SECTION 08110
STEEL DOORS AND FRAMES

SECTION INDEX

PART 1 - GENERAL

1.1 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A366/A366M - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
2. A569/A569M - Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
3. A653/A653M - Specification for Steel Sheet, Zinc -Coated (Galvanized) or Zinc -Iron Alloy -Coated (Galvannealed) by the Hot -Dip Process.
4. C236 - Test Method for Steady -State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
5. C509 - Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
6. C976 - Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box

B. American Welding Society (AWS)

1. D9.1 - Sheet Metal Welding Code.

C. Federal Specifications (Fed. Spec.)

1. QQ-L-201F - Lead Sheet.

D. Military Specification (Mil. Spec.)

1. DOD-P-21035A - Paint, High Zinc Dust Content, Galvanizing Repair.

E. National Fire Protection Association (NFPA)

1. 80 - Standard for Fire Doors and Windows.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit Shop Drawings showing details of each frame type, elevations of each door type, location in building of each item, conditions at openings with various wall thicknesses and materials, typical and special details of construction, method of assembling sections, location and installation requirements for hardware, size, shape and thickness of materials, joints and connections.

2. Furnish approved Shop Drawings of steel frames for prefitted doors specified elsewhere.

B. Performance Data

1. Submit type and performance data for door louvers giving percentages of free area for louvers to be installed.

1.3 QUALITY ASSURANCE

A. Labels

1. Provide metal Testing Agency classification markings for application to labeled steel doors and frames, mechanically applied with drive screws or rivets.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and job storage.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to the Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 100-mm- (4-inch-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 6-mm (1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceco Door Products; Curries Co.; Artek Door Ltd.; S.W. Fleming Ltd.; Overly Door Co.; Pioneer Industries; Steelcraft; Trussbilt, Inc.; Windsor Door; or as approved.

2.2 MATERIALS

A. Steel Sheet

1. Cold-rolled, complying with ASTM A366; hot -rolled, complying with ASTM A569, pickled and oiled; or galvannealed complying with ASTM A653, A25 coating designation, unless otherwise specified; mill phosphatized.

2. Free from surface or internal defects, and with clean smooth surfaces.

3. Steel sheet for doors, in addition to the above: stretcher leveled.

4. Steel for exterior doors and frames, [and interior doors and frames indicated as A60 galvannealed] including their anchors: ASTM A653/A653M, commercial quality, A60 coating designation, mill phosphatized.

B. Sound-Deadening Liner for Doors

1. For non-labeled doors: rockwool or other approved synthetic resin based liner.

2. For labeled doors: as required by the labeling authority.

C. Integral Seal

1. Closed cell neoprene complying with ASTM C509.

D. Zinc-Rich Paint

1. ZRC Products Co., "Z.R.C." or other acceptable product complying with DOD-P-21035A.

2.3 METAL GAGES

A. Metal gages for steel sheets and strips for steel door and frame work: manufacturer's standard, minimum as follows:

1. Frames for doors, transoms and side lights

Exterior frames	16 ga.
Interior frames	16 ga.
Rough bucks (except lead lined)	12 ga.
Rough bucks for lead lined doors	10 ga.
Mullions and transom bars same as frame	
Moldings	20 ga.

2. Frames for borrowed lights

Frames and mullions	16 ga.
Moldings	18 ga.

3. Full flush doors (metal core reinforcement)

Face sheets for interior doors	18 ga.
Face sheets for exterior doors	16 ga
Core stiffener channels or "Z" members	20 ga.
Optional core - continuous trusscore	28 ga.
Moldings	18 ga.
Dutch shelf outer sheets	18 ga.
Dutch shelf reinforcement and brackets	14 ga.

4. Stile and rail doors

Stiles and rails	18 ga.
Channel construction - outer sheets	18 ga.
Moldings	18 ga.

2.4 WORKMANSHIP AND FABRICATION

A. General

1. Insofar as practicable, fabricate the Work at shop, ready for delivery and erection at building. Trial-fit Work impossible to completely fabricate in shop. Assemble at shop to insure proper assembly at building. Provide holes, connections, fastenings for and to work of other trades abutting, adjoining or intersecting the Work.

B. Welding

1. Comply with AWS D9.1.

C. Fabrication

1. Fabricate the Work with all joints and connections continuously welded, surfaces in alignment, straight and free from defects such as warp, or buckling. Unless indicated otherwise, make all corners square and edges sharp. Join molding neatly and weld. Dress all joints flush with base metal surface. Provide bracing necessary to support movable parts.

D. Reinforcement

1. Provide concealed reinforcement of sheet or bar steel for hardware, including automatic devices, and other attached work, where and as required by conditions. Hinge reinforcement: not less than 5 mm (3/16 inch) thick by not less than 38 mm (1-1/2 inches) wide by not less than 150 mm (6 inches) longer than hinge. Reinforcement for other hardware and attached work: not less than 12 gage and of sufficient size to receive fastenings. Secure hinge, door closer and door holder reinforcements with at least 6 spot welds. Secure other reinforcement with at least 2 spot welds.

E. Hardware Preparation

1. Drill and tap Work as required for mortised hardware. Locate by template, specified in "Finish Hardware" Section.

2. Prepare steel door frames and steel doors for finish hardware. Coordinate fitting of hardware on frames for doors specified in other sections, which require factory fitting of hardware. Provide sinkages or mortises, as required, formed accurately to template so that mortised hardware will fit neatly into depressions, with hardware member surface flush with surface of door or frame, unless otherwise required.

3. Provide reinforcing plates, less drilling and tapping, for doors and frames to receive surface applied hardware, except push plates and kick plates.

4. Provide plaster guards or mortar boxes in back of hardware cutouts welded to frame.

5. Punch interior door frames to receive door silencers. For single door frames, provide for 3 silencers in lock side jambs. For double door frames, provide for one silencer for each leaf in frame head.

6. For double door frames with flush transom panels, provide continuous sponge neoprene silencer at transom rabbeted stop.

7. Provide necessary additional space, cut -outs, reinforcements and provisions for fastening in doors and frame heads to receive overhead door closers concealed in frame members.

8. Provide continuous hardware reinforcement for hinges for lead-lined doors.

F. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

a. Polystyrene core door with thermal break construction, edges filled flush and smooth, with U-value of [0.74 W/sq. m x K (0.13 Btu/sq. ft. x h x deg F)] or better.

2.5 SHOP PAINTING

A. Cleaning

1. Remove oil, grease, sand, dirt and other foreign substances. After cleaning, chemically treat cold-rolled and galvanized metal surfaces to assure maximum

paint adherence.

B. Galvanized Surfaces

1. Touch up welds and abrasions in galvannealed and galvanized surfaces with zinc -rich paint.

C. Primed Finish

1. Apply dip or spray coat of rust-inhibitive metallic oxide or synthetic resin metal primer, baked on or oven-dried, to ferrous metal surfaces, including galvanized and galvannealed surfaces, which are smooth and free from irregularities and rough spots.

D. Bituminous Paint Finish

1. In addition to primed finish, paint back surfaces of frames, reinforcing struts and other ferrous parts concealed by building construction one heavy coat of approved bituminous paint.

2.6 STEEL FRAMES

A. General

1. Form frames for doors, transoms, side-lights, borrowed lights, interior glazed panels and other items indicated as being steel or hollow metal of steel sheets. Fabricate frames as indicated. Vary forming from that indicated where special conditions necessitate changes from indicated details, as approved.

B. Type and Construction

1. Unless otherwise indicated, provide combination type frames with integral buck, integral seal where indicated, jamb and trim, welded construction, with all contact edges of corner joints closed tight, and with trim faces mitered and continuously welded. Provide plaster flanges and keys for frames located in plastered walls.

2. Seal joints in exterior frames watertight.

C. Mullions and Transom Bars

1. Provide mullion and transom bars in frames using closed or tubular construction with rabbets for doors, glass, and transom panels. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between members with concealed clip angles of same metal gage as frame.

D. Frame Reinforcing

1. Reinforce heads of frames in non-load bearing masonry partitions less than 200 mm (8 inches) thick. Unless otherwise indicated, provide continuous channel head reinforcing formed from not less than 12 gage steel sheet, of width and depth the greatest dimensions possible to suit frame head condition, and welded to back of frame at head. Other methods of reinforcing may be employed subject to the approval of the Architect.

E. Wall Anchors

1. General: Provide metal anchors of shape and sizes required for adjoining wall construction. Fabricate wall anchors of steel, not less than 18 gage.

2. For frames set in masonry, except labeled openings: Use adjustable, flat or perforated or corrugated, T-type sliding anchors, 75 mm (3 inches) by 250 mm (10 inches) long, with anchor head of width and length to fill void in back of frame. Locate anchors on each jamb near top and bottom of frame and at intermediate points not over 600 mm (24 inches) apart.

3. For labeled openings: Use anchors approved by the Testing Agency as required by wall construction. At new masonry walls, use masonry "tee" anchors. At previously placed concrete or masonry walls, provide approved spacers. Locate anchors in accordance with Testing Agency requirements.

4. For frames set in metal stud partitions: Use metal jamb anchor clips, notched and punched type at truss type studs, and with turned down edge at channel type studs. Weld clips to inside of each jamb. Provide anchors which are suitable for type of metal studs specified under another section. Provide 4 anchors per jamb for frames 2130 mm (7 feet) or less in height. Locate anchors immediately above and below top hinge reinforcement and above other hinge reinforcements. Locate anchors on strike side directly opposite the anchors on the hinge side. For frames over 2130 mm (7 feet) high, use additional anchors per jamb spaced not more than 450 mm (18 inches) apart.

5. For frames set in previously placed concrete or masonry walls: Provide flat -head machine bolt and shield anchors through frame stops. Provide steel spacer or plate reinforcing welded to frame behind stop at each anchor location. Locate anchors on each jamb near top and bottom of frame and at intermediate points not over 600 mm (24 inches) apart. Provide continuous rough buck or plate welded to legs of frame.

