STEEL DOORS AND FRAMES

1. GENERAL

1.1 Design Requirements

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.2 Install work to CSDFMA Installation Guide.

1.2 Quality Assurance

.1 Fabrication: Comply with requirements of CSDFMA.

.2 Source Limitations: Obtain doors and frames through one source from a single manufacturer.

1.3 Requirements of Regulatory Agencies

.1 Fire Rated Assemblies: Labelled and listed by a nationally recognized testing agency having factory inspection service in conformance with CAN4 S104M and CAN4 S105M for fire protection ratings indicated.

.2 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

1.4 Submittals

.1 Shop Drawings: Indicate each type of door and frame, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, arrangement of hardware and fire rating.

1.5 Delivery, Storage, and Handling

.1 Brace and protect doors and frames to prevent distortion during shipment. Store in a secure dry location.

.2 Store doors vertically, resting on planks, with blocking between to allow air to circulate.

2. PRODUCTS

2.1 Materials

.1 Metallic Coated Sheet Steel: ASTM A568M Class 1 Commercial grade steel, hot dip galvanized to ASTM A 653/A653M ZF75/A25 zinc coated (Galvanized) or ZF180/A40 zinc-iron alloy-coated (Galvannealed).

.2 Minimum Core Thickness, Without Coating: Metallic Coated Sheet Steel:

.1 Interior Door and Sidelight Frames: 1.519 mm (0.060").

.2 Exterior Door and Sidelight Frames: 2.0 mm (0.078").

.3 Doors and Panels, Hollow Steel Construction

.1 Face Sheets: 1.519 mm (0.060").

.2 Vertical Stiffeners, 0.912 mm (0.036").

.4 Doors and Panels, Honeycomb Core Construction:

.1 Face Sheets, 1.2 mm (0.047").

.5 Lock and Strike Reinforcements: 2.66 mm (0.1").

.6 Hinge and Pivot Reinforcements: 3.416 mm (0.134") thick by 38 mm ($1\ ^1/_2$") wide by 150 mm (6") longer than hinge and pivot, secured by not less than 6 spot welds.

.7 Closer or Holder Reinforcements: 2.66 mm (0.1").

.8 Top and Bottom End Channels and Caps: 1.6 mm (0.060").

.9 Mortar Guard Boxes: 0.759 mm (0.03").

.10 Glass Stops: 0.912 mm (0.036").

.11 Floor Anchors: 1.6 mm (0.060").

.12 Jamb Spreaders: 0.912 mm (0.036").

.13 Frame Anchors:

.1 Masonry T-strap Type: 1.214 mm (0.048").

.2 Existing Masonry/Concrete Wall Type: 0.912 mm (0.036").

.3 Masonry Wire Type: 4.0 mm (.16") diameter.

.4 Masonry Stirrup-strap Type: 50 mm x 250 mm x 1.6 mm (2" x 10" x 0.060").

.3 Insulation: One component, low pressure expanding polyurethane foam, non-solvenated, maximum flame spread of 25 tested to ULC S102.

.4 Adhesives for Steel Components: Heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.5 Touch-Up Primer: CAN/CGSB-1.181, Zinc rich primer.

.6 Door Silencers: Single stud rubber or neoprene.

.7 Filler: Metallic paste, manufacturer's standard.

.8 Thermal Break: Rigid polyvinylchloride extrusion.

2.2 Fabrication - General

.1 Fabricate work in accordance with CSDFMA specifications.

.2 Blank, reinforce, drill and tap units for mortised, templated hardware, and electronic hardware using templates provided by the hardware suppliers. Reinforce units for surface mounted hardware.

.3 Do welding to CSA W59.

.4 Apply, at factory, touch up primer to doors and frames manufactured from metallic coated steel where coating has been removed during fabrication.

.5 Make provisions in doors and frames to suit requirements of Section providing security devices.

.6 Fabricate fire rated assemblies to ULC requirements and bearing ULC, cUL or Warnock-Hersey International Ltd., label, as acceptable to authorities having jurisdiction.

.7 Locate fire rating labels on the inside of the frame hinge jamb and door hinge edge midway between the top hinge and the head of the door.

2.3 Fabrication – Frames

.1 Fabricate frames to profiles and maximum face sizes as required to suit design, welded construction.

.2 Cut mitres and joints accurately and weld continuously on inside of frame profile.

.3 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

.4 Protect mortised cutouts with mortar guard boxes in masonry and concrete constructions. Conceal fastenings except where exposed fastenings are required. Provide appropriate anchorage to floor and wall construction..

.5 Provide jamb anchors for fixing at floor.

.6 Provide three door silencers on strike jamb for each single door, and two bumpers at head of frame for each door leaf in double doors.

