a letter from the manufacturer confirming:
 - a) They have reviewed the site conditions
 - b) The proposed sealants are acceptable for the application
 - c) The installation methods, including cleaning and priming methods and environmental conditions are acceptable.
3. The Contractor shall provide a mock-up of each type of joint for review and approval by the Consultant and manufacturer at minimum of 7 days prior to beginning bulk sealant installation. The mock-up shall also determine the colour of sealant to be used.
 - a) The mock-up shall be carried out by the same installers, who will complete the general installation.
 - b) Allow the sealants to cure according to the manufacturer's recommendation. Carry out adhesion testing as required by the manufacturer or Consultant to verify the surface preparation procedures.
 - c) Provide written confirmation of the required surface preparation and installation methods from the manufacturer prior to general installation.

4. Job Conditions and Protection

1. Do not apply sealants when substrate temperatures are less than 5° °C without first obtaining manufacturer's written approval and instructions.
2. Apply sealants only to completely dry surfaces.

3. Deliver and store materials in original wrappings and containers with manufacturer's seals and labels intact. Protect from freezing, moisture and water.
4. Comply with requirements of Workplace and Safety Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Human Resources Development Canada.
5. Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for application and curing of sealant including special conditions governing use.

5. Quality Assurance

1. Notify Consultant for review of surface preparation and caulking installation.

6. Warranty

1. The Contractor warrants that the caulking work of this section is guaranteed against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion, or other failure, staining adjacent surfaces. Warranty period is two years from the date of Certificate of Substantial Performance.

PART II – PRODUCTS

1. Materials

Sealants shall conform to CGSB specifications as listed below; colour to Consultant's selection.

1. Exterior Sealants: Multi-component, epoxidized polyurethane sealant. To meet specified requirements of CGSB Specification CAN2.19-24-M90. Use at all locations, except where another type is specified. Approved products include:
 - a) Tremco Dymeric FC
 - b) BASF Sonolastic NP2

2. Backer Rod

1. Polyolefin, polyethylene, urethane, neoprene or vinyl foam
 - a) Extruded closed cell foam backer rod.
 - b) Size: oversize 30–50%.
 - c) Chemically compatible with primers and sealants.
 - d) Round solid rod, Shore A hardness 70.
 - e) Acceptable materials
 - i) SOF ROD by Tremco Ltd.
 - ii) SOF-Type Rod by Industrial Thermo Polymers
2. Fill voids with spray foam insulation.

3. Bond breaker tape

1. Polyethylene bond breaker tape which will not bond to sealant.
2. Acceptable materials
 - a) #226 or #481 Tape by 3M Canada Inc
 - b) #40 Clear Bond Breaker Tape by Valley Industrial Products
3. Thin layer of silicone sealants partially cured as an approved by Consultant.

4. Joint Cleaner

1. Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
 - a) Methylethylketone (MEK) for urethane and silicone sealants
 - b) Xylol for urethane sealants
 - c) Xylene for urethane sealants
 - d) Wire brush for concrete surfaces
2. Cloths shall be clean, white, and solvent resistant. Coloured cloths are not permitted.

5. Primer

1. As recommended by manufacturer.

PART III – EXECUTION

1. Preparation of Joint Surfaces

1. Remove all existing sealant to expose a sound substrate, without damaging adjacent finishes.
2. Examine joint sizes and conditions to establish correct depth-to-width relationship for installation of back-up materials and sealants.
3. Clean bonding joint surfaces of harmful matter substances including dust, rust, oil, grease and other matter that may impair work, particularly where they have been saw cut or repaired.
4. Utilize the two rag method for cleaning surfaces to receive sealant. Wipe with cloth saturated with solvent; follow immediately with another dry cloth to wipe surface dry. Clean only as much work as can be sealed in one hour. Cleaned surfaces that are exposed to rain or contaminants must be re-cleaned.
5. Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent or other coatings, unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
6. Ensure joint surfaces are dry and frost-free.
7. Prepare surfaces in accordance with manufacturer's directions.

2. Priming

1. Where necessary to prevent staining, mask adjacent surfaces prior to priming and sealing.
2. Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to sealing.