6. For frames set in steel subframes: Provide flat -head machine bolt through frame stops. Provide steel spacer or plate reinforcing welded to frame behind stop at each anchor location. Locate anchors on each jamb near top and bottom of frame and at intermediate points not over 600 mm (24 inches) apart. Provide continuous rough buck or plate welded to legs of frame.

F. Floor Anchors and Spreaders

1. For frame jambs, and mullions extending to floor, use floor anchor clips of not less than 10 gage steel, with 2 holes for anchoring to floor, and welded to trim flanges. Where separate topping is indicated, extend door frames and mullions to concrete subslab. Provide temporary removable steel spreaders or shipping bars across bottom of frames and tack weld to jambs and mullions.

G. Moldings

1. Provide moldings with steel frames having openings for glass, panels and other locations where trim moldings are indicated. Fabricate glazing moldings of steel, removable type, square or rectangular, suitable for 6-mm-thick (1/4-inch-thick) glass assembled with butted corners, and secured with countersunk oval-head Phillips machine screws, uniformly spaced not more than 300 mm (12 inches) apart.

2. Fabricate moldings for panels other than glass of shape indicated, suitable for panel thickness indicated. Assemble molded shapes with mitered corners and square or rectangular shapes with butted corners. Secure as specified for glazing moldings.

3. Locate removable moldings on room side for frames facing corridors, on interior side for exterior frames.

H. Lead-Lined Frames

1. Where steel frames occur in lead-insulated partitions, provide retainers in frames as required to hold lead lining in position. Provide compatible jamb anchor clip configuration. Notch and punch clips at truss type studs for stud attachment. Lead lining is specified in "Radiation Shielding Construction" Section.

2.7 STEEL DOORS

A. General

1. Fabricate steel doors of full flush door construction, unless indicated to be stile and rail door construction.

2. Leaf thickness, unless otherwise indicated: 45 mm (1-3/4 inches).

B. Full Flush Door Construction

1. Construct doors of 2 outer steel sheets with edges continuously welded and finished flush, without visible seams or joints on door faces or edges. Reinforce doors with metal core framing consisting of interlocking steel channels, or Z-shaped members, placed vertically and extending through full door height, spaced not more than 6 inches on centers and spot -welded not more than 3 inches on centers to interior surfaces of outer sheets. Reinforce tops and bottoms of doors horizontally full width of door by steel channels spot welded to outer sheets. Provide weep holes in bottom channel. Fill spaces between metal core framing members with approved sound-deadening liner.

2. Optional framing core: Inner core may be continuous truss formed from not less than 28 gage sheet metal and spot -welded to interior surfaces of outer sheets not more than 75 mm (3 inches) on centers horizontally and vertically over entire surface on both sides. Fill spaces with approved sound-deadening liner.

C. Stile and Rail Door Construction

1. Fabricate stiles and rails of steel sheets formed into rectangular tubes with integral rabbets, with joints between stiles and rails either mitered or butted, reinforced with concealed steel plates or shapes, continuously welded, and ground smooth; stiles and top rails 125 to 140 mm (5 to 5-1/2 inches) wide, and bottom rail 200 to 250 mm (8 to 10 inches) wide. Provide approved sound-deadening material inside of stiles and rails.

2. Optional construction: Fabricate stiles and rails of continuous steel channels, welded together to form rigid frame, with two outer steel sheets spot -welded to frame, joints between stiles and rails mitered or butted, and continuously face-welded; stile and rail dimensions and sound-deadening same as specified above.

D. Door Clearances

1. For non-labeled doors: 2.4 mm (3/32 inch) at jambs and heads, 3 mm (1/8 inch) at meeting stiles of pairs of doors, and 19 mm (3/4 inch) at bottom, including thickness of resilient floor covering.

2. For labeled doors: in accordance with NFPA 80.

E. Stile Edges

1. Beveled at 1 to 16 slope, unless otherwise specified.

2. Lock stile edges for double-acting doors: rounded.

F. Edge Closures

1. Top and bottom edges of exterior steel doors: closed with flush cap to produce a weatherseal.

2. Top and bottom edges of [all] interior doors [where indicated]: closed and filled flush to provide a sanitary surface.

3. Provide closure as part of door construction or by the addition of inverted steel channels or other suitable shapes welded to face.

2.8 LABELED DOORS AND FRAMES

A. Approved Construction

1. Details of construction and requirements for labeled steel doors and frames, as required by the Testing Agency, for each fire class of opening, shall take precedence over project details and specifications, except for gages of metal when the Project Specifications require thicker gages than those required for labeled doors and frames. In the case of an inconsistency between Testing Agency's requirements and the requirements indicated or specified, or both, submit the matter to the Architect for adjustment before fabricating such work. Rated construction without label will not be accepted.

B. Labeled Openings

1. For steel doors and frames, including transom panels, in labeled openings, provide the Testing Agency's classification marking for the fire class of opening indicated.

2. Rate Class B labels for stair tower doors with temperature rise in 30 minutes to 230 degrees C (450 degrees F) maximum.

3. Where authorities having jurisdiction over the Project require deviation from the Testing Agency's requirement for latching device, reinforce doors and frames for surface mounted exit device.

2.9 ASTRAGALS

A. Furnish astragals for pairs of labeled doors, pairs of doors in fire-rated partitions, and pairs of exterior doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Install steel door and frame work in correct locations, in alignment, plumb and to true planes. Make breaks, angles and corners square with walls. Where coordination with adjoining work is necessary, take job measurements. Installation shall be in accordance with approved Shop Drawings.

B. Frames

1. Install steel frames prior to construction of enclosing walls and ceilings. Brace frames securely until permanent anchors are set. Anchor bottom of frames with anchor bolts and lead expansion shields, or with drop-in expansion bolts. Build wall anchors into walls, or secure wall anchors to adjoining construction. Provide required wedging or blocking for frames . Remove and reinstall frames which exceed the recommended tolerances.

2. Provide steel shims required under floor anchors.

END OF SECTION

SECTION 08120
ALUMINUM DOORS AND FRAMES

SECTION INDEX

PART 1 - GENERAL

1.1 REFERENCES

A. Aluminum Association (AA)

1. CA-92 - Care of Aluminum.
2. DAF-45 - Designation System for Aluminum Finishes.
3. SAA-46 - Standards for Anodized Architectural Aluminum.

B. American Architectural Manufacturers Association (AAMA)

1. 2605 - Performance Requirements and Test Procedures for Superior Performing Organic

C. American Society for Testing and Materials (ASTM)

1. A36/A36M - Specification for Carbon Structural Steel.
2. B26/B26M - Specification for Aluminum-Alloy Sand Castings.
3. B108 - Specification for Aluminum-Alloy Permanent Mold Castings.
4. B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
5. B209M - Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
6. B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
7. B221M - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes [Metric].

D. American Welding Society (AWS)

1. C1.1 - Recommended Practices for Resistance Welding.

E. National Association of Architectural Metal Manufacturers (NAAMM)

1. Specifications for Rubber-Like Gasket Materials.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit Shop Drawings indicating layout and elevations, sections, thickness and gage of metals, fastening, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, corner post details and erection details.

B. Samples

1. Submit Samples of finish for exposed aluminum surfaces, applied to Sample of each alloy to be used approximately 150 mm (6 inches) long.

C. Maintenance Instructions

1. Submit maintenance instructions for finished materials.

1.3 QUALITY ASSURANCE

A. Contractor's Qualifications

1. Require the manufacturer or his authorized representative, as approved by the Architect, to install the Work using workmen skilled in the trade.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protection

1. Protect the Work from damage during transportation to the Project site, storage at site and during progress of the Work until completion. Store units upright on pieces of lumber in a dry location and under cover.

1.5 PROJECT CONDITIONS

A. Field Measurements

1. Take field measurements to verify or supplement dimensions indicated. Be responsible for accurate fit of the Work.

1.6 WARRANTY

A. Special Warranty

1. Warrant the Work for 2 years against defective materials or workmanship, or both, and against leakage, except where such leakage is caused by lightning, hurricane, tornado, hail storm or other unusual climatic phenomena of the elements, or failure of related work installed by other parties, or abuse or vandalism.

2. During the warranty period, the Contractor agrees to restore defective Work to the standard of the Contract Documents, including materials, labor, refinishing and other costs incidental to the Work. Within 24 hours after receipt of notice from the Owner, the Contractor shall inspect the Work and immediately repair leaks in the Work. The Contractor agrees to restore Work found to be defective as defined in the Contract Documents within 10 days after receipt of notice from the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum

1. Extruded bars, rods, shapes and tubes: ASTM B221, 6063 alloy, unless otherwise specified.

2. Flat sheet and plate: ASTM B209, 1100, 3003 or 5052 alloy, unless otherwise specified.

3. Aluminum for hard anodic finish: the alloy required to produce the specified finish, temper as recommended by the manufacturer.

4. Aluminum castings: ASTM B108 for permanent mold castings, and B26, Class 25, for sand castings.

B. Fasteners

1. Screws, nuts, washers, bolts, rivets, anchors, and other miscellaneous fastening devices used in fabrication of the work: stainless steel and of sufficient size and strength to perform the function for which they are used.

2. Exposed fasteners: finished to match aluminum finish.

C. Steel

1. Structural steel shapes and bars: ASTM A36.

D. Glazing Gaskets

1. EPDM complying with NAAMM "Specifications for Rubber-Like Gasket Materials", of configuration recommended and as furnished by the manufacturer of the aluminum work for a watertight installation.