.7 Fabricate thermally broken frames for exterior doors using steel core, separating exterior portion of frame from interior portion with polyvinyl chloride thermal breaks.

2.4 Fabrication - Doors

.1 Fabricate doors with longitudinal edges seamless, spot welded, filled and sanded flush.

.2 Hollow Steel Construction: Form each door face from sheet steel. Reinforce doors with vertical stiffeners, securely welded or laminated to each face sheet at 150 mm (6") on centre maximum. Fill voids between stiffeners of exterior doors with insulation.

.3 Fabricate doors with top and bottom steel channels full width of door and welded to both faces. Provide flush steel top edge on exterior doors.

2.5 Fabrication – Glazing Stops

.1 Fixed Glazing Stops: Formed integral with door faces and frames, minimum 16 mm ($^5/_8$") high, unless otherwise indicated.

.1 Locate fixed stops on outside of exterior and on secure side of interior doors and frames.

.2 Loose Glazing Stops: Minimum 0.8 mm (0.032") thick, formed channel, fabricated from same material as frames in which they are installed. Minimum 16 mm ($^5/_8$") high unless otherwise indicated.

.1 Locate loose stops on inside of doors and frames.

.3 Form corners of stops with butted or mitered hairline joints.

.4 Coordinate rabbet width between fixed and loose stops with type of glazing and type of installation indicated.

.5 Fasteners: Vandal resistant, countersunk flat or oval head machine screws spaced uniformly not more than 225 mm (9") o.c., and not more than 50 mm (2") from each corner.

3. EXECUTION

3.1 Installation - General

.1 Install fire rated assemblies in accordance with NFPA 80.

.2 Touch up with primer galvanized finish damaged during installation.

3.2 Installation - Frames

.1 Set frames plumb, square, level and at correct elevation.

.2 Provide suitable anchors to suit construction. Use one base anchor and two wall anchors per jamb side for frames up to 1500 mm (60") and one additional wall anchor per jamb side for each additional height of 750 mm (30") or fraction thereof.

.3 Secure anchorages and connections to adjacent construction.

.4 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Remove temporary spreaders after frames are built-in.

.5 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.6 Apply insulation to fill voids in exterior frame assemblies.

3.3 Installation - Doors

.1 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows:

.1 Hinge side: 3 mm ($^1/_8$").

.2 Latchside and head: 3 mm ($^1/_8$").

.3 Finished floor for non-rated assemblies: 12 mm ($^1/_2$"), unless otherwise indicated.

.4 Finished floor for rated assemblies: To NFPA 80 requirements.

.2 Adjust operable parts for correct function.

3.4 Cleaning

.1 Clean and make good all surfaces soiled or otherwise damaged in connection with work. Upon completion of work and remove debris, equipment and excess material from site.

END OF SECTION

FLOOR HATCHES

1. GENERAL

1.1 Submittals

.1 Shop Drawings: Indicate each type of floor hatches, arrangement of hardware, operating mechanism, and required clearances.

.2 Maintenance Data: Provide operation and maintenance data for incorporation into Project Record Manual.

2. PRODUCTS

2.1 Materials

.1 Aluminium Plates: 6061-T6 alloy, anodizing quality.

.2 Aluminium Extrusions: 6063 alloy, T5 temper, anodizing quality.

.3 Fasteners: Manufacturer's standard to suit intended use, non-corrosive and compatible with in-contact metals.

.4 Grout: Non-shrink, non-metallic, flowable, 24h, 15 MPa (2100 psi), pull-out strength 7.9 MPa (1150 psi).

2.2 Floor Hatches

.1 Type: Flush mount, capable to support 1464 kg/m^2 (300 psf) live load, drainable,Type J-AL by The Bilco Company.

.2 Cover and Frame: Mill finished, diamond pattern reinforced aluminium cover plate, 6 mm ($^1/_4$") thick exclusive of raised pattern, and 6 mm ($^1/_4$") extruded aluminium channel frame with bend down anchor tabs and continuous EPDM perimeter gasket.

.3 Lifting Mechanisms: Compression spring operators, enclosed in telescopic nylon reinforced composite tubes, controlling cover operation throughout the entire arc of cover upward motion and acting as a check in retarding cover downward motion when closing.

.4 Turn and Lift Handle: Removable exterior turn/lift handle with a spring loaded ball detent and protected by a flush, gasketted, removable screw plug.

.5 Hinges: Heavy forged aluminium pivot hinges, each having a minimum 6.3 mm ($^1/_4$") diameter Type 316 stainless steel pin, maintain cover does not protrude into the channel frame.

.6 Hold Open Arm: Equip cover with a hold open arm which automatically locks the cover in the open position.