3. Backup Material

1. Apply bond breaker tape where required to manufacturer's instructions and to meet Joint Profile requirements below.
2. Where a fillet bead joint width is less than 9mm fill cavity with spray foam insulation and install bond breaker tape. At tensile bead profiles which cannot accommodate installation of backer rod install tape on bottom of joint across the entire width.
3. Install joint filler to achieve correct joint depth and shape. Use blunt installation tool designed to set material at specified depth.

4. Mixing

1. Mix materials in strict accordance with sealant manufacturer's instructions.

5. Joint Profile

1. Sealant depth shall be $\frac{1}{2}$ the joint width where possible.
2. Joint widths shall be a min. 9mm (3/8").
3. Minimum sealant thickness shall be min. 6mm (1/4").
4. Substrate adhesion shall be a min. 9mm (3/8") or equal to maximum depth of sealant.
5. Fillet/cant bead sealant joint width shall be min. 15mm (5/8").
6. All joints shall have an unbonded surface of min. 12mm (1/2").

6. Application

1. Apply sealant in accordance with manufacturer's instructions.
 - a) Apply sealant in continuous beads.
 - b) Apply sealant using gun with proper size nozzle.
 - c) Use sufficient pressure to fill voids and joints solidly.
 - d) Form surface of sealant with full bead, smooth, and free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - e) Tool exposed surfaces to give slightly concave shape.
 - f) Remove excess compound promptly as work progresses and on completion.
2. Curing
 - a) Cure sealants in accordance with sealant manufacturer's instructions.
 - b) Do not cover up sealants until proper curing has taken place.

7. Clean-up

1. Clean adjacent surfaces immediately and leave work neat and clean.
2. Remove excess and droppings, using recommended cleaners as work progresses.
3. Remove masking tape after initial set of sealant.

End of Section 07 92 10

METAL WINDOWS AND DOORS**PART I – GENERAL****1. Related Work**

1. Section 08 80 50 – Glazing
2. Section 07 92 10 – Joint Sealing
3. Section 07 62 00 – Sheet Metal Flashing and Trim

2. Reference Standards

1. Ontario Building Code 2012
2. National Building Code 2010
3. AA (Aluminum Association) - Designation System for Aluminum Finishes.
4. CAN/CSA-A440-00, Windows
5. CAN/CSA-A440.1-00 User Selection Guide to CAN/CSAA440-00
6. CAN/CSA-A440.2-04 Energy Performance of Windows and other Fenestration Systems
7. CAN/CSA-A440.3-04, User Guide CAN/CSA-A440.2-04
8. CAN/CSA-A440.4-07, Window and Door Installation
9. AAMA 611, Specifications for Anodized Architectural Aluminum.
10. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference.
11. ASTM E783, Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
12. ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls.
13. NFRC 100-2010, Procedure for Determining Fenestration Product U-Factors
14. NFRC 200-2010, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

3. System Description

1. Framing: Thermally broken aluminium sections two-color, factory Fabricated and factory finished.
2. Window Configuration: Fixed with an operable, horizontal slider as per window type sketch. Fixed units above the doors.
3. Door Configuration: Hinged with fixed glass unit, frame sized to a minimum to suit strength.

4. Performance Requirements

1. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with the Ontario Building Code, 10-year probability, unless otherwise specified. For the calculation of internal pressures, use the gust effect factor for a Category 2 Building as described in the commentary on wind loads in structural commentaries on the National Building Code of Canada.
2. Deflection: Limit member deflection to 1/200 of the longer dimension to a maximum of 3mm with full recovery of glazing materials.
3. Assembly: To accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing, and deflection of lintel.
4. Thermal Value: Effective thermal conductance (U-Value) of window and door assemblies to meet requirements of Ontario Building Code 2012 and Supplementary Standard SB-12.
5. Meet requirements of CSA A440:
 - i) Air Tightness: A3/Fixed
 - ii) Water Tightness: B4
 - iii) Load Resistance: C4
 - iv) Insect Screen Strength: S2 (Heavy Duty)
 - v) Resistance to Forced Entry: F20
 - vi) Condensation resistance: Temperature Factor 55
6. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.
7. Air and Vapour Seal: Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

5. Submittals / Mock-Ups

1. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details and direction of opening of operable sashes.
2. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; installation requirements; and proposed fasteners for windows and doors. Anchors are to be designed by a Professional Engineer. Shop drawings are to be stamped and signed by a Professional Engineer of Ontario.
3. Submit two samples illustrating window frame mullion section, screen and frame, factory finished aluminium surfaces, and glass units.
4. Submit two samples of operating hardware.
5. Manufacturer's Certificate: Certify that all products meet or exceed CSA 440 laboratory tests to the levels specified herein. The Certificate shall include detail drawings of test window and door, stamped by testing

agency. Lab tested windows and doors shall be identical in every respect to windows and doors being installed at this building.