2.2 MANUFACTURERS

A. Product of one of the following, or as approved:

1. Kawneer Co.

2. Tubelite, Inc.

3. Vistawall Architectural Products.

4. U.S. Aluminum

2.3 FABRICATION - GENERAL

A. Welding

1. Comply with AWS C1.1.

2.4 ALUMINUM DOORS

A. Type

1. Narrow stile with glazed opening, single or in pairs and in size as indicated. Width of stiles and top rail: 50 mm (2 inches) minimum.

2. Medium stile with glazed opening, single or in pairs and in size as indicated. Width of stiles and top rail: 75 mm (3 inches) nominal.

B. Construction

1. Stiles and rails: extruded aluminum tubular sections 44 mm (1-3/4 inches) deep with 3-mm (1/8-inch) nominal wall thickness. Width of bottom rail: 150 mm (6 inches) nominal. Door leaf: equipped with an adjustable mechanism located at the top rail near the lock stile that will provide for minor clearance adjustments after installation.

2. Doors reinforced and through-bolted, with joints made by mechanical fastening or by concealed welding and mechanical fastening. Mechanical joints: accurately milled to a hairline joint and provide controlled water weepage.

C. Single-Acting Doors

1. Stiles for single-acting doors: beveled.

2. Meeting stiles for pairs of single-acting doors: rounded with mortised weatherstripping in one stile.

D. Double-Acting Doors

1. Stiles for double-acting door: rounded.

2. Meeting stiles for pairs of double-acting doors: mortised weatherstripping in one stile.

E. Weatherstripping

1. Weatherstripping mortised in stiles: polypropylene pile in aluminum or stainless steel housing, adjustable and replaceable.

F. Hardware Cutouts and Reinforcing

1. Provide cutouts, recesses, mortising, or milling operations required for finish hardware, including automatic devices, accurately to templates. Provide backing plate reinforcing as required to insure adequate strength of connection.

2. Hardware templates and approved hardware schedule are specified in "Finish Hardware" Section.

G. Glazing Shapes

1. Extruded aluminum, square stop design.

2. Stops on exterior side of door: lock-in tamper-proof type.

3. Glazing beads: snap-in type with glazing gasket designed for 6-mm-thick (1/4-inch-thick) glass. Exposed screws will not be permitted.

H. Location of Hardware

1. As specified in Section 08710.

2.5 ALUMINUM FRAMES

A. General

1. Fabricate principal parts of frames for aluminum doors, transoms and side lights of extruded aluminum tubular sections not less than 3-mm (1/8-inch) nominal wall thickness, and not less than width and depth indicated.

2. Door frames in curtain wall openings: extruded aluminum sections designed to fit into glazing recess of curtain wall members.

3. Receive, finish and install aluminum operator and presence sensor housings specified in "Automatic Door Equipment" Section.

B. Construction and Workmanship

1. Construct the Work to provide for thermal movement based on 38-degree C (100-degree F) temperature differential, to withstand wind loads normal to plane of door of 960 Pa (20 psf) positive and negative pressures with maximum deflection limited to 19 mm (3/4 inch) or 1/175 of the clear span, whichever is the least, and to assure neat appearance. Fabricate joints to remain flush and hairline tight.

C. Reinforcement for Door Frames

1. Provide steel members, as may be required for additional reinforcement of aluminum door frames, as an integral part of the prefabricated units. Provide frames with anchors and reinforcement for door hinges, locks and other finish hardware items.

D. Glazing Provisions

1. Design glazed openings in transom and side light frames for "flush" glazing with neoprene glazing inserts and for thickness of glass specified in Section 08810.

2. Provide face clearance from rabbet or glazing bead to glass of 3 mm (1/8 inch) minimum all around. Provide bite of not less than 10 mm (3/8 inch) for glass size up to 100 united inches, and not less than 13 mm (1/2 inch) for glass size over 2500 united mm (100 united inches).

E. Weatherstripping

1. Weatherstrip door heads, jambs and meeting stiles.

2. Weatherstripping in door stops: extruded EPDM.

F. Accessories

1. Furnish aluminum trim, closures, and other components necessary for the complete installation of the Work. Use extruded aluminum shapes where possible.

2. Minimum thickness of brake metal, if used: 1.63 mm (0.0641 inch).

3. Provide weathertight closures to interface with curtain wall members.

2.6 ALUMINUM FINISH

A. Anodic

1. Provide AA-M12C22A41 clear finish for exposed aluminum surfaces in accordance with AA DAF-45 and AA SAA-46.

2. Provide AA-M12C22A42 integral color finish for exposed aluminum surfaces in accordance with AA DAF-45 and AA SAA-46. Color of finish shall be equal to Alcoa No. 313 dark bronze.

PART 3 - EXECUTION

3.1 ERECTION

A. General

1. Install the Work in accordance with manufacturer's printed directions and the approved Shop Drawings. Set members plumb, level, and true in openings. Fastenings shall be concealed.

B. Setting

1. Set aluminum doors in alignment, plumb, straight and in true planes. Installation of finish hardware is specified in Section 08710.

2. Seal frames in curtain wall openings with glazing gaskets.

C. Anchors and Fastenings

1. Anchor framing members to adjoining or adjacent construction as indicated on details and approved Shop Drawings. Drill and tap steel and other work for the attachment of framing members, trim and accessories.

3.2 ADJUSTING

A. Before final acceptance of building, check and readjust the operating hardware. Leave the Work in complete and operating condition, as approved by the Architect.

3.3 CLEANING

A. Before final acceptance, thoroughly wash finished surfaces with clean water and soap, and rinse with clean water in accordance with AA CA -92. Do not use acid

solutions, steel wool or other harsh abrasives. Clean or restore the finish of aluminum surfaces that have been stained or discolored in accordance with AA CA - 92 and the aluminum finish manufacturer's recommendations. Replace stained, discolored, and abraded components that cannot be repaired to the Architect's satisfaction with new units.

END OF SECTION

SECTION 08360
SECTIONAL OVERHEAD DOORS

SECTION INDEX

PART 1 - GENERAL

1.1 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A36/A36M - Specification for Carbon Structural Steel.
2. A48 - Specification for Gray Iron Castings.
3. A153 - Specification for Zinc Coating (Hot -Dip) on Iron and Steel Hardware.
4. A283/A283M - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
5. A366/A366M - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
6. A653/A653M - Specification for Steel Sheet, Zinc -Coated (Galvanized) or Zinc -Iron Alloy -Coated (Galvannealed) by the Hot -Dip Process.

B. American Welding Society (AWS)

1. D1.1 - Structural Welding Code - Steel.

C. Federal Specifications (Fed. Spec.)

1. TT-P-25E - Primer Coating, Exterior (Undercoat for Wood, Ready -Mixed, White and Tints).
2. TT-P-641G - Primer Coating, Zinc Dust-Zinc Oxide (for Galvanized Surfaces).

D. National Fire Protection Association (NFPA)

1. 70 - National Electrical Code.

E. National Electrical Manufacturers Association (NEMA)

1. MG 1 - Motors and Generators.

F. U.S. Department of Commerce, National Bureau of Standards, Product Standard

1. PS 1 - Construction and Industrial Plywood.

G. West Coast Lumber Inspection Bureau (WCLB)

1. Standard Grading Rules.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit Shop Drawings, showing layout and details of fabrication and installation, including dimensions and wiring diagram for operator and limit switches, and control items and wiring.

B. Maintenance Instructions

1. Submit maintenance and operating instructions for doors and operating equipment.

1.3 PROJECT CONDITIONS

A. Field Measurements

1. Take field measurements to verify or supplement dimensions indicated. Be responsible for accurate fit of this Work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Raynor Garage Doors; Overhead Door Corp.; Wayne-Dalton Corp.; or as approved.

2.2 MATERIALS

A. Steel and Iron

1. Steel bars and structural shapes: hot -rolled from new billet steel complying with ASTM A36.

2. Stretcher-leveled steel sheet: ASTM A366.

3. Steel plate: ASTM A283.

4. Gray iron castings: ASTM A48.

B. Zinc-Coated Steel Sheet

1. Zinc -coated steel sheet: ASTM A653/A653M, commercial quality, G90 coating designation.

C. Zinc-Coated Hardware

1. Zinc coating on hardware: ASTM A153.

D. Wood

1. Lumber: Grade B and Better industrial Douglas fir or Sitka spruce, complying with the WCLB Standard Grading Rules.

2. Plywood: U.S. Product Standard PS 1, Exterior Type, Grade A-A.

E. Prime Paint

1. Prime paint for zinc -coated surfaces: Fed. Spec. TT-P-641F, Type II.

2. Prime paint for wood surfaces: qualitative requirements of Fed. Spec. TT-P-25E.

2.3 FABRICATION

A. Steel Door Construction

1. Door panel sections: roll formed of USS 16 gage galvanized steel with rabbeted horizontal edges and flush exterior face. Intermediate and end stiles: channel or tubular shaped sections, USS 16 gage or heavier, welded to door panels.

2. Maximum deflection of door: 1/120 of the span in the full open position (horizontal) or in the closed position with a 960 Pa (20 pounds per square foot) wind load.

3. Insulate panels with UL Class A urethane or isocyanurate, minimum r 11.6, backed with USS 20 gage galvanized steel sheet fastened securely in place.

4. Furnish glazed sections, as shown, complete with galvanized glazing stops to receive 6-mm (1/4-inch) glass and gaskets as specified in Section 08810.

C. Track

1. 75-mm (3-inch) size, minimum sideroom type, designed to wedge the door against frame in closed position, formed of not less than USS 12 gage zinc -coated steel sheet.

2. Horizontal track section: angle reinforced full length.

3. Track type: high lift.

D. Suspension

1. Suspend doors from zinc -coated aircraft cables having a minimum factor of safety of 5, wound on tapered cable drums.

2. Counterbalance doors to remain in any position by oil tempered torsion springs on continuous steel shaft mounted on ball or roller bearings. Guarantee torsion springs for a minimum of 100,000 cycles. Provide tamperproof cycle counter for each door.

