

**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.
2. Borrowed-light frames.

1.02 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
- B. LEED Submittals:
  1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include the following:
  1. Elevations of each door design.
  2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages and connections.

7. Details of accessories.
  8. Details of moldings, removable stops, and glazing.
- D. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
  - E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

#### 1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.
- C. Fire-Rated Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
  1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.07 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Standard Hollow Metal Doors and Frames:
  - 1. Products: Subject to compliance with requirements, provide products by the following:
    - a. Amweld Building Products, a Division of Black Mountain Doors.
    - b. Ceco Door Products; an Assa Abloy Group company.
    - c. Curries Company; an Assa Abloy Group company.
    - d. Pioneer Industries, Inc.
    - e. Steelcraft; an Ingersoll-Rand company.

### 2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Glazing: Comply with requirements in Division 08 Section "Glazing."
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious

impurities.

G. Glazing: Refer to Division 08 Section "Glazing".

## 2.03 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: As indicated.

2. Core Construction:

- a. Standard Doors: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
- b. Fire Door Core: As required to provide fire-protection ratings indicated.
- c. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Square edge.

4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.

a. Close exterior doors with flush end closures.

5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below

by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level A (Heavy Duty), Model 1 (Full Flush).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

#### 2.04 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
  2. Fabricate frames as full profile welded unless otherwise indicated.
  3. Frames for Level 3 Steel Doors: 0.075-inch thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
1. Fabricate frames with mitered or coped corners.
  2. Fabricate frames as full profile welded unless otherwise indicated.
  3. Frames for Openings over 4 Feet in Width: 0.075-inch thick steel sheet.
  4. Frames for Level 3 Steel Doors: 0.053-inch thick steel sheet.
  5. Frames for Wood Doors: 0.053-inch thick steel sheet.
  6. Frames for Borrowed Lights: Same as adjacent door frame.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## 2.05 FRAME ANCHORS

### A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

### B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.06 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

### C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud

partitions.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
  
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
  1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  4. Provide loose stops and moldings on inside of hollow metal work.
  5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.07 STEEL FINISHES



- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Field Finish: Finish paint as specified in Division 9.

### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.03 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
  1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable glazing stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
  2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  5. Concrete Walls: Solidly fill space between frames and

concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
  - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
  - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
  - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

- d. Between Bottom of Door and Top of Finish Floor  
(No Threshold): Maximum 3/4 inch.
- 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
  - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

### 3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

+ + END OF SECTION + +

**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware for custom Forum doors.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
3. Certificates for Credit MR 7: Chain-of-custody certificates indicating that flush wood doors comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
4. Product Data for Credit IEQ 4.4: For adhesives and

composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
  - a. Provide Samples for each species of veneer and solid lumber required.
  - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Sample Warranty: For special warranty.

F. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

#### 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that and is a certified participant in AWI's Quality

Certification Program.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.07 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
  2. Eggers Industries.
  3. Marshfield Door Systems, Inc.
  4. Mohawk Doors; a Masonite company.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

## 2.02 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
  2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Certified Wood: Flush wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain added urea formaldehyde.
- E. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at



positive pressure according to NFPA 252 or UL 10C.

1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

G. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
  - a. Screw Withdrawal, Face: 700 lbf.
  - b. Screw Withdrawal, Edge: 400 lbf.

H. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
  - a. 5-inch top-rail blocking.
  - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
  - c. 5-inch midrail blocking, in doors indicated to have armor plates.
  - d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.03 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade B faces).
2. Species: One of the following, located as indicated on the door and finish Schedules on the Contract Drawings.
  - a. White Oak.

3. Cut: Quarter sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance and center match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Blueprint Match: Provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling.
9. Exposed Vertical and Top Edges: Same species as faces.
10. Core: Structural composite lumber.
11. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core.

#### 2.04 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
  1. Wood Species: Same species as door faces.
  2. Profile: Flush rectangular beads.

#### 2.05 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  1. Coordinate with hardware mortises in metal frames to

verify dimensions and alignment before factory machining.

2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section "Glazing."

## 2.06 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
  2. Finish doors at factory.
- B. Transparent Finish:
1. Grade: Custom.
  2. Finish: AWI catalyzed polyurethane system.
  3. Staining: Match Architect's sample.
  4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
  5. Sheen: Satin.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics

and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.03 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

+ + END OF SECTION + +

**PART 1 - GENERAL**

1.01 SUMMARY

- A. This Section includes the following:
  - 1. Wall access doors and frames.
  - 2. Fire-rated wall access doors and frames.
  - 3. Ceiling access doors and frames.