6. Install one complete window assembly and door assembly in one suite for review by the Consultant and Owner prior to starting general installation. This mock-up will remain as part of the Work. Notify the Consultant to review the mock-up installation and allow 48 hrs for inspection by the Consultant and Owner prior to proceeding with work at other locations. This mock-up will become the accepted standard for the project.
7. The mock-up shall be field tested to comply with ASTM E783 and ASTM E1105 standards.
8. The mock-up shall be completed by the installers who will carry out the work of this contract.

6. Job Conditions and Protection

1. Transport, handle, store, and protect products.
2. Windows shall be transported in an upright position with temporary bracing in place. Temporary cross-bracing shall be applied to maintain squareness. Diagonal braces or spacer strips, where possible, shall not be removed until after the installation is complete.
3. Workers' hands shall be clean when handling windows. The National Wood Manufacturers Association recommends wearing clean canvas gloves.
4. All window corners shall be blocked and secured to prevent windows being pushed in during construction. The window shall be protected by polyethylene until the finish trim is installed.
5. Sills shall be protected to prevent damage during construction.
6. Protect factory finished aluminium surfaces. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

7. Quality Assurance

1. The Consultant may tour the window manufacturer's facility during manufacturing of the windows for this project to review the assembly of components and materials used. The Contractor is responsible to correct any deviations from this contract or CSA-A440 at no cost to the Owner.
2. Installation shall be by the window manufacturer or its approved installer using only mechanics skilled in this trade and in sealant trade as applicable. Installers to have a minimum of 5 years' experience or similar projects. Installation crew to remain the same for the duration of the project provided they provide acceptable performance.
3. Random in situ testing to verify the air and water tightness of the window assembly may be carried out by the Consultant to verify compliance with performance levels specified. If testing indicates failure, the Contractor shall carry out remedial work and retesting required to achieve compliance at no cost to the Owner. Field testing shall comply with ASTM E783 and ASTM E1105 standards.

4. Testing and Consulting fees for work required to resolve deficiencies due to failure of the windows to meet specified performance levels, including but not limited to additional site visits or tests, shall be deducted from amounts owing to the Contractor.

8. Warranty

1. The Contractor warrants that there will be no water penetration, air leakage, loosening of whole or parts of the units, glass breakage from excessive stresses developed exterior to the insulating glass units (other than by accidental cause), or deformation of unit framing due to installation. Warranty period is five (5) years from the date of Certificate of Substantial Performance.
2. The Contractor further warrants the fabrication of windows specified in this section against leakage, defects and malfunction under normal useage, blistering, delamination, or excessive fading of coating, and the hardware operating parts as determined by the Consultant. Warranty period is ten (10) years from the date of Certificate of Substantial Performance.
3. Any repairs required shall be carried out as directed by the Consultant / Owner at no cost to the Owner.

PART II – PRODUCTS

1. Windows

1. Extruded Thermally Broken Aluminium Frames: Extruded aluminium shall be alloy 6060 or 6063. Extruded aluminium used for main frame, mullion, sash, or ventilator sections shall have a minimum yield strength of 110 MPa in thicknesses up to and including 12.7mm.
2. Operable frame: Dimensioned to facilitate typical window A/C unit installation.
3. Sheet Aluminium: Sheet aluminium shall be alloy 1100, 3003, 3004, 3005, 3105, or 5005. Sheet aluminium shall have a minimum yield strength of 100 MPa. Note: Aluminium alloy designations, composition, and mechanical properties correspond to those of the Aluminium Association.
4. The thickness of any extruded aluminium component shall be not less than 1.00 mm. The thickness of cladding and sheet aluminium components shall be not less than 0.55 mm, unless the aluminium cladding is fully supported by rigid material, in which case it may have a minimum thickness of 0.40 mm.
5. Thickness requirements for extruded aluminium components as specified in 1.(3) shall not apply to tapered, bevelled, or chamfered sections that are not intended to contribute to the structural strength of the window members, provided that the root thickness of these sections is not less than 1.00 mm.
6. Steel Sections: Profiled to suit mullion sections.
7. Fasteners: Stainless steel.