E. Hardware

1. Steel zinc -coated after fabrication, including the following:

a. Hinges, USS 13 gage, offset tubular pin type.
b. One-piece steel rollers with ball bearings in case hardened races.
c. Rim deadlock for each door with brass cylinder masterkeyed to building system.

F. Weatherstripping

1. Maximum air infiltration between jamb and door: 1.85 m^3 per hour per linear meter (20 cu. ft. per hour per linear foot) of door edge at 16 km/h (10 mph) wind velocity.

2. For bottom of doors, provide flexible neoprene astragal held by steel retainer. Seal top of doors with adjustable neoprene weatherstrip. Furnish jamb weatherstripping as required to meet infiltration design requirements.

G. Safety Device

1. Provided a safety latching device which will automatically engage the vertical track and prevent the door from falling in event of cable or spring breakage.

H. Finish

1. Prepare exposed door surfaces including hardware, track and hangers, and apply a shop coat of prime paint. Touch up surfaces in the field which have been abraded during installation. In preparation, include chemically treating metal surfaces.

2.4 OPERATING EQUIPMENT FOR POWER OPERATED DOORS

Choice required.

A. General

1. Electrical components: NFPA 70.

B. Power Operator Components

Verify electrical characteristics.

1. Totally enclosed, non-ventilated, instantly reversible, ball bearing motor in standard NEMA frame, operating on 480-volt, 3 phase, 60 hertz alternating current; removable without affecting manual operation or limit switch setting; of sufficient capacity to operate door at speed of 300 mm (1 foot) per second without exceeding a temperature rise of 55 degrees C, above 40 degrees C. ambient, but not less than 1/2 hp.
2. "V" belt primary reduction with sprocket and roller chain secondary reduction or reduction gears that operate in oil bath in closed gear box.
3. Friction clutch set to allow only slightly more power to reach the operator than is required to operate the door, designed to slip free if door becomes stalled and to be adjusted to cushion the starting, stopping and reversing loads.
4. Solenoid brake to prevent door from coasting and hold door locked when closed.

C. Auxiliary Operators

1. Provide auxiliary hand chain operation with a device to disconnect the door from power operation, release the brake and allow manual operation in case of power failure or if motor is removed from the operator.

D. Limit Switches

1. Control door movement by a limit switch, easily adjustable to stop door in any position and enclosed in a cast iron or steel box, GE Industrial Systems CR115E or G, or as approved.

E. Safety Edge Switch

1. Provide bottom weatherstripping astragal which contains a pneumatic hose or mechanical linkage safety switch.
2. Provide bottom weatherstripping astragal running full width of door which contains a fail-safe type safety switch, consisting of a stainless steel contact plate and phosphor-bronze coiled contact spring. Provide a 3-conductor coil cord connection as required.

F. Finish

1. Machinery enamel for exposed ferrous metal parts of operating equipment.

G. Controls

1. Provide controls as specified in Section 08305.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Require the Work to be installed by the door manufacturer or his authorized representative in accordance with approved Shop Drawings and door manufacturer's instructions.

B. Accessories

1. Include continuous brackets for mounting track, pads for support of operators

and torsion springs, track hangers and fastening devices as recommended by manufacturer. Attach pad supports to masonry or concrete with bolts embedded in masonry or concrete, but not penetrating exterior face of wall. Include drilling and tapping of frames or other related work as required for connections. Furnish and install or supervise the installation of anchor bolts and other fastening devices.

C. Operators and Controls

1. After electrical work is completed, test and adjust the doors, operators and controls as required for smooth operation.

D. Field Touch-Up

1. After installation, touch up abraded areas with prime paint.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

SECTION INDEX

PART 1 - GENERAL

1.1 REFERENCES

A. Aluminum Association (AA)

1. CA-92 - Care of Aluminum.
2. DAF-45 - Designation System for Aluminum Finishes.
3. SAA-46 - Standards for Anodized Architectural Aluminum.

B. American Architectural Manufacturers Association (AAMA)

1. AAMA/NWWDA 101/I.S. 2 - Voluntary Guide Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
2. 803.3 - Specification for Narrow Joint Seam Sealer.
3. 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
4. 2605 - Performance Requirements and Test Procedures for Superior Performing Organic

C. American Society for Testing and Materials (ASTM)

1. B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
2. B221M - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes [Metric].
3. E283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
4. E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.2 REFERENCE SPECIFICATIONS

A. Refer to "Glass and Glazing" Section for applicable glazing requirements, including general provisions, submittals and materials.

1.3 SUBMITTALS

A. Warranty

1. Submit a statement of compliance for performance requirements and aluminum finish.

2. Submit testing laboratory reports required by AAMA/NWWDA 101/IS2.

B. Special Warranty

1. Warrant aluminum windows for 5 years against defective materials and workmanship and against failure of weathertightness due to defective materials or workmanship or installation.

2. During the warranty period restore defective Work to the standard of the Contract Documents, including all materials, labor, refinishing and other costs incidental to the Work. Inspect the Work within 24 hours after receipt of notice from the Owner and make immediate repairs to leaks. Restore Work found to be defective as defined in the Contract Documents within 10 days after receipt of notice from the Owner.

C. Shop Drawings

1. Submit Shop Drawings indicating elevations of windows, sections, thicknesses and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, method of glazing, erection details, and other pertinent construction details.

2. Submit a letter from the window anchor manufacturer indicating that the manufacturer has reviewed and approved the use of the proposed anchors and applications.

D. Samples

1. Submit Samples of finish for exposed aluminum surfaces, approximately 150 x 75 mm (6 x 3 inches) in size, representing extreme range of variation in color and texture, to be used for comparison during production.

2. Submit cross-sectional sample of window showing thermal break construction.

E. Maintenance Instructions

1. Furnish maintenance instructions for finish materials and operating components.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements

1. Comply with AAMA/NWWDA 101/IS2 requirements for the type specified and the following performance requirements:

a. Water resistance: No uncontrolled water leakage at 480 Pa (10.0 psf) pressure differential with water rate of 200 litres/hr./sq. m (5 gallons/hr./sf.) when tested in accordance with ASTM E331.

b. Air Infiltration: 0.0003 cu. m/s/lmcp maximum at 300 Pa (6.24 psf) pressure differential when tested in accordance with ASTM E283.

c. Thermal Transmittance (U): 0.50W/sq. m/K (____ Btu-hr-sq.ft./deg. F) maximum at 24 km/h (15 mph) outside air velocity when tested in accordance with AAMA 1503.1.

d. Condensation Resistance Factor: C55 when tested in accordance with AAMA 1503.1.

1.5 QUALITY ASSURANCE

A. Contractor's Qualifications

1. Employ an approved authorized representative of the manufacturer to install the Work, using workmen skilled in the trade.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect the Work from damage during transportation to the Project site, storage at the site, and during progress of the work until completion. Store units upright on pieces of lumber in a dry location and under cover.

1.7 SITE CONDITIONS

A. Field Measurements

1. Take field measurements to verify or supplement dimensions indicated. Be responsible for accurate fit of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum

1. Extruded bars, rods, shapes and tubes: ASTM B221.

2. Furnish required alloy for anodic finish to produce the specified finish, temper as recommended by the manufacturer.

B. Anchors and Fasteners

1. Screws, nuts, washers, bolts, rivets, anchors, and other miscellaneous fastening devices used in the work: aluminum alloy or stainless steel, and of sufficient and appropriate strength to perform the function for which they are used.

C. Hardware

1. Exposed hardware: solid bronze, free from imperfections.

2. Keepers: stainless steel.

D. Glass and Glazing Materials

1. Refer to "Glass and Glazing" Section for the following:

a. Insulating glass.

b. Glazing materials.

E. Screen Cloth

1. 18 by 16 mesh, alclad aluminum, woven from not less than 0.287-mm (0.0113-inch) wire.

F. Metal Joint Sealant

1. AAMA 803.3.

2.2 FABRICATION

A. Manufacturers

1. EFCO Corp.; Wausau Window and Wall Systems; Winco Window Co., or as

approved.

B. Type

1. Provide fixed type, without muntins, and of sizes indicated.

2. Provide venetian blinds between lights of glass where indicated.

C. Construction - General

1. Main frame and ventilator sections: extruded aluminum. Minimum combined overall depth of window at sash: 50 mm (2 inches). Minimum wall thickness: 3 mm (1/8 inch), except for glazing beads and as otherwise specified.

2. Frame corners: mortised and tenoned or mitered and fusion welded. Ventilator members: tubular with mitered corners internally reinforced.

3. Perform welding prior to finishing, with welded joints solid, excess metal removed, and dressed smooth on exposed and contact surfaces. Perform the dressing so that no discoloration or roughness will show after finishing. Completely remove welding flux, if used, immediately after welding is completed.

4. Joints formed with mechanical fastenings: closely fitted, sealed with polysulphide or butyl sealant to be permanently watertight.

D. Thermally Improved Construction

1. For thermally improved windows, provide frames and ventilators of split construction with exterior component separated from interior component by a non-metallic material providing a complete separation and joined to both components without the use of metal fasteners through the thermal break. Design, construct and install the window so that any failure of the thermal break material will not result in diminished structural performance, increased air infiltration or exfiltration, water infiltration, or disengagement of window components.

2. The following types of thermal break are acceptable:

a. Insulbar: a glass-reinforced polyamide 6/6 nylon, with glass fibers oriented in three directions, mechanically crimped into dual dovetail-shaped slots in the aluminum extrusions.

b. Struct-Link or other similar construction: a poured and interrupted debridged polyurethane construction that periodically leaves a measured length of aluminum web to provide structural integrity, with the debridged sections continuously sealed using an elastomeric sealant.

c. Pressure Bar: a continuous extruded aluminum member anchored to the window framing system with mechanical fasteners and separated from the framing by an insulating non-metallic spacer.