.7 Locks: Type 316 stainless steel snap lock, manufacturer's standard.

3. EXECUTION

3.1 Examination

.1 Verify dimensions and conditions of previously installed work, upon which this Section depends, and coordinate repairs, alterations, and rectification if necessary.

.2 Obtain Contract Administrator's written approval prior to field cutting or altering of structural members.

3.2 Installation

.1 Install work level, true, square, straight, and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

.2 Perform drilling of concrete as required to fasten work of this Section.

.3 Grout work in concrete with non-shrink grout. Trowel surface smooth and flush with adjacent surfaces.

.4 Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and concrete. Use bituminous paint, butyl tape, building paper or other approved means.

END OF SECTION

COILING DOORS

1. GENERAL

1.1 Submittals

.1 Shop Drawings: Indicate each type of coiling doors, arrangement of hardware, operating mechanism and required clearances.

.2 Maintenance Data: Provide operation and maintenance data for coiling doors for incorporation into Project Record Manual.

2. PRODUCTS

2.1 Materials

.1 Galvanized Steel Sheet: Commercial quality to ASTM A653, Z275 coating designation.

.2 Steel Shapes, Plates, and Similar Items: CAN/CSA-G40.20-G40.21-M, Grade 350W, hot dipped galvanized to CSA G164.

.3 Zinc Primer: Zinc rich, ready mix to CGSB 1-GP-181M.

.4 Insulation: Manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, in accordance with CAN/ULC S102.

.5 Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to jambs, bottom and top of exterior doors. At door head, use 3 mm ($^1/_8$") thick, replaceable, continuous sheet secured to inside of hood.

.1 Motor Operated Doors: Combination bottom weatherseal and sensor edge.

2.2 Fabrication

.1 Fabricate fire rated rolling metal coiling doors to NFPA 80.

.2 Door Curtains: Fabricate overhead coiling door curtain of interlocking galvanized sheet steel slats in baked finish, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated. Provide insulated doors as indicated.

.1 Insulated Doors: Fill slat cavity with thermal insulation, enclose insulation completely within metal slat faces.

.3 Curtain Jamb Guides: Steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 5 mm ($^{3}/_{16}$") thick galvanized steel. Slot bolt holes for guide adjustment.

.1 Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

.4 Construct counterbalance assembly consisting of torsion spring with 25% overload factor. Enclose spring in steel pipe to support door curtain and counterbalance mechanism with maximum deflection of 1/360th of opening width. Provide ball bearings at rotating points. Provide spring tension adjusting wheel, accessible for setting.

.1 Support counterbalance assembly on 5 mm minimum thickness steel plate brackets, forming end enclosures.

.5 Hood: Same material as doors, form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.

.1 Include automatic drop baffle to guard against passage of smoke or flame.

.6 Endlocks and Windlocks: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

.7 Bottom Bars: Consisting of 2 angles, each not less than 38 mm x 38 mm x 3 mm (1 $^{1}/_{2}$" x 1 $^{1}/_{2}$" x $^{1}/_{8}$"), galvanized, stainless-steel, or aluminium extrusions to suit type of curtain slats.

.8 Equip doors for locking from inside with cylinder locks compatible with masterkeyed cylinder specified in Division 8 Section Finish Hardware.

2.3 Electric Door Operators

.1 General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

.2 Electric Motors: High starting torque, reversible, continuous-duty, worm gear, heavy duty industrial type, bracket mounted, Class A insulated, with overload protection; sized to start, accelerate, and operate door in either direction from any position, at not less than 0.2 m/s ($^{2}/_{3}$ f/s) and not more than 0.3 m/s (1 f/s).

.1 Coordinate wiring requirements and electrical characteristics of motors with building electrical system.

.3 Back Up Manual Operation: Chain hoist equipped with a disconnect device which allows the operator to be disengaged from the door and operate the door manually from the floor by hand in the event of a power failure without having to remove the drive roller chain.

.4 Brake: Solenoid disc brake to prevent door from coasting and secure stopping and locking of door in any position.

.5 Control Station: 3-button control, momentary contact type, open-close-stop, mounted on wall adjacent to door in location where directed by Contract Administrator.

.6 Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using Manufacturer's standard take-up reel or self-coiling cable.

.1 Provide pneumatically actuated automatic bottom bar.

.7 Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

2.4 Steel and Galvanized Steel Finishes

.1 Baked Finish: Manufacturer's standard baked finish consisting of primer and topcoat in accordance with coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.

3. EXECUTION

3.1 Electrical Co-Ordination

.1 The disconnect switch/junction box and power to the disconnect switch/junction box shall be supplied and installed under Electrical Divisions. Wiring and connection at and from the disconnect switch/junction box to motors, starters, switches, controls, safety devices and other items requiring power from the disconnect switch/junction box shall be the responsibility of this Section.