2. Doors

1. Exterior doors shall be fully insulated.
2. Construct thermally broken frames of aluminium extrusions with minimum wall thickness of 3mm.
3. Extruded Thermally Broken Aluminium Frames: Extruded aluminium shall be alloy 6063 – T5 anodizing quality.
4. Steel reinforcement: to CAN/CSA-G40.20/21, grade 300 W.
5. All doors shall have fixed double glass unit sized to maximum possible.
6. Weather-stripping: pile weather-stripping with fins.
7. Door bumpers: black neoprene.
8. Door bottom seal: adjustable door seal of anodized extruded aluminium frame and vinyl weather seal, surface mounted with drip cap, closed ends
9. Reinforce mechanically-joined corners of doors to produce sturdy door unit.

3. Materials

1. Perimeter Insulation: Polyurethane Spray Foam: non-shrinking, low expansion (25%), closed cell, no CFC, single component polyurethane foam, complying with CAN/CGSB 51-GP-23M. Approved product ENERFOAM manufactured by The Dow Chemical Company., or approved equivalent.
2. Shims: Cedar. Where cedar shakes and shingles are used as shims, they shall comply with CSA Standard 01 18.1 or 01 18.2. Only pre-cut shims shall be used. The use of scrap shall not be permitted.
3. Membrane flashings: self-adhering rubberized asphalt composite membrane with high density polyethylene film. Approved product Henry Blueskin WB25 Window and Door Flashing or approved alternate.

4. Components

1. Frames: thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
2. Reinforced Mullion: profile of extruded aluminium with integral reinforcement of shaped steel structural section.
3. Sills: extruded aluminium; sloped for positive wash; fit under sash; one-piece full width of opening jamb angles to terminate sill end.
4. Insect Screen Frame: Rolled aluminium frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
5. Insect Screens: FS RR-W-365, woven aluminium mesh 14/18 mesh size.
6. Operable Sash Weather Stripping: Nylon pile; permanently resilient, profiled to effect weather seal.
7. Fasteners: Carbon steel

5. Hardware

1. Unless otherwise noted provide zinc-plated 1018 steel or 304 stainless steel for operating hardware, nuts, washers, bolts, rivets, and other fastening devices incorporated in the window systems.
2. Provide strong durable lifts, pulls and latches as required at operable sashes. Pulls shall be continuous and integral with sash.
3. Sash lock: Lever handle with cam lock.
4. Security Latches: Provide zinc die cast spring-loaded latches to provide automatic locking in closed position. Vinyl latches are not permitted.
5. Safety Restrictors:
 - a) Provide safety restrictors to limit the maximum opening dimension of all operable windows to 100 mm in accordance with the OBC.
 - b) Safety restrictors shall permit manual by-pass to allow full opening of the operable window and shall automatically reset when the unit is moved to the closed position.
 - c) Spring loaded pins requiring a hole in the main frame are not permitted.
 - d) Provide means to prevent sash from lifting over restrictor when installed in the bottom rail only.
 - e) Operable sashes shall be fitted with concealed, convex nylon roller on upstanding monorails to remain operable despite accumulation of dust and dirt on sill. Concave or PVC rollers are not permitted.

6. Finishes

1. **Interior Colour: Clear Anodized. Exterior Colour: Duranar LG Charcoal K7390 approved by the Owner.** Anodized coatings on aluminium shall be certified by the manufacturer of the finished metal, using independent laboratory tests, to the following specifications:
 - a) the coating thickness shall be not less than 10 μm , except for interior trim, which shall be not less than 5 μm when tested in accordance with ASTM Standard B 244;
 - b) the coating area density shall be not less than 24 g/m², except for interior trim, which shall have a minimum coating area density of 12 g/m², when tested in accordance with ASTM Standard B 137;
 - c) the coating shall be uniform in appearance and free from powdery areas;
 - d) the coating shall be adequately sealed and shall show no evidence of staining when tested in accordance with ASTM Standard B 136; and
 - e) the coating shall be capable of withstanding 250 h of exposure to salt spray, except for interior trim, for which the minimum time exposure shall be 100 h, without pitting of the coating or base metal, when tested in accordance

with ASTM Standard B 117.