E. Weatherstripping

1. Provide ventilator sections with vinyl plastic and wool pile or neoprene weatherstripping contacting the frame in the closed position, continuous with fused corners and easily replaceable without special tools.

F. Glazing Provisions

1. Design windows for inside glazing with continuous "snap-in" type extruded aluminum glazing beads with locking groove for compression wedge. Design inside face of tape sealant glazing stop to be serrated or to mechanically retain tape sealant shim.

G. Watershedding Provisions

1. Make provision in sill for exterior drainage of water. Provide weep holes

recommended by the Glass Association of North America, protected my internal baffles or anti-blow-back devices.

H. Hardware - General

1. Secure hardware with screws to internal reinforcement. Do not tap aluminum section.

2. Finish for exposed surfaces of hardware: match aluminum finish or B.H.M.A. Code 613 finish (US10B, oil rubbed bronze).

I. Mullions and Subframes

1. Design mullions and subframes to withstand wind load of [1900 Pa (40 psf)] [___ Pa (___ pfs)] without exceeding a deflection of 1/175 of span between anchoring points.

J. Accessories

1. Provide all necessary aluminum trim, closures, hardware, fastenings, clips, and other components necessary for complete installation of windows and operation of ventilators.

2.3 ALUMINUM SILLS

A. Extruded aluminum with provision for anchoring with clips and concealed fastenings, with joints backed up with concealed splice plates and located at mullion centers, unless otherwise indicated.

2.4 ALUMINUM FINISH

A. Anodic

1. Provide AA-M12C22A41 clear finish for exposed aluminum surfaces in accordance with AA DAF-45 and AA SAA-46.

2. Provide AA-M12C22A42 integral color finish for exposed aluminum surfaces in accordance with AA DAF-45 and AA SAA-46, in color equal to Alcoa No. 313 dark bronze.

B. Protective Coating

1. Insulate aluminum which will come in contact with concrete, masonry, wood, or dissimilar metals (except stainless steel, white bronze, or solid zinc) by application of heavy brush coat of alkali resistant bituminous paint or zinc chromate prime paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Install the Work in accordance with manufacturer's printed directions and the approved Shop Drawings. Set members plumb, level and true in openings. Fastenings shall be concealed. Properly brace frames to prevent distortion and misalignment. Protect ventilators and other operating parts against accumulation of cement, lime, and other building materials by keeping ventilators tightly closed and secured to frames.

2. Seal joints in aluminum sills with metal joint sealant.

B. Anchors and Fastenings

1. Anchor window units to adjacent construction. Drill and tap steel work for the attachment of window units, trim and accessories. Anchors and fastenings shall

be built into, anchored or bolted to the jamb of openings, and shall be fastened securely to the window units, and to adjacent construction. Unless otherwise indicated, anchor spacing shall be as recommended by window manufacturer. Anchors shall have sufficient strength to hold the window units firmly in position.

C. Adjustment

1. After window units have been installed, adjust ventilators and hardware to operate smoothly and to be weathertight when ventilators are fully closed and locked. Lubricate hardware and operating parts as necessary.

3.2 GLAZING

A. Install insulating glass in windows as specified in Section 08810 for wet/dry glazing.

3.3 CLEANING

A. Before final acceptance, thoroughly wash finished surfaces with clean water and soap, and rinse with clean water in accordance with AA CA -92. Do not use acid solutions, steel wool or other harsh abrasives. Clean or restore the finish of aluminum surfaces which have been stained or discolored in accordance with AA CA -92 and the aluminum finish manufacturer's recommendations. Replace stained, discolored, and abraded components which cannot be repaired to the Architect's satisfaction with new units.

3.4 PROTECTION

A. Protect adjacent construction against damage during progress of the Work.

END OF SECTION

DOOR HARDWARE - 08710
SECTION INDEX

PART I - GENERAL

Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.

1.1 WORK INCLUDED:

A. Furnish all items of Finish Hardware specified, scheduled, shown or required herein except those items specifically excluded from this section of the specification.

B. Related Sections:
1. Section 06100 – Rough Carpentry
2. Section 06200 – Finish Carpentry: Installation of Finish Hardware
3. Section 07900 – Joint Sealers
4. Section 08111 – Standard Steel Doors
5. Section 08112 – Standard Steel Frames
6. Section 08210 – Wood Doors
7. Section 08410 – Aluminum Entrances and Storefronts

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:
1. Windows
2. Cabinets of all kinds, including open wall shelving and locks.
3. Signs, except as noted.
4. Toilet accessories of all kinds including grab bars.
5. Installation
6. Rough hardware
7. Access doors and panels
8. Overhead doors

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.

2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.
3. Provide hardware for fire-rated openings in compliance with NFPA 80 and state and local building code requirements. Provide only hardware that has been tested and listed by UL for types and sizes of doors required and complies with requirements of door and door frame labels.
4. Where emergency exit devices are required on fire-rated doors that carry supplementary marking on the doors UL labels indicating "Fire Door to be equipped with Fire Exit Hardware" provide UL label on exit devices indicating "Fire Exit Hardware".

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builders' hardware. He must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. Only domestic manufacturers are acceptable and the distributor must be a factory-authorized dealer for all materials required. The supplier shall be or have in employment an Architectural Hardware Consultant. (AHC)

C. Electrified Door Hardware Supplier:

1. Shall be an experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
2. Shall prepare data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
3. Shall have experience in providing consulting services for electrified door hardware installations.

D. Manufacturer:

1. Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
2. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

1.3 SUBMITTALS:

A. Hardware Schedule

1. Submit proper number of Hardware Schedules to allow the Architect to retain two copies for his use, plus the number of copies required by the Contractor for his distribution and use. In any event, do not submit more than six copies.
2. Include the following:
   a. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

3. Hardware Locations: Refer to Article 3.1 B.2 Locations.
4. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
5. Hardware Description: Quantity, category, product number, fasteners, and finish.
6. Headings that refer to the specified Hardware Set Numbers.
7. Scheduling Sequence shown in Hardware Sets.
8. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
9. Riser drawings, wiring drawings and system operation description.
10. "Vertical" scheduling format only. "Horizontal" schedules will be returned "Not Approved."
11. Typed Copy.
12. Double-Spacing.
13. 8-1/2 x 11 inch sheets
14. U.S. Standard Finish symbols or BHMA Finish symbols.
15. Generally, follow guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule. Modified as above.

B. Product Data:

1. Submit, in booklet form using supplier's schedule covers as binders. Product data of items of hardware listed in supplier's schedule.
2. Submit product data concurrently with hardware schedule.

C. Inspection Report:

1. Submit inspection report specified in 3.1.C.2. for locksets, exit devices, ADA special closers, door closers and all electrical hardware.

D. Samples:

1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule.
2. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

E. Key Schedule:

1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.
2. Submit as an integral part of finish hardware schedule or as a separate keying schedule.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the contractor.

1.5 WARRANTIES

A. Exit devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.

B. Continuous gear hinges shall carry manufacturer's guarantee to be free from defects in material and workmanship.

C. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.

D. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work. Inspect the work within 24 hours after receipt of notice from the Owner. Replace work found to be defective as defined in the Contract Documents.

PART 2 - PRODUCT

2.1 Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.

2.2 Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, it is understood that this is the owner's Building Standard and "no substitution" is allowed.

A. Hinges:

1. Unless specified otherwise in sets furnish hinges of class and size as follows:
2. Furnish class 5BB1 and size 4-1/2 x 4-1/2 inches.
3. Numbers used are Ives.
   a. Equal products from any B.H.M.A. member will also be acceptable.

B. Locksets and Latchsets – Grade 1 - Cylindrical Type:

1. Function numbers listed are IR-Schlage ND series with Rhodes lever trim.
2. Provide 2-3/4 inch backset.
   a. Falcon
   b. Sargent
   c. Best
3. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond doorframe trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors. Provide wrought box strikes on all locks and latches.

C. Push and Pull Hardware:

1. Pull, Offset: One inch round rod, 90 degree offset, 12 inch centers.
2. Manufacturer: Provide push and pull hardware from any member of B.H.M.A.

D. Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 ½" in diameter, and double heat treated pinion shall be 11/16" in diameter with double D slab drive arm connection.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to –30 degrees F.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. All surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.
6. Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
7. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.
8. Products listed in sets are IR-LCN 4011-4111 series.
    a. Sargent 281

E. Overhead Holders and Stops:

1. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.
2. Manufacture products using base material of Brass/Bronze for US3, US4, & US10B finished products and 300 Stainless Steel for US32 & US32D finished products.
3. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's selector chart.
    a. Equal products from any B.H.M.A. member will also be acceptable.

F. Kick Plates:
1. Furnish .050 inches thick 10" high x door width less 1-1/2" at single doors and less 1" at pairs. Where glass or louvers prevent this height, supply with height equal to height of bottom rail less 2".
2. Any BHMA manufacturing product meeting above is acceptable.

G. Bumpers:
1. Wrought, forged, or cast, approximately 2-1/2 inch diameter, convex or concave rubber center, concealed fasteners.
    a. IR-Ives WS407CCV
    b. BHMA L02101.