.2 Employ licensed electrician to wire and interconnect all operational and safety components for the Work. Terminate wiring required for connection to control circuitry and power in NEMA enclosures. Ground all control wiring.

.3 Do wiring in strict conformity with the Electrical Code and Electrical Divisions requirements.

.4 Use CSA approved, tested and labelled materials and electrical components for intended use.

3.2 Installation

.1 Install work in accordance with Manufacturers' printed instructions.

.2 Adjust operable parts for correct function and smooth operation.

END OF SECTION

ALUMINIUM WINDOWS

1. GENERAL

1.1 System Description

.1 Performance Criteria: Windows shall meet following CAN/CSA-A440-M window classification ratings provided, however, thickness of extruded aluminium components shall not be less than 1.6 mm (0.062").

.1 Air Tightness: Fixed.

.2 Water Tightness: B3.

.3 Wind Load Resistance: C5.

1.2 Quality Assurance

.1 Installer: Trained and approved by the Manufacturer and having a minimum three (3) 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 Pre-Installation Meeting: Ten (10) business days 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.

.3 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.

1.3 Submittals

.1 Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, and the following:

.1 Joinery details.

.2 Expansion provisions.

.3 Flashing and drainage details.

.4 Thermal-break details.

.5 Glazing details.

.2 Maintenance Data and Operating Instructions: On completion of work, supply three (3) copies of maintenance and glazing instructions for insertion in maintenance manual.

1.4 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 Store glazing units in dry and cool locations. Maintain air circulation between glazing units.

.3 Factory apply strippable coating or protective wrappings on exposed surfaces of aluminium. Do not remove protection until completion of building.

2. PRODUCTS

2.1 Materials

.1 Window Type: Fixed windows, thermally brokened, 5500 ISOWEB by Kawneer or 900E by Alumicor.

.2 Aluminium Association Alloy AA6063-T5 for extruded shapes, commercial quality AA1100-H14 aluminium sheet for formed shapes.

.3 Flashing: Aluminium, finished to match window framing, minimum 24 gauge.

.4 Bolts, Screws, Anchors And Fasteners: Stainless steel or aluminium for aluminium connections; cadmium plated steel may be used at interior side of air/vapour barriers; galvanized steel elsewhere.

.5 Slip Washers: Teflon coated steel or aluminium washers.

.6 Insulation: One component, low pressure expanding polyurethane foam, non-solvenated, maximum flame spread of 25 tested to ULC S102.

.7 Isolation Coating: CAN/CGSB-1.108-M, acid and alkali resistant.

2.2 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 Aluminium Framing and Adjacent Structures: CAN/CGSB-19.24-M, Type 2, Class B, multi-component, urethane based.

.2 Sealant for Heel Beads: CAN/CGSB-19.13-M, Class MCG-2-25-A-N, one component, silicone base.

2.3 FABRICATION – Window Frames

.1 Form work true to detail, free from defects impairing appearance, strength and durability.

.2 Fabricate aluminium windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

.3 Apply sealant to joints within window 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 louvres 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 windows, movements in structure, and superimposed wind and rain loads.

.7 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 insulation.

.8 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.

.9 Deburr and make smooth sharp milled edges and corners of sash frames.

.10 Construct and erect windows free of exposed fasteners. If unavoidable, ensure fasteners are tamper proof.

.11 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.

2.4 Aluminium Finishes

.1 Prefinish exposed to view aluminium surfaces. Ensure aluminium finish is free from blemishes or scratches and uniform in colour and sheen. Pretreat aluminium and apply primer and finish coats in accordance with manufacturer's instructions.

.1 High Performance Fluoropolymer Metallic Finish: AA-C12C40R1x, chemical finish: cleaned with inhibited chemicals; chemical finish: conversion coatings; organic coating: Manufacturer's standard three coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70% polyvinylidene fluoride resin by weight. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin Manufacturers' written instructions.

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 such as aluminium to concrete, masonry, mortar, or steel.

.2 Install windows in accordance with CAN/CSA-A440-M and requirements specified herein.

.3 Set window framing 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.

.4 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.

.5 Clean and restore primer and bituminous paint to surfaces disturbed by field welding or other operations.

.6 Leave final installation water, air and weather tight.

3.2 Installation - Glazing

.1 Free rabbets, stops and glass edges of dust, dirt, moisture, oil and other foreign matter detrimental to glazing material adhesion. Ensure drainage holes are not blocked.