2. Finish Coatings: Conform to AAMA 611
3. Apply one coat of bituminous paint to concealed aluminium surfaces in contact with treated wood, cementitious, or dissimilar materials

7. Window and Door Anchors

1. Anchors to be specified by Professional Engineer and indicated on shop drawings.
2. Into Concrete Structure and Masonry Walls: Pre-drilled, selftapping screws formed from carbon steel, 6mm (1/4") minimum diameter, length as required to provide minimum 25mm (1") embedment into concrete or masonry; use Tapcon by ITW Construction Products or Tapper by Powers Rawl.
3. Into Structural Steel: Pre-drilled, self-tapping screws formed from carbon steel, 1/4" minimum diameter, length as required to provide minimum thread engagement in the steel as shown on approved shop drawings .
4. Into Wood: Minimum #8 wood screws, formed from stainless steel, length as required to provide penetration into wood members as shown on approved shop drawings.
5. Aluminium Components: Self-drilling, self-tapping screws, minimum #6, minimum length, as required to provide full penetration, pan head, formed from stainless steel; use Twin-Fast by Powers Rawl or Traxx by ITW Construction Products .
6. Length, diameter and spacing to suit application, and as indicated on engineered shop drawings to provide adequate securement such that all loads subjected to the window and door will be transferred to and be carried by the anchors and anchor support systems (All anchors to be designed to meet loads and stresses as dictated by the Ontario Building Code).
7. Screw fasteners shall be socket pan head or hex washer head type, except where screws are installed through window and door frames (fixed and/or operable), or in sliding doors where flat head may be used provided they are properly countersunk.
8. All fasteners to be concealed.
9. Fasteners shall not be installed through the drainage plane in window or door sills unless approved by the Consultant. If fasteners at these locations are required and approved, wrap screw shanks with unshimmed butyl glazing tape.

8. Fabrication

1. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
2. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

3. Prepare components to receive anchor devices. Fabricate anchors.
4. Arrange fasteners and attachments to ensure concealment from view.
5. Prepare components with internal reinforcement for operating hardware.
6. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
7. Assemble insect screen frame, mitre and reinforced frame corners. Fit mesh taut into frame and secure.
8. Double weather-stripping to be used in operable units.
9. Factory glaze window units

PART III - EXECUTION

1. Examination

1. Verify wall openings and adjoining air and vapour seal materials are ready to receive work of this Section.
2. Measure openings for window and door frames to ensure adequate clearances as described herein.

2. Opening Preparation

1. Existing windows or doors shall not be removed until the new units are on-site or unless approved by the client. The installer shall verify that the new units will fit properly into the existing opening before removing the old units, taking into consideration frame and shim thicknesses. Note: It is recommended that when measuring the width or height of the existing opening, at least three locations in each direction shall be checked and that the smallest dimension be used.
2. The old window or door shall be removed so as to minimize damage to the remaining structure and the mouldings, trim, wallboard, plywood, or other materials to be returned to original or better condition upon completion of the installation.
3. The installer shall avoid damaging any existing flashings inside the wall. If flashings, building paper, or other protective membranes are disturbed during removal of the window or door, they shall be patched with appropriate materials so as to maintain continuity of the air, vapour, thermal, and weather barriers.
4. Old window materials and debris shall not be permitted to fall onto the ground below. Take measures to ensure that all debris is collected inside. Transport debris through the interior of the building using plastic / metal containers on wheels.
5. Protect existing wall and floor finishes from damage or staining. Cover floors with protective rubber sheets and drop sheets. Thoroughly clean / vacuum after the installation is complete.

3. Clearances

1. Sufficient clearances shall be maintained around the perimeter of the unit, particularly at the head, to allow for deflection or creep of the structure and differential movements resulting from temperature and relative humidity.
2. Unless specifically required otherwise by the manufacturer, the following clearances shall apply to the installation of the window and door frames:
 - a) The width of the rough opening shall
 - i) be between 19 mm (3/4 in) and 38 mm (1 1/2 in) greater than the width of the window and door frame; and
 - ii) provide a minimum gap of 9.5 mm (3/8 in) and a maximum gap of 19 mm (3/4 in) at each side of the window and door. The window and door shall be centred in the rough opening such that the gap at each side of the window and door is the same, +/- 3 mm.
 - b) The height of the rough opening shall:
 - i) be between 25 mm (1 in) and 44 mm (1 -3/4 in) greater than the height of the window and door frame; and
 - ii) provide a minimum gap of 12.5 mm (1 /2 in) and a maximum gap of 22 mm (7/8 in) at the top and bottom of the window and door. The gap at the top may be larger than the gap at the bottom.
 - c) Add additional clearance for plywood blocking on underside of window and door sill.
3. If the clearance is greater than 25 mm (1 in), it shall be sealed with a compressible spacer (such as one-component semi rigid foam, backer rod, or a flexible metal U-channel).