H. Wall Stops:
1. Length to exceed projection of all other hardware
    a. IR-Ives WS33
    b. BHMA L12011 or L12021

I. Thresholds:
   1. 1/2" high - 5" wide. Cope at jambs.
   2. Furnish full wall opening width when frames are recessed.
   3. Cope in front of mullions if thresholds project beyond door faces.
   4. Furnish with non-ferrous Stainless Steel Screws and Lead Anchors.
      a. National Guard as listed in sets
      b. Equal of Hager, Pemko, Reese & Zero

J. Door Sweeps:
   1. Surface Sweeps:
      a. National Guard as listed in sets
      b. Equal by Pemko or Reese

K. Weather-stripping:
   1. Apply to head and jamb stops.
   2. Solid Bar stock all sides
      a. National Guard as listed in sets
      b. Equal by Pemko or Reese

L. Smoke and Draft Control Seals: (Use this section for hollow-metal 'S' labeled doors.)
   1. Gaskets must comply with UBC7.2 (1997) Part 2, UL1784 (1995), and NFPA 105 (1999) for use on all 'S' labeled wood and hollow-metal Positive Pressure door assemblies.
   2. Products listed in sets are National Guard Products model 2525B.
      a. Pemko
      b. Reese

M. Miscellaneous:
   1. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

N. Fasteners:
   1. Furnish fasteners of the proper type, size, quantity and finish. Use machine screws and expansion shields for attaching hardware to concrete or masonry, and wall grip inserts at hollow wall construction. Supply sex bolts for closers at lead-lined or UL listed wood doors only. Supply sex bolts when UL listing of wood doors requires them. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames. Furnish full thread wood screws for attachment to solid wood doors and frames. "TEK" type screws are not acceptable.

2.3 FINISHES:

A. Generally, Dull Chrome, US26D / BHMA 626. Furnish finish for each item as indicated in sets.

2.4 TEMPLATES AND HARDWARE LOCATION:

A. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.
B. Furnish metal template to frame/door supplier for continuous hinge.
C. Refer to Article 3.1 B.2, Locations, and coordinate with templates.

2.5 CYLINDERS KEY CONTROL AND KEYING:

A. This supplier shall meet with Architect and Owner to finalize keying requirements and obtain keying instructions in writing.
B. Supplier shall include the cost of this service in his proposal.
C. Provide a cylinder for all hardware components capable of being locked.
D. Provide cylinders factory master and grand master keyed to existing Schlage standard core system according to Owner's instructions. Provide two change keys for each cylinder and master and grand master key as required by Owner.
E. Furnish visual key control - stamp key bows only with key set symbol.
F. At the request of the Architect and when performing changeover from construction key system to final key system deliver to the Architect or Owners Representative the following:
    1. Grand Master Keys
    2. Master Keys
    3. Copy of Finish Hardware Schedule

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
    1. Install hardware according to manufacturers installations and to manufacturers template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
    2. Reinforced hollow metal doors and frames and reinforced aluminum door and frames: drilled and tapped machine screws.
    3. Solid wood doors and frames: full thread wood screws. Drill pilot holes before inserting screws.
    4. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.

B. Locations:
    1. Dimensions are from finish floor to center line of items.
    2. Include this list in Hardware Schedule.

CATEGORY	DIMENSION
Hinges	Door Manufacturer's Standard
Levers	Door Manufacturer's Standard
Exit Device Touchbar	Per Template
Roller Latch	At Head
Offset Pulls	Suitable for Exit Devices

C. Final Adjustment:
    1. Provide the services of a representative to inspect material furnished and its installation and adjustment, to make final hardware adjustment, and to instruct the Owner's personnel in adjustment, care and maintenance of hardware.
    2. Locksets, closers and exit devices shall be inspected by the factory representative and adjusted after installation and after the HVAC system is in operation, to insure correct installation and proper adjustment in operation. The manufacturer's representative shall prepare a written report

stating compliance, and also recording locations and kinds of noncompliance. The original report shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

3.2 HARDWARE SETS:

HW SET: 1

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53PD RHO	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE

HW SET: 2

1	EA	CONTINUOUS HINGE	SL11HD	628	SEL
1	EA	DEAD LATCH	4900 X 4591 PADDLE	628	ADA
1	EA	PUSH PUL UNIT	91990-2-N-O	630	IVE
1	EA	SURFACE CLOSER	4024 X 4020-18	689	LCN
1	EA	OVERHEAD STOP	904S	630	GLY
1	SET	WEATHER SEALS	BY FRAME SUPPLIER	AL	B/O
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425	AL	NGP

HW SET: 3

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 34"	630	IVE
1	SET	SEALS	2525B	BRN	NGP

HW SET: 4

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	ND40 RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 34"	630	IVE
1	EA	WALL STOP	WS33	626	IVE

HW SET: 5

1	EA	CONTINUOUS HINGE	SL24HD	628	SEL
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH X ST-1586	689	LCN
1	EA	KICK PLATE	8400 10" X 34"	630	IVE
1	SET	WEATHER SEALS	700N	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425	AL	NGP

1	EA	DRIP CAP	16A	AL	NGP

HW SET: 6

2	EA	CONTINUOUS HINGE	SL24HD	628	SEL
2	EA	FLUSH BOLTS	FB458	626	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
2	EA	SURFACE CLOSER	4111 SCUSH X ST-1586	689	LCN
2	EA	KICK PLATE	8400 10" X 34"	630	IVE
1	EA	ASTRAGAL SEAL	178SA	AL	NGP
1	SET	WEATHER SEALS	700N	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425	AL	NGP
1	EA	DRIP CAP	16A	AL	NGP

HW SET: 7

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10 RHO	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 34"	630	IVE

END OF SECTION 08710

SECTION 08810
GLASS AND GLAZING

SECTION INDEX

PART 1 - GENERAL

1.1 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

1. 804.1 - Specification for Back Bedding Mastic Type Glazing Tapes.

B. American Society for Testing and Materials (ASTM)

1. C236 - Test Method for Steady -State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
2. C509 - Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
3. C542 - Specification for Lock-Strip Gaskets.
4. C716 - Specification for Installing Lock-Strip Gaskets and Infill Glazing Materials.
5. C864 - Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
6. C920 - Specification for Elastomeric Joint Sealants.
7. C963 - Specification for Packaging, Identification, Shipping, and Storage of Lock-Strip Gaskets.
8. C964 - Guide for Lock-Strip Gasket Glazing.
9. C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
10. C1036 - Specification for Flat Glass.
11. C1048 - Specification for Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
12. C1087 - Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
13. C1115 - Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
14. C1172 - Specification for Laminated Architectural Flat Glass.

15. C1184 - Specification for Structural Silicone Sealants.
16. C1193 - Guide for Use of Joint Sealants.
17. C1311 - Specification for Solvent Release Sealants.
18. C1376 - Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
19. C1503 - Specification for Silvered Flat Glass Mirror.
20. D1784 - Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
21. E90 - Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
22. E413 - Classification for Rating Sound Insulation.
23. E774 - Specification for Sealed Insulating Glass Units.
24. E2188 - Test Method for Insulating Glass Performance.
25. E2189 - Test Method for Testing Resistance to Fogging in Insulating Glass Units.
26. E2190 - Specification for Insulating Glass Unit Performance and Evaluation.

C. American National Standards Institute, Inc. (ANSI)

1. Z97.1 - Safety Performance Specifications and Methods of Test for Glazing Materials Used in Buildings.

D. Consumer Product Safety Commission (CPSC)

1. 16 CFR 1201 - Standard on Architectural Glazing Materials.

E. Glass Association of North America (GANA)

1. Glazing Manual.
2. Sealant Manual.

F. Insulating Glass Certification Council (IGCC)

1. Certified Products Directory.

G. Insulating Glass Manufacturer’s Alliance (IGMA)

1. Certified Products Directory.

H. Safety Glazing Certification Council (SGCC)

1. Certified Products Directory.

I. Sealed Insulating Glass Manufacturers Association (SIGMA)

1. Practices for Vertical Field Glazing of Organically Sealed Insulating Glass Units.
2. Guidelines for Sloped Glazing of Organically Sealed Insulating Glass Units.

J. Underwriters Laboratories Inc. (UL)

1. UL 9 - Fire Tests of Window Assemblies.
2. UL 263 - Fire Tests of Building Construction and Materials.
3. UL 752 - Bullet -Resisting Equipment.
4. UL 972 - Burglary Resisting Glazing Material.

1.2 SUBMITTALS

A. Product Data

1. Submit the following:

a. Glass manufacturer's product description with instructions, including limitations, for storage, handling, installation and maintenance for specified glass products.

b. Glazing materials manufacturer's product description with instructions, including limitations, for storage, handling, installation and maintenance of sealants, gaskets, setting blocks, shims, reglets, protective tape and other specified products.

c. For exterior glazing, glass product manufacturer's statement that products meet the specified glass breakage probability requirements for indicated applied loads, that expected thermal stressing of products is acceptable and that glazing details (if required by Glass Product Manufacturer) have been reviewed and are approved.

B. Shop Drawings

1. Submit Shop Drawings of glazing details. Draw details at least full size (twice full size preferred) and indicate dimensions, tolerances and materials.

C. Samples

1. Submit Samples of the following:

a. Each style of monolithic and laminated glass, except clear monolithic glass, no less than 75 by 150 mm (3 by 6 inches).

b. Each style of insulating and insulating laminated glass unit, no less than 300 by 300 mm (12 by 12 inches), including type of edge seal, spacer, and corner construction of spacer. Identify specific type of reflective and low-emissivity coated glasses, coated surfaces, and exterior face of unit.

c. Each style of spandrel glass, no less than 300 by 300 mm (12 by 12 inches).

d. Corner construction of lock-strip gaskets with each leg approximately 150 mm (6 inches) long.

e. Corner construction of compression gasket for dry glazing with each leg approximately 150 mm (6 inches) long.

f. Cured sealant (if other than black) after color selection has been made.

g. Tape sealant, 150 mm (6 inches long).

h. Compression wedge, 150 mm (6 inches) long.

i. Channel gasket, 150 mm (6 inches) long.

j. Reglet, 150 mm (6 inches) long.

k. Bed gasket, 150 mm (6 inches) long.

l. Face shim or spacer.

m. Setting block.

n. Edge block.

o. Protective tape.

p. Compressible filler.

q. Open cell filter.

D. Quality Control

1. Submit statement, written on glazing product manufacturer's official letterhead and signed by the responsible representative, stating that glazing products meet the requirements of the specified standards and there is no incompatibility of glazing materials with the insulating glass unit sealants.