1.02 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings (if required), materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other. Show methods of attaching door frames to surrounding construction.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain access doors and frames through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. NFPA 252 for vertical access doors and frames.

2. ASTM E 119 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

#### 1.04 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

### **PART 2 - PRODUCTS**

#### 2.01 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Hot-Rolled Steel Sheets: A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- C. Cold-Rolled Steel Sheets: A 1008/A 1008M, Commercial Steel (CS), or A 1008/A 1008M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with A 879/A 879M, Class C coating, may be substituted at fabricator's option.
- D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
  2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
- E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

- F. Plaster Beads: Casing bead formed from 0.0299-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.
- G. Sizes: 16 x 16 inches at masonry walls and 12 x 12 inches at other locations, unless larger size is required for access to device.

## 2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Flush glass reinforced gypsum fire-rated access doors with continuous random filament glass fiber mat and structural reinforcing:
  - 1. Basis of Design Products: Subject to compliance with all requirements of the Contract Documents, provide products Wind-Lock; Stealth Access panels or comparable product by one the following:
    - a. J.L. Industries; Model FDWB.
    - b. Nystrom Products Co; Model IW.
    - c. Larsen's Manufacturing Co.
    - d. No substitutions, only listed products.
  - 2. Fire-Resistance Characteristics: Class A.
  - 3. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
  - 4. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead.
  - 5. Hinges: Manufacturer's standard.
  - 6. Latch: Self-latching bolt operated by mortise cylinder lock, specified in Division 08 Section "Door Hardware," with interior release.
- B. Recessed Access Doors:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. J. L. Industries; Model CTWB.
    - b. Nystrom Products Co; Model RW.
    - c. Commercial Products Group; Milcor Style DWR.
    - d. Karp Associates, Inc.; RDW.
  - 2. Locations: Gypsum board wall and ceiling surfaces, acoustic panel ceiling surfaces in patient rooms,

public spaces, and toilet rooms where fire rated doors are not required.

3. Assembly Description: Fabricate door in the form of a pan recessed minimum for gypsum board and acoustical tile infill.
4. Door: Minimum 0.060-inch- thick sheet metal, set with infill finish flush with surrounding finish surfaces.
5. Frame: Minimum 0.060-inch- thick sheet metal.
  - a. Provide frame with gypsum board bead for concealed flange and no bead for acoustical tile installation.
6. Hinges: Manufacturer's standard continuous type.
7. Latch: Screwdriver-operated cam latch.

### 2.03 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
  1. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
  2. Provide mounting holes in frames for attachment of units to metal or wood framing.
  3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  1. For doors with latches released by and locks operated by mortise cylinders, prepare access doors for



cylinders specified in Division 8 Section "Door Hardware."

## 2.04 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
  - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

### 3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.03 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.

- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

+ + END OF SECTION + +

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. Insulated service doors.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
  - 1. Wind Loads: As calculated in accordance with ASCE 7, using parameters given on S001.

1.03 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
  - 1. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  - 1. Curtain Slats: 12 inches long.

- E. Qualification Data: For qualified Installer.
- F. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICCA117.1.

## **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cookson Company.
  - 2. Cornell Iron Works Inc.
  - 3. McKeon Rolling Steel Door Company, Inc.
  - 4. Overhead Door Company.

#### 2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
  2. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection rated glass as required for type of door; set in glazing channel secured to curtain slats.
  3. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
  4. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

## 2.03 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Shape: Round, unless otherwise indicated.

#### 2.04 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  1. Lock Cylinders: Provide cylinders specified in Division 08 Section "Door Hardware." and keyed to building keying system.
  2. Keys: Provide Two for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

#### 2.05 CURTAIN ACCESSORIES

- A. Weatherseals: Equip each exterior door with weatherstripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
  1. At door head, use 1/8-inch thick, replaceable, continuous sheet secured to inside of hood.
  2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch thick seals of flexible vinyl, rubber, or neoprene.

#### 2.06 COUNTER DOOR ACCESSORIES

- A. Integral Metal Sill: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with No. 4 finish.