4. Membrane Flashings

1. Install plywood blocking. Secure blocking to masonry at 200mm O.C. in a staggered pattern.
2. Fasten aluminium channel to wood blocking to support membrane flashings.
3. Prime all surfaces to receive membrane and allow to cure as per manufacturer's instructions.
4. Membrane shall provide continuous folded end dams at jamb upturns. Cut end dams will not be accepted.
5. Membrane shall extend from aluminium channel and down over exterior wall by a minimum of 38mm.
6. Install flashing free of wrinkles, tenting and fishmouths. Provide 75mm overlaps.

5. Shimming

- .1 Shims shall be installed in a manner and in sufficient number to minimize deflection, distortion, or rotation of the frame or sill and to permit the proper operation of the window or door.

- .2 Shims shall be installed in accordance with CSA A440.4. A minimum distance shall be maintained between the exterior corner of the window frame and lateral shims. Refer to Detail D-14
- .3 Shims shall be placed evenly along the bottom and sides of the window or door frame. Shims shall be installed as near as possible at all restraining points, and there shall be shims at each fastener location.
- .4 Shims under the sill of a fixed window shall be installed such that the centreline of the shim corresponds to the centreline of the setting blocks.
- .5 The shims shall be recessed at least 6 mm (1 /4 in) on the interior, to allow a full bead of sealant to be applied around the complete perimeter of the window or door frame.

6. Anchorage

- .1 Fasteners shall be installed at the locations indicated in CSA A440.4. If the window size warrants, additional shims shall be added so that the maximum distance B is not exceeded.
- .2 Where a reference anchoring point (R-point) is required, as shown in CSA A440.4, the R-point shall have a rigidity double that of the other anchors. This may be achieved by installing two anchors at the R-point and only one anchor at other locations, or by installing at the R-point an anchor that is twice as rigid as those used at other points.
- .3 All anchors shall resist the lateral loads imposed upon them.
- .4 Fastener length shall be sufficient to penetrate a minimum of 25 mm (1 in) into the rough opening studs.
- .5 Fasteners passing through the interior sill shall be sealed. Fasteners shall not be installed through exterior sill tracks.
- .6 The installer shall drive as few fasteners as possible through the exterior parts of the frames, since fastener penetration may contribute to deterioration.
- .7 Anchors or fasteners shall not bypass the thermal break (i.e., if the anchor or fastener is in contact with the part of the frame on the inside of the thermal break, it shall be secured back to part of the structure on the interior of insulation, and vice versa).
- .8 The installation of fasteners or fastening systems shall not cause distortion of any frame member, nor in any way impede the correct operation of the unit.
- .9 All anchors and fasteners shall be inaccessible from the exterior
- .10 To prevent galvanic action, aluminium components shall be isolated from dissimilar metals (except stainless steel, zinc, cadmium, or white bronze of small area), concrete, mortar, masonry, and wood by means of an isolation coating, such as bituminous paint. The isolation coating shall be compatible with any sealant or setting compounds that come into contact with it.
- .11 Fasteners shall be compatible with associated materials. Metal fasteners shall be constructed of the same material as the metal components they

fastener, or of a metal that will not set up an electrolytic (galvanic) action that would damage or cause deterioration of the fastener or the components.

- .12 Screws shall be used to install aluminium window and door frames.
- .13 Screw holes through the frames shall be predrilled to at least the diameter of the metal shank.
- .14 Screws shall not be driven with hammers.
- .15 Screw size shall be a minimum of #8.