1.3 QUALITY ASSURANCE

A. Contractor's Qualifications

1. The Work shall be provided by a glazing contractor that has specialized in the type of work specified and indicated on the drawings for at least the past 5 years. If requested by Architect, submit evidence of successful experience on projects similar in size and scope to the Work.

B. Sample Construction

1. Glaze the sample construction of precast architectural concrete with spline type lock-strip gaskets, at the manufacturer's plant, using reglet and glass thickness specified for the Project.

C. Pre-Installation Meeting

1. At least 2 weeks prior to installation of glass and glazing work, arrange a meeting at Project or fabrication site with the glazier, sealant and gasket manufacturers' technical representatives, glass framing erector and any other necessary trades to review glazing procedures, products to be used, and schedule for the Work. Give at least 2 weeks notice to Architect and other concerned parties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the Project site in original, unopened containers bearing label clearly identifying manufacturer's name, brand and grade.

B. Store and handle products as recommended by the manufacturer to prevent damage and deterioration. Additionally, store glass products in a cool, dry, shaded, well-ventilated area not subject to condensation, rain, snow or direct sun.

C. Affix labels to each pane of glass indicating thickness and type. Labels shall remain on glass until final cleaning.

1.5 PROJECT CONDITIONS

A. Field Measurements

1. Take field measurements to verify or supplement dimensions indicated.

B. Existing Conditions

1. Install exterior glass and glazing materials in accordance with manufacturer's printed instructions, unless otherwise specified.

2. Do not install sealant in damp or dusty weather, when ambient temperature is below 4 degrees C (40 degrees F), or when joint substrates are damp or wet due to rain, frost, condensation or other causes.

1.6 WARRANTY

A. Special Warranty

1. Warrant glass products as follows:

a. Laminated glass, for 5 years against deterioration or delamination and edge milkiness (not to exceed 12 mm).

2. Lock-strip gaskets shall be warranted for 5 years against defective materials and workmanship and to remain in a weathertight condition.

3. Glazing systems installation shall be warranted for a period of 5 years against defective materials and workmanship.

4. During the warranty period, restore defective Work to the standard of the Contract Documents, including all labor, materials, refinishing and other costs incidental to the Work. Inspect the Work within 24 hours after receipt of notice from the Owner and immediately repair leaks. Restore Work found to be defective as defined in the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Single Source Responsibility

1. Provide glass products produced by a single manufacturer for each condition and kind of glass and composed of primary glass obtained from a single source for each type and class specified.

2.2 GLASS - GENERAL

A. Provide products conforming to references and as specified.

B. Primary Glass

1. ASTM C1036, fully annealed unless otherwise specified, quality as follows:

a. Float glass: q3.

b. Mirrors: q2.

c. Wired and patterned glass: q8.

C. Glass Breakage Probability

1. Do not exceed the following probabilities of glass breakage, for listed glass usage, when designed to resist wind loads, thermal stressing, and snow loads where applicable:

a. 8 per 1000 lites for monolithic and laminated glass and 8 per 1000 units or openings for insulating glass units, when glazed no more than 15 degrees from vertical.

b. 1 per 1000 for glass products glazed more than 15 degrees from vertical.

D. Heat-Treated Glass

1. ASTM C1048; except the surface compression stress level for Kind HS glass shall be not less than 24 MPa (3500 psi) or greater than 52 MPa (7500 psi). Glass shall be heat -treated by horizontal roller process with roll wave distortion parallel to bottom edge of glass when installed, unless otherwise specified.

E. Coated Glass

1. Provide coated glass products that meet or exceed the optical and esthetic quality requirements of ASTM C1376.

F. Insulating Glass

1. Hermetically sealed with 13-mm (1/2-inch) argon gas filled space, listed in the IGCC or IGMA Certified Products Directory with appropriate Certification mark on spacer or at least one pane of unit, certified as passing Class CBA performance as determined by ASTM E774.

2. Units for non-structural sealant glazing applications, of dual seal construction with a polyisobutylene primary seal and a polysulfide, polyurethane or silicone secondary seal.

3. Units for structural sealant glazing, of dual seal construction including a polyisobutylene primary seal and silicone secondary seal, and with soldered, welded, and/or bent spacer corner construction.

G. Laminated Glass

1. ASTM C1172, fully annealed unless otherwise specified.

H. Safety Glass

1. CPSC 16 CFR part 1201, testing requirements of ANSI Z97.1, and listed in the SGCC Certified Products Directory with appropriate SGCC certification mark or label permanently affixed.

2. Furnish safety glass for glass occurring in doors and sidelights, and where indicated and further required by authorities having jurisdiction.

I. Glass Fabrication

1. Sizes required for glazing indicated openings, with glass edge clearances, tolerances, and edge conditions complying with recommendations of glass manufacturer, of thicknesses indicated or as recommended by glass manufacturer.

2. Seamed edges for exposed edges of glass subject to personal contact.

3. Speaking holes 100 mm (4 inches) in diameter, unless otherwise indicated.

J. Glass in Lock-Strip Gaskets

1. Glass, except insulating glass, with corners rounded to radius of 3 to 6 mm (1/8 to 1/4 inch).

2. Clear monolithic and laminated glass with seamed edges.

3. Tinted glass edge perimeter, taped with protective tape 6 mm (1/4 inch) wider than thickness of glass. Tape shall be continuous with butt joint at ends, with 3 mm (1/8 inch) covering each face of glass and the portion covering face of glass mitered so that no puckering or overlapping occurs at rounded corners of glass. Cutting of tape shall be done carefully so as not to scratch glass surface.

2.3 INSULATING LAMINATED GLASS

A. Style IL -01, Dark Bronze Tinted

1. Exterior pane of Type I, Class 2, Condition A, [Kind HS,] 1.52 (0.060) mm (inch) thick tint glass and interior laminated pane composed of two panes of Type I, Class 1, Condition A, [Kind HS,] 6 mm-thick (1/4-inch-thick) glass with clear, 1.52 mm-thick (0.060-inch-thick) polyvinyl butyral interlayer assembled into an insulating glass unit; as manufactured by Guardian Industries Corp.; Viracon; or as approved, with the following performance characteristics:

a. Winter nighttime U-value, max. .30

b. Summer daytime U-value, max. .72

c. Shading coefficient, max. .39

d. Visible light transmittance, min. 50%

2.4 GLAZING PRODUCTS

A. General

1. Glazing products such as sealants, tapes, gaskets and accessories shall be

compatible with each other and with other products with which they will come into contact, including glass products, seals of insulating glass units, polyvinyl butyral interlayer of laminated glass, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and experience. Submit proof of compatibility where specified.

2. Comply with recommendations of sealant, tape, glass, and gasket manufacturers, unless otherwise specified, for selection of glazing products and glazing systems which have performance characteristics suitable for applications indicated and conditions at time of installation. Submit glazing system for review.

3. Provide glazing products and systems conforming to references and as specified.

B. Sealants

1. For non-structural exposed and concealed locations: a silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, Uses A, G and O; Dow Corning "791", "795" or "995"; GE Silicones "UltraGlaze SSG4000" or "SilPruf SCS2000"; Tremco "Spectrem 2"; or as approved.

2. For non-structural concealed locations: non-sag butyl sealant complying with ASTM C1311; PTI "707"; Pecora "BC-158"; Tremco "Butyl Sealant"; or as approved.

C. Tape Sealants

1. For openings up to 1900 united mm (75 united inches): a preformed, solvent free, 100 percent solids, unshimmed, butyl-polyisobutylene tape that is non-staining and non-migrating when in contact with nonporous surfaces and that complies with AAMA 804.1; Pecora "Extru-Seal"; PTI "303 Glazing Tape"; Tremco "440 Tape"; or as approved.

2. For openings over 1900 united mm (75 united inches): a preformed, solvent free, 100 percent solids, pre-shimmed, butyl-polyisobutylene tape that is non-staining and non-migrating when in contact with nonporous surfaces and that complies with AAMA 804.1; Pecora "Shim-Seal"; PTI "303 Shim Tape"; Tremco "Pre-Shimmed 440 Tape"; or as approved.

D. Gaskets

Silicone rubber gaskets are available in various colors. Consult with manufacturers for availability and minimum quantity before specifying.

1. Extruded, closed cell, neoprene, EPDM or silicone rubber, in compliance with ASTM C509, as recommended by glazing and sealing systems manufacturer and as manufactured by D.S. Brown Co.; Cadillac Rubber and Plastics, Inc.; Variseal Corporation; or as approved.

a. Bed gasket for wet glazing system: continuous with pressure sensitive adhesive 1 side, designed to be compressed 25-40 percent in the opening.

b. Compression gasket for dry glazing system: shape as required to be compressed in place a minimum of 25 percent and of one-piece construction with factory -assembled frames with injection-molded, vulcanized corners; produced oversize in opening dimension, as determined by measurements, to insure compression at corners but within limits so that compression does not create a "pucker".

c. Channel gasket: continuous channel of shape and dimensions for application in the opening with specified glazing.

2. Extruded, dense, neoprene, EPDM or silicone rubber, in compliance with ASTM

C864 or C1115, Type C and as manufactured by D.S. Brown Co.; Cadillac Rubber and Plastics, Inc.; Variseal Corporation; or as approved.

a. Compression wedge for dry glazing system: 70 plus/minus 5 Shore "A" durometer, of shape and size to compress the exterior compression gasket a minimum of 25 percent, and as recommended by glazing and sealing systems manufacturer.