.2 Place two setting blocks under each unit at quarter points. Place spacers on all edges of glass, located directly opposite each other when on both sides of the glass, located at

maximum 600 mm (24") centres and maximum 300 mm (12") from corners and uniformly spaced.

.3 Install glazing tapes and gaskets to ensure complete contact on surface of glass and stops. Make joints only at corners of sash or frame. Fit accurately with tight joints, free from tension, gaps, cracks and embedded foreign matter.

.4 Set glass properly centred with uniform bite and face and edge clearance, free from twist, warp or other distortion likely to develop stress.

.5 Ensure water and air tight seal for glass between glazed element and frame is flush with sight line.

.6 Perform glazing only when the temperature is above 4°C.

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 heal 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 window 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 the City, make good damage and disfigurement. Remove protective covering and coating from aluminium 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 Total Completion, clean windows thoroughly, inside and out. Demonstrate proper cleaning methods to Contractor Administrator during final cleaning.

END OF SECTION

DOOR HARDWARE

1. GENERAL

1.1 Quality Assurance

.1 Furnish services of an Architectural Hardware Consultant (AHC) for preparation of hardware shop drawings, keying, co-ordination with other Sections, consultation with the City and the Contract Administrator and for On-Site inspections.

.2 Inspect all hardware after installation by the Manufacturer's representative who shall certify in writing to the City, that all hardware has been supplied and installed in accordance with the specifications and reviewed Shop Drawings, and are functioning properly.

.3 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.4 Provide to applicable Sections templates and information required for proper preparation and application of hardware in ample time to facilitate progress of Work.

.5 Before furnishing any hardware, carefully check Hardware Schedule, Drawings and Specifications. Verify door hands, door and frame material and operating conditions, and assure that hardware will fit work to which it is to be attached. Advise Contract Administrator in writing of required revisions.

.6 Templates: Check Hardware Schedule, Drawings and Specifications, and furnish promptly to applicable Sections any templates, template information and Manufacturer's literature, required for proper preparation for hardware, in ample time to facilitate progress of work.

.7 Provide services of competent mechanics for the installation of hardware. Make adjustments necessary to leave hardware in perfect working order. Provide written summary of work completed and status of all items, including any adjustments, revisions or modifications.

.8 Maintenance Seminar: Instruct the City regarding proper care, cleaning and general maintenance.

.9 Source Limitations: Obtain each type of product from a single Manufacturer.

1.2 Regulatory Requirements

.1 Ensure hardware for fire-rated openings complies with requirements of authorities having jurisdiction, with door and frame Manufacturer's tested assemblies, and that hardware items bear labels acceptable to authorities having jurisdiction.

1.3 Extended Warranty

.1 Warrant work against defects in materials and quality of performance for a period of five (5) years for door closers and two (2) years for other hardware.

2. PRODUCTS

2.1 Materials

.1 Type and Design: Matching in all respects to samples of hardware and finishes approved by City. Use one Manufacturer's products for all similar items.

.2 Metal Finishes: Free from defects, clean and unstained, and of uniform colour.

.3 Fire Rated Doors: Meeting requirements of ULC as part of fire rated door assembly, with ULC or WHI label, or as acceptable to authority having jurisdiction.

.4 Fasteners: Screws, bolts, expansion shields and other fastening devices as required for satisfactory installation and operating of hardware.

.1 Same finish as hardware to which it is to be fastened.

.5 Supply hardware complete with all necessary screws, bolts and other fastening of suitable size and type to anchor the hardware in position neatly and properly in accordance with the best practices and to the Contract Administrator's approval.

.6 Fastenings: All fastenings shall harmonize with the hardware materials and finishes.

.7 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.

.8 Following Manufacturer's are acceptable subject to review by the City of samples and list of items proposed.

.1 Hinges

.1 All Doors: Full mortised, stainless steel, minimum 114 mm x 102 mm, heavy weight, 5 knuckles, ball bearing, stainless steel screws.

.2 Non Removal Pin: Out swinging exterior doors and where scheduled.

.3 Stamp hinge catalogue numbers on face of leaf of each hinge at factory to enable easy recognition of hinge material and manufacture after doors are hung.

.4 Where doors are required to swing to 180 degrees, furnish hinges of sufficient throw to clear trim.

.2 Locksets

.1 Type and Finish: Heavy duty, stainless steel construction, orb handle and raised escutcheon.

.2 Backset: 125 mm for exterior doors, 70 mm for interior doors.

.3 Cylinders: 6 pin cylinders.

.4 Strikes: Stainless Steel, ANSI standard size with curved lip strikes for latch bolts and no lip strikes for dead locks. Provide complete with wrought boxes finished to match strike.

.3 Closers

.1 Hydraulically controlled and full rack and pinion operation, clear anodized aluminium arm and full cover.