7. Insulating Rough Opening Gap

1. In-situ-applied polyurethane spray foam shall be used to fill the gap between unit and rough opening including around shims. Do not fill the rough-opening gap more than 50% in one pass. Should filling the gap completely be desired the foam shall be injected in a series of passes, allowing the previous bead to fully expand and become tack-free before injecting the next pass.
2. Install spray foam in such a manner as to avoid distorting the frame or in any way impeding its smooth operation. Materials shall remain compressible and shall allow for differential movement without separation.
3. After the foam has cured, the excess material shall be cut off. The operation of the window and the locking systems shall be checked again for any distortion of the frame and to ensure proper functioning.
4. If the window or door frame is hollow-moulded and designed to be fitted with pieces of rigid insulation, the installer shall ensure that the insulation is present and that there are no gaps in the insulation before installing the window or door.

8. Continuity of Air Barrier – Interior Drywall Method

1. Install a continuous bead of sealant between the window and door frames and interior drywall surfaces. If a metal spacer is required seal gaps between the metal spacer and drywall and metal spacer and frame with specified sealant.

9. Exterior Sills

1. There shall be a minimum 6% slope on sills to the exterior.
2. The sill ends shall prevent water from entering the walls at the lower corners of the window and door.
3. All sills shall have a drip edge to prevent the backflow of runoff water.
4. Sills shall protrude at least 12.5mm from brick face.

10. Exterior Perimeter Sealing

1. Refer to section 07 92 10 Joint Seal

11. Tolerances

1. Windows and doors shall be installed level, square, and plumb, within the tolerances specified below, so as not to compromise the seals or operation of the unit, and to ensure that the designed slope is maintained to the exterior. These adjustments shall be made at the time the unit is first placed into the rough opening, before any anchorage or sealing of the unit is completed.

A frame shall be considered:

- a) level when the
 - i. sill is horizontal; and
 - ii. vertical deviation of one end relative to the other is 2 mm or less, regardless of the length of the span;
- b) square when
 - i. the overall height and width of the frame measured at mid-span is equal to the average height or width +/- 1 mm; and
 - ii. difference between the two diagonals is less than or equal to 2 mm for a frame with exterior perimeters less than or equal to 4 m; or
 - iii. difference between the two diagonals is less than or equal to 3 mm for a frame with exterior perimeters greater than or equal to 4m; and
- c) plumb when the
 - i. vertical offset in the plane perpendicular to the facade is such that water will not remain trapped on the sill;
 - ii. vertical offset of the head relative to the sill is maximum 2 mm; and
 - iii. warping of the frame is such that the performance or operation is not compromised

12. Adjustment

1. Adjust hardware for smooth operation and secure weathertight closure.

13. Cleaning

1. All parts of a window and door shall be cleaned as soon as installation is complete. Exposed interior metal surfaces shall be washed down using a solution of mild domestic detergent in warm water, applied with a soft, clean wiping cloth. Exposed exterior non-metal surfaces shall be cleaned as recommended by the window manufacturer.
2. Glass surfaces shall be cleaned soon after installation. Paint plaster, and sealant spills or splashes shall be removed from the glass immediately. Glass shall not be cleaned with abrasive material or cleaners. Commercial glass-cleaning products or household hand dishwashing detergents in

water solutions will not normally harm glass or glazing sealants and may be used. Before using more aggressive cleaning chemicals or rubbing compounds, their compatibility and application techniques shall be verified with the manufacturer and sealant supplier. Glass and aluminium surfaces exposed to leaching water from new concrete or stucco shall be rinsed immediately to prevent permanent damage.

3. Hardware and tracks shall be lubricated according to the manufacturer's instructions after installation is complete. When lubricating metal track, silicone aerosol spray shall be prevented from contacting plastic locking mechanisms, as these are usually made of impact-resistant polycarbonate, which will begin to dissolve in the solvents contained in these sprays. The installer shall ensure that the lubricant used is compatible with vinyl parts, if appropriate.
4. The installer shall take care not to damage seals or glass if cleaning glass with a blade. Perpendicular scoring of the glass by a blade can result in glass breakage

End of Section 08 51 00

GLAZING**PART I – GENERAL****1. Related Work**

- (1) Section 08 51 00 – Metal Windows and Doors

2. Reference Standards

1. CAN/CGSB-12.1-M, “Tempered or Laminated Safety Glass”
2. CAN/CGSB-12.2-M, “Flat, Clear Sheet Glass”
3. CAN/CGSB-12.3-M, “Flat, Clear Float Glass”
4. CAN/CGSB-12.4-M, “Heat-absorbing Glass”
5. CAN/CGSB-12.8, Insulation Glass Units
6. CAN/CGSB-12.20, Structural Design of Glass for Buildings
7. CAN/CGSB 19.18-M, Sealing Compound, One Component, Silicone Base, Solvent Curing
8. CGSB.Standard 19-GP-14M, Sealing Compound, One Component, Butyl Polyisobutylene Polymer Base, Solvent Curing
9. Insulating Glass Manufacture Alliance (IGMA), "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use"
10. ASTM E2190, "Insulating Glass Unit Performance and Evaluation".