3. Extruded, dense, neoprene rubber, in compliance with ASTM C542 and C963, and as manufactured by Cadillac Rubber and Plastics, Inc.; StanLock; or as approved.

a. Lock-strip gasket: 75 plus/minus 5 Shore "A" durometer for gasket, 80 plus/minus 5 Shore "A" durometer for locking strip and made from extruded sections of shape indicated; corners and intersections factory made by the injection mould process; each gasket factory assembled for the full height of panel; no field fabricated joints permitted. Produce oversize in opening dimension, as determined by measurements, to insure compression at corners but within limits so that compression does not create a "pucker". dimensions of the gasket Section and corners shall be such that the gasket will properly fit the profile of frame or recess and over the size glass specified, to maintain no less than the lip seal pressure required by ASTM C542 nor more than recommended by glass or panel manufacturer, and accomplish a weathertight seal without the supplementary use of sealants.

E. Accessories

1. Extruded, dense, neoprene, EPDM or silicone rubber, in compliance with ASTM C864 or C1115, Type C and as manufactured by D.S. Brown Co.; Cadillac Rubber and Plastics, Inc.; Variseal Corporation; or as approved.

a. Setting block: 85 plus/minus 5 Shore "A" durometer, each block properly sized for load, as wide or wider than glazing, no less than 4 inches long, except in lock-strip gaskets no less than 6 inches long; profile to permit friction fit, dart insertion into metal chair, or pressure sensitive adhesive one side to fix block in glazing opening.

b. Edge block: 40 to 60 Shore "A" durometer, each block a minimum of 100 mm (4 inches) long, as wide as glazing, placed in the vertical glazing channel, and sized to allow a nominal 3-mm (1/8-inch) clearance between glass edge and installed block; profile to permit friction fit or pressure sensitive adhesive one side to fix block in glazing opening.

c. Face shim or spacer: 40 to 60 Shore "A" durometer, continuous in glazing opening; profile to permit friction fit, dart insertion or pressure sensitive adhesive one side to fix shim or spacer in location.

2. Solvent

a. Oil-free cleaning solvent (for example: toluene, xylene, methyl ethyl ketone, acetone, 50/50 mixture of isopropyl alcohol and water, and mineral spirits) as recommended by the sealant manufacturer. Furnish containers for cleaning solvent storage that are clean, oil-free and suitable for use with the solvent.

3. Primer

a. Where required, a nonstaining product recommended by the sealant manufacturer.

4. Compressible filler for wet glazing system

a. Expanded open cell polyurethane shape compressed a minimum of 25

percent of its dimension at time of installation in the opening; Plateau Supply Co. "Denver Foam"; Industrial Thermo Polymers Limited "Tundra Foam"; or as approved.

b. Expanded closed cell polyethylene shape compressed no more than 25 to 33 percent of its dimension at the time of installation in the opening; Industrial Thermo Polymers Limited "ITP Standard Backer Rod"; Nomaco, Inc. "Green Rod"; W.R. Meadows, Inc. "Sealtight Backer Rod"; or as approved.

5. Open Cell Filter

a. Reticulated flexible polyester urethane foam having 20 pores per inch, sized at least 25 mm (1 inch) larger in dimension than weephole, of cross section to provide 15 to 25 percent compression for friction fit and as manufactured by Foam Division, Scott Paper Co.; H-O Products Corp.; or as approved.

6. Bond breaker

a. Heavy duty, 0.28-mm (11-mil) minimum thickness, colored, polyethylene or teflon, self-adhesive bond breaker of type recommended by sealant manufacturer and suitable for conditions of usage. Liquid bond breaker is not permitted.

7. Reglet for spline type lock-strip gasket

a. ASTM D1784, Class 14333D, extruded, rigid, polyvinyl chloride tubular shape with integral removable closure strip, channel depth of 19 mm (3/4 inch) and channel width of 16 mm (5/8 inch), plus/minus 1 mm (1/32 inch); Dayton Superior Corp. "Gasket -Lock Reglet"; Fry Reglet Corp. "FZ Reglet"; or as approved.

b. Furnish reglets to be embedded in precast architectural concrete.

8. Protective tape for glass edges in lock-strip gasket

a. Technical Tape, Inc., "Tuck Tape"; or as approved.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection

1. Protect the Work and adjacent construction against damage during progress of the Work. Do not store glass in areas that are exposed to the environment.

2. Protect glass surfaces and edges from damage during storage, handling and installation. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from Project and dispose of glass with edge damage or other imperfections that exceed glass manufacturer's recommendations or of type that, when installed, weakens glass and impairs performance and appearance.

3.2 INSTALLATION

A. General

1. Inspect work of window or glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness,

offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Do not allow glazing work to proceed until unsatisfactory conditions, as required in writing by glazier, have been corrected.

2. Installation, including preparation, definition of terms, glass positioning, edge clearances and tolerances, setting and application of glazing materials shall comply with the minimum requirements of listed references of the GANA, SIGMA and ASTM. Support and cushion glass in the glazing channel to prevent point loading, rotational forces and excessive clamping pressure.
3. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
4. Do not install insulating, laminated or wired glass, that is exposed to moisture, in glazing channels that are not provided with weepholes. Do not allow glazing work to proceed until corrected.
5. Apply primers to joint surfaces if required for adhesion of sealants, as determined from preconstruction testing by sealant manufacturer.
6. Clean glazing channels and other framing members that receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.
7. Do not install exterior glass until sand-blasting, bushhammering, grouting, waterproofing and similar work on surrounding concrete is completed.
8. Install setting blocks of proper size in glazing channel, located one quarter of glass width from each corner, but with block edge nearest corner no closer than 150 mm (6 inches) from corner, unless otherwise specified or required by glass manufacturer. Insulating glass used in sloped glazing shall have both panes supported by setting blocks.
9. Install spacer where required of correct size to preserve required face clearances except where gaskets or preshimmed glazing tapes are used for glazing. Provide 3-mm (1/8-inch) minimum bite of spacer on glass and use thickness equal to sealant width.
10. Install edge blocking to comply with requirements of referenced glazing standards, except where otherwise specified or required by glass manufacturer.
11. Install compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glazing channel or weep systems as well as to control depth of sealant for optimum performance, unless otherwise specified.
12. Install sealants in compliance with ASTM C1193. Force sealant into glazing channels to eliminate voids and to ensure complete "wetting" and adhesion of sealant to glass and channel surfaces. Tool exposed surface of sealant to provide a 2-mm-high (1/16-inch-high) watershed away from glass.
13. Drive wedge-shaped gaskets into one side of glazing channel to compress sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Miter cut wedge-shaped gaskets at corners and install in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
14. Provide edge blocking in window ventilators to protect glass and restrict glass movement. Install shim and setting blocks as recommended by window

manufacturer.

B. Wet Glazing

1. Wet glazing with sealant: install glass in metal windows or framing with bed gasket compressed a minimum of 25 percent and notched at weep holes, open cell filter foam centered behind weep holes, continuous spacer shim on removable stop side wedged against stop and not less than 6 mm (1/4 inch) below sight line, and sealant both sides 6 mm (1/4 inch) deep. Install sealant with primer if required and as recommended by sealant manufacturer.

2. Wet glazing with tape sealant: install glass in metal windows or framing with tape sealant compressed and notched at weepholes if required, open cell filter foam centered behind weep holes, continuous spacer shim on removable stop side wedged against stop and not less than 6 mm (1/4 inch) below sight line, and sealant applied over spacer shim 6 mm (1/4 inch) deep. Install sealant with primer if required and as recommended by sealant manufacturer. Install air seal or heel bead of sealant and edge blocking as recommended by glazing and sealing systems manufacturer.

C. Dry Pressure Glazing

1. Install glass in metal windows or framing with compression gasket applied to stationary stop and compressed a minimum of 25 percent, edge blocking at jambs, open cell filter foam centered behind weep holes, and compression wedge locked into removable stop. Clamping pressure of glazing system shall be a uniform 70 to 110 kg per lineal meter (4 to 6 pounds per lineal inch), and in no case to exceed 180 kg per lineal meter (10 pounds per lineal inch).

D. Wet/Dry Glazing

1. Wet/dry glazing with sealant: install glass in metal windows or framing with bed gasket applied to stationary stop and compressed a minimum of 25 percent and not less than 6 mm (1/4 inch) below sight line, with sealant applied over bed gasket not less than 6 mm (1/4 inch) deep, and with compression wedge locked into removable stop. Install sealant with primer if required and as recommend by sealant manufacturer. Install air seal or heel bead of sealant and edge blocking as recommended by glazing and sealing systems manufacturer.

2. Wet/dry glazing with tape sealant: install glass in metal windows or framing with tape sealant compressed and notched at weepholes if required, open cell filter foam centered behind weepholes, and with compression wedge locked into removable stop. Install air seal or heel bead of sealant and edge blocking as recommended by glazing and sealing systems manufacturer.

E. Lock-Strip Gasket Glazing

1. Ship, store, handle and install lock-strip gaskets in accordance with ASTM C716, C963, and C964.

2. Lubricants recommended by the gasket manufacturer may be used in the lock-strip recess. Do not use lubricants in the glass or lug recesses.

3. Install gaskets for outside glazing.

F. Glazing Aluminum Doors and Frames

1. Install glass in aluminum doors and frames with gaskets and metal stops furnished with doors and frames and installed in accordance with door and frame manufacturer's recommendations. Glaze doors in closed position.

3.3 CLEANING

A. Examine glass surfaces adjacent to or below exterior concrete, other masonry surfaces, and weathering steel at frequent intervals during construction, but not less than once a

month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.

B. Remove nonpermanent labels and clean glass surfaces, by cleaning both faces using non-abrasive cleaners and procedures, not more than 4 days prior to date scheduled for inspections that are intended to establish date of substantial completion, in each area of Project. Clean glass by method recommended by glass manufacturer.

3.4 PROTECTION

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction, including natural causes, accidents and vandalism.

C. Protect glass with screens of appropriate barrier material wherever welding, cutting or other potentially damaging work is performed.

D. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances come into contact with glass, remove immediately by method recommended by glass manufacturer.

END OF SECTION