.2 Adjustable closing speed, latch speed and back check control.

.3 Adjustable swing power.

.4 Install all necessary attaching brackets, mounting channels, cover plates where necessary for correct application of door closers.

.5 Parallel arms at out swinging exterior doors and at interior doors where specified.

.6 Delayed action for barrier free application.

.7 Coordinate closers with overhead holders.

.4 Construction Keying

.1 Equip lock cylinders in construction system.

.2 The construction key system to be inoperative once the Owner's keys are inserted in the cylinders.

.5 Push Plates and Kickplates

.1 Length: 40 mm (1 $^{1}/_{2}$") less than door width for single doors and 20 mm ($^{3}/_{4}$") less than door width for doors in pairs.

.2 Thickness: 1.3 mm (0.050"), free of rough or sharp edges. Corners and edges to be slightly radiuses.

.3 Installation: 3M tape.

.6 Surface Bolts

.1 Stainless steel top and bottom bolts, chain pull for top bolt.

.2 Dust free strikes.

.7 Door Stops

.1 Surface mount, stainless steel retainer, half dome shaped neoprene stop.

.2 Install floor stops in manner so as not to create a tripping hazard and allows maximum opening of doors.

.3 Furnish door stops of height to engage doors.

.8 Astragals: Stainless steel bar with neoprene bulb.

.9 Weatherstrippings: Surface mounted extruded aluminium housing with neoprene bulb having spring mounted adjustment, 770A by Zero International.

.10 Door Bottoms: Surface mounted, extruded aluminium housing, pressure spring loaded neoprene bulb, 365A by Zero International.

.11 Thresholds: Extruded aluminium, high seat, except flat saddle for barrier free application.

2.2 Keying System

.1 Lay out keying system for building in consultation with the City. Keying system shall include keying alike, keying differently, keying in groups, master keying and grand-master keying locks and exit devices as required.

.2 Prepare and submit keying chart and related explanatory data for approval. Do not order cylinders until written confirmation of keying arrangements is received from the City.

.3 Stamp keys "DO NOT DUPLICATE".

.4 Provide two (2) change keys for each lock. Three (3) keys for each submaster level and six (6) grand master keys. In the case of keyed alike groups, supply six (6) cut keys only and supply the balance as blanks.

.5 Supply 1 Key Control System complete with cabinet and necessary components as Lund Model 1201, 2 tag system.

.6 Confirm with Contractor and the City for shipping directions.

3. EXECUTION

3.1 Preparation

.1 Thoroughly check design and provide required hardware for openings to required detail.

.2 Trim undesignated openings with hardware of equal quality and design to that specified for similar opening.

.3 Furnish door and frame manufacturers with complete instructions and templates for preparation of their Work to receive hardware.

.4 Co-ordinate voltages with Division 16, Electrical where applicable.

3.2 Installation

.1 Install finish hardware to template in accordance with Manufacturer's written instructions. Do not modify finish hardware without manufacturer's written approval.

.2 Install finish hardware for fire rated doors in accordance with NFPA 80 requirements.

.3 Install finish hardware secure, plumb, level, and true to line.

.4 Cut and fit to substrates avoiding damage and weakening. Reinforce attachment substrate as necessary for proper installation and operation.

.5 Size cutouts so that hardware item completely covers cutout.

.6 Mortise work to correct location and size without gouging, splintering, and causing irregularities in exposed finish work.

.7 Where cutting and fitting is required on substrates to be painted or similarly finished, install, fit, and adjust hardware prior to finishing.

.8 Remove hardware and place in original packaging.

.9 Re-install hardware after finishing operation is complete.

.10 Install hardware items affixed to concrete and masonry with machine screws and threaded metal expansion shields.

.11 Set, fit and adjust hardware according to manufacturer's templates and instructions. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.

.12 Consult with manufacturer of security hardware items such as door monitoring equipment, card reader access equipment, electric strikes, and electric hinges operated by card access equipment and combination magnetic door holder releases/door closers and install in accordance with Manufacturer's recommendations under supervision of Division 16 Sections Fire Detection and Alarm System. Use templates as supplied by Manufacturer for predrilling doors and frames.

.13 Pre-drill kickplates and doors before attachment of plates. Apply with water resistant adhesive and countersunk stainless steel screws.

.14 Weatherstrip exterior doors. Install effectively to tightly seal entire perimeter of door. Secure in place with non-ferrous screws, in accurate alignment.

.15 Maintain integrity of weather seal at head of doors fitted with closers. Adapt weatherstripping as required to achieve specified performance and provide any necessary accessories.