3. Performance Requirements

1. Provide glass and glazing materials for continuity of building enclosure vapour retarder and air barrier:
 - a) To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapour retarder seal.
 - b) To maintain a continuous air barrier and vapour retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.
2. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with the Ontario Building Code. Minimum glass thickness shall be 4mm.
3. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

4. Submittals / Mock-Ups

1. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

2. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special

5. Job Conditions and Protection

1. Do not install glazing when ambient temperature is less than 10 degrees C.
2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

6. Quality Assurance

1. Insulating glass unit manufacturers shall be certified with the Insulating Glass Manufacturers Association of Canada (IGMAC) certification program. The insulating glass units shall be identified as required by the IGMAC certification program with the IGMAC trademark, company name, location of production facility, and year of manufacture.
2. The Consultant may tour the window manufacturer's facility during manufacturing of the insulating glass units for this project to review the assembly of components and materials used. The Contractor is responsible to correct any deviations from this contract or IGMAC at no cost to the Owner.
3. Random inspection of the insulating glass units will be completed by the Consultant on site. Destructive testing may be carried out to confirm items not visible such as the thickness of the primary and secondary seals and treatment of corner keys. All defective units and units subject to destructive testing shall be replaced by the Contractor at no cost to the Owner.

7. Warranty

1. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
2. Provide a two (2) year warranty to include coverage for sealed glass units from cracking, premature failure of the perimeter seal causing chemical and or vapour fogging on glass surfaces within the air space, liquid water infiltration within the air space, inward migration of spacer, corrosion of spacer and failure of perimeter sealants.
3. Warranty period is from the Date of Substantial Performance.

PART II – PRODUCTS

1. Insulated Glass Units

1. Insulated Glass Units Low E (Type SG B): ASTM E774 and E773; double pane with polyisobutylene primary and polysulfide secondary edge seals; outer pane of annealed glass, inner pane of Low E glass (#3 surface) on clear colour glass cover plate, visible light transmittance of 75 percent, solar light transmittance of 60 percent, whole product performance value and centre of glass U-factor 0.3 W/m²k, and shading coefficient of 0.84 (solar heat gain coefficient 0.73), purge interpane space with argon gas; total unit thickness of 20 mm minimum.
2. Approved Low E coatings include:
 - a) LOF Energy Advantage from Pilkington;
 - b) LoE-179 from Cardinal;
 - c) Sungate 500 from PPG; and
 - d) ClimaGuard 75/68 from Guardian
3. Edge Seal: Warm Edge Spacer.
4. Glass Thickness: Minimum 6mm, or per design engineer.

2. Glazing Accessories

1. Setting Blocks: Neoprene, EPDM or Silicone 80 to 90 Shore durometer hardness, length of 25 mm for each square metre of glazing or minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height to suit glazing method and pane weight and area. Conform to IGMAC recommendations.
2. Spacer Shims: Neoprene or Silicone 50 to 60 Shore A durometer hardness, minimum 75 mm long x one half the height of the glazing stop x thickness to suit application.
3. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black colour.

PART II – EXECUTION

1. 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.
4. Install sealant in accordance with manufacturer's instructions.

2. Installation of Insulating Glass Unit

1. Cut glazing tape to length and set against permanent stops, 5 mm below sight line. Do not overstretch tape. Seal corners by butting tape and dabbing with butyl sealant.
2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapour seal.
3. Place setting blocks at $\frac{1}{4}$ points with edge block no more than 150 mm from corners.
4. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
5. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm below sight line.
6. Fill gap between glazing and stop with silicone type sealant to depth equal to bite of frame on glazing, but not more than 9 mm below sight line.
7. Apply cap bead of silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3. Cleaning

1. Remove glazing materials from finish surfaces.
2. Remove labels after Work is complete.
3. Clean glass and adjacent surfaces.

End of Section 08 80 00