.16 After installation of hardware under this Section, check opening units for correct fit and uniformity of space around perimeter of units, or between units. Provide smoothly operating opening units free from binding.

3.3 Field Quality Control

.1 Have hardware supplier's representative visit Site and submit written report of each visit to Site, giving storage conditions and installation details, date and name of hardware supplier's representative.

.2 Before completion of Work but after hardware installation, have hardware supplier's representative inspect work and submit certificate to the City stating that final inspection has been made and that hardware of proper type has been properly installed and adjusted, is in good working order and condition, and is in conformance with Contract requirements.

3.4 Adjustments and Cleaning

.1 Adjust and clean hardware according to Manufacturer's written instructions.

.2 Turn over construction keys and extractor key to the City and provide any required adjustment or modifications prior to substantial performance of the contract.

.3 Hand over to the City Grand-master and master keys, Change Keys, Control Keys and Permanent Cylinders and core. The City will be responsible for interchanging temporary construction cores with permanent cylinder cores in locks. Temporary construction cores will be returned to Contractor.

END OF SECTION

GLASS AND GLAZING

1. GENERAL

1.1 Submittals

.1 Provide samples of materials as requested. Label samples with Manufacturer's name, with registered name of product, weight, and quality of glazing material.

.2 Provide maintenance data of glass and glazing system used in this Project including cleaning instructions for incorporation into manual.

1.2 Quality Assurance

.1 Perform work in accordance with recommendations of Glazing Association of North America (GANA). Size glass to Code requirements and verify that openings for glazing are correctly sized and within tolerance.

.2 Glass Lites: Float, tempered, laminated or heat strengthened and in thicknesses in accordance with requirements of glass Manufacturer as substantiated by the glass Manufacturer's stress analysis for each location required, unless otherwise indicated.

.3 Use a safety factor of 2.5:1 minimum for glass design.

1.3 Environmental Requirements

.1 Install glazing when ambient temperature is 10°C minimum. Maintain ventilated environment for twenty four (24) hours after application.

.2 Maintain minimum ambient temperature before, during and twenty four (24) hours after installation of glazing compounds.

1.4 Warranty

.1 Submit a ten (10) year warranty against defects in the insulating glass units and warrant them to be free from material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause, under design conditions, other than extrinsic glass breakage, but including breakage due to thermal shock and temperature differential due to inherent glass faults.

.1 The glass coatings will not discolour, oxidize, delaminate, or have scratches and pinholes and shall be uniform in thickness and uniform in colour throughout each glass unit and from glass unit to glass unit.

.2 Insulating glass units will be free from condensation, fogging material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause under normal conditions.

.3 The insulating glass units will not change their mechanical design properties and shall not in any way deteriorate, degrade, delaminate or change their visual appearance.

2. PRODUCTS

2.1 Materials

.1 Float Glass: CAN/CGSB-12.3, clear, glazing quality, minimum 6 mm ($^1/_4$") thick.

.2 Tempered Safety Glass: CAN/CGSB-12.1 Type 2, Class B, minimum 6 mm($^1/_4$") thick, heat treated using the horizontal tong free method, with roll-wave distortion parallel to bottom edge of glass as installed.

.3 Heat Strengthened Glass: ASTM C1048 Type HS, minimum 6 mm (1/4") thick, heat treated using the horizontal tong free method, with roll-wave distortion parallel to bottom edge of glass as installed.

.4 Wired Glass: Clear, 6 mm ($^1/_4$") thick, polished Georgian 12 mm ($^1/_2$") square wire-reinforced, float glass, having the required fire resistance rating based on ULC testing.

.5 Tinted Glass: Heat absorbing glass, Solargray by PPG.

.6 Low emissivity coating: Solarban 60 by PPG**.**

2.2 Accessories

.1 Glazing materials, primers and cleaning solvents: Mutually compatible, standard colours.

.2 Insulated Glass Unit Spacer Core: Extruded, thermoset polymer structural silicone foam tape with integrally incorporated desiccants, resistant to ozone, sunlight, oxidation, black, Super Spacer Premium Plus by Edgetech.

.3 Glazing Compound: CAN2-19.13, one component silicone base.

.4 Glazing Tape, Preshimed: Extruded, ribbon shaped, non-drying, non-skinning, non-oxidizing polyisobutylene tape with continuous synthetic rubber spacer rod, sufficiently wide and thick as to completely cover bite area of glazing unit when unit is pushed into place.

.5 Glazing Tape: Extruded, ribbon-shaped, non-drying, non-skinning, non-oxidizing, reinforced, polyisobutylene tape of sufficient width and thickness, 6 mm ($^1/_4$") minimum, to permit a continuous seal.

.6 Shims, Spacers and Setting Blocks: 45, 50, and 90 Durometer A hardness ± 5 respectively, neoprene rubber. Resistance to sunlight, weathering, oxidation and permanent deformation under load shall be prime essentials of shims, spacers and setting blocks.

.7 Glazing Gaskets: Neoprene, EPDM, thermoplastic or other approved material, of sufficient thickness to be 25% compressed when installed. Gaskets shall have a 13.8 MPa (2000 psi) tensile strength, Durometer A hardness of 50, ± 5, resistance to permanent set 30% maximum, minimum elongation at break of 300% and resistance to ozone showing no cracks.

2.3 Fabrication

.1 Accurately size glass to fit openings allowing clearances recommended by Glass Association of North America. Cut glass clean and free of nicks and damaged edges. Grind smooth and polish exposed glass edges. Do not cut or abrade tempered, heat treated, or coated glass.

2.4 Fabrication – Insulating Glass Units

.1 Insulating glass units: CAN2-12.8, double glazed, composed of lites of minimum 6 mm thick glass separated by a 13 mm wide dehydrated air space, double sealed and atmospheric pressure equalized to prevent bowing of the glass lites in the vertical position. Edges of glass shall be straight cut, free of nicks and other imperfections conducive to breakage. Coatings used in structural glazing shall be edge deleted 10 mm.

.1 Sealing System: At Contractor's option, dual seal with polyisobutylene primary and polysulfide secondary sealants, or dual seal with polyisobutylene primary and silicone secondary sealants.

.2 Set spacer core straight and even into glass units with a maximum variation in line of spacer core of plus or minus 2 mm (0.080") and the primary seal not extend past the inside edge of spacer core by more than 1.6 mm (0.060"). Weld or vulcanize spacer core corners and joints.

3. EXECUTION

3.1 Inspection

.1 Verify dimensions at the site before proceeding with fabrication or glazing units.

.2 Ensure that openings are free from distortion, and that surfaces are free from protrusions that will obstruct face and edge clearances.

.3 Ensure that ferrous metals are painted or zinc coated; and that surfaces are suitable for adhesion of the glazing materials.

.4 Ensure that operable units to be glazed are adjusted for proper operation.

.5 Ensure that surfaces to receive mirrors are sealed.

.6 Ensure that ambient and surface temperatures are above 5°C.

3.2 Preparation

.1 Free rabbets, stops and glass edges of dust, dirt, moisture, oil and other foreign matter detrimental to or obstructing the glazing material.

3.3 Installation - General

.1 Handle and install glass in accordance with Manufacturer's directions. Prevent nicks, abrasions and other damage likely to develop stress on edges.

.2 Without limitations, cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; leaking of glazed joints will be rejected.

.3 Remove and replace glazing stops in original locations, using original fasteners, securely set and undamaged.

.4 Use setting blocks and spacers as required to properly support the glass, centred in place in the glazing space independent of the materials and to uniformly distribute its load.

.5 Use a minimum of 2 setting blocks, located at the quarter points. Locate spacers at jamb edges of glass, uniformly spaced at 600 mm (24") oc maximum, and 300 mm (12") maximum from top and bottom.

.6 Assess coloured glass units for colour uniformity and arrange to avoid abrupt variation in appearance.

.7 Set glass properly centred with uniform bite and face and edge clearance, free from twist, warp or other distortion likely to develop stress.

.8 Leave labels on glass until it has been set and inspected and approved. Leave glass whole and without cracks, scratches or other defects and with setting in perfect condition at completion, to the approval of the Contract Administrator.

.9 Remove rejected, broken or damaged glass due to defective materials or improper setting and replace with perfect materials. Units producing distorted vision will be rejected and replaced at the reasonable discretion of the Contract Administrator.

3.4 Interior Glazing

.1 Set glazing in fire rated assemblies in accordance with NFPA 80 and the Code requirements. Install glazing to ULC tested proprietary methods of installation.

.2 Unless otherwise specified, all interior glazing shall be dry glazing.

.3 Provide glazing gasket around entire perimeter of glass. Make tight butt joint at corners of lights. Place setting blocks at sill and spacers at both jambs as required to centre the unit in

the frame. Place the unit into the frames and apply the stops against the gaskets. Tighten the screws or clips to obtain positive uniform pressure avoiding excessive pressure.

.4 Ensure rattle-free cushioning.

3.5 Cleaning

.1 Clean and make good to the approval of the Contract Administrator, surfaces soiled or otherwise damaged in connection with the work of this Section. Pay the cost of replacing finishes or materials that cannot be satisfactorily cleaned.

.2 Upon completion of the Work, remove all debris, equipment and excess material resulting from the work of this Section from the Site.

END OF SECTION