#### 2.07 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality,

welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.08 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
  - 3. Provide UL listed control panels(s) containing all motor controllers, sequencing equipment, etc., which shall be rated to withstand the available fault current from the building's power supply system without requiring supplemental overcurrent protective devices. The available fault current shall be as shown on the electrical single line diagrams, for the switchboard, panelboard, or other distribution equipment that is the source for the feeder to the equipment, unless specifically permitted otherwise by the Engineer.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for

each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
  2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
  3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

## 2.09 CONTROLS AND SAFETIES

### A. Overhead Coiling Doors:

1. Electrical Connection: Accommodate 120 (plus or minus 10%) volt or 208 (plus or minus 10%) volt, single phase, 60 Hz. (plus or minus 1%) electrical service as indicated on Drawings.
    - a. For all hardwired equipment, provide UL listed control panels(s) containing all motor controllers, sequencing equipment, and other electrical components, which shall be rated to withstand branch circuit available fault current of 10,000 amperes, unless otherwise indicated on electrical single line diagrams or panelboard schedules for the distribution equipment that is the source for the feeder to the equipment, unless or as specifically permitted otherwise by the Engineer.
- B. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.



- C. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening.
  - 1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
- D. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
  - 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- E. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- F. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- G. Automatic-closing motor function shall be designed for activation by the following:
  - 1. Building fire-detection and -alarm systems and manufacturer's standard door-holder-release devices.
- H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

## 2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to

minimize contrast.

## 2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

1. Color: Custom color as selected by Architect.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

### 3.03 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Perform installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.04 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

### 3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

+ + END OF SECTION + +



**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes electrically operated overhead glass doors.

1.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components. Glass performance requirements shall be as specified in Section 08800, Glazing.
- B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Exterior sectional doors shall withstand the effects of wind and gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI7.
- D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E283.
  - 1. Air Infiltration: Maximum rate of 0.3 cfm/sq.ft. when tested at 6.54 psf.
- E. Windborne-Debris-Impact-Resistance Performance: Provide glazed sectional doors that pass large-missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and ASTM E1996.
- F. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI7.
- G. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

### 1.03 SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory. Include the following:
  - 1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Frame for Glass Door: 6 inches long of each width of stile and rail required.
- D. Delegated-Design Submittal: For glass doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of seismic restraints.
  - 2. Summary of forces and loads on walls and jambs.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For doors, accessories, and components, from manufacturer.
- G. Maintenance Data: For sectional doors to include in maintenance manuals.
- H. Warranties: Sample of special warranties.

### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.

#### 1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.01 OVERHEAD GARAGE GLASS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Renlita Overhead Door, Series 2000.

## 2. Clopay Building Products Co.

### 2.02 STEEL FRAME SECTIONS

- A. Section Frames: Fabricate interior frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A653/A653M, with indicated zinc coating and thickness.
- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
- C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.
- D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place
- E. Provide reinforcement for hardware attachment.

### 2.03 ALUMINUM FRAME SECTIONS

- A. Sections: Construct frame sections with stiles and rails formed from extruded-aluminum shapes, complying with ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated. Fabricate sections with stile and rail dimensions and profiles shown on Drawings. Join stiles and rails by welding or with concealed, 1/4-inch- minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section. Form meeting rails to provide a weathertight-seal joint.
  - 1. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen glass door and for wind loading
  - 2. Provide reinforcement for hardware attachment.

### 2.04 GLASS CLADDING

- A. Insulated Glass: As specified in Section 088000 "Glazing."



## 2.05 TRACKS, ROLLERS, COUNTERBALANCE, SUPPORTS, AND ACCESSORIES

- A. Tracks, Rollers, Counterbalance: Manufacturer's standard.
- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- C. Glass Unit: Manufacturer's standard units of size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed. Provide removable stops of same material as door-section frames.

## 2.06 HARDWARE

- A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, stainless steel hinge, Type 316, at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet wide unless otherwise recommended by door manufacturer.
- C. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

## 2.07 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.08 COUNTERBALANCE MECHANISM

- A. Weight Counterbalance: Counterbalance mechanism consisting of filled pipe weights that move vertically in a galvanized-steel weight pipe. Connect pipe weights with cable to weight-cable drums mounted on torsion shaft made of steel tube or solid steel.

- B. Cables: Galvanized-steel lifting cables with cable safety factor of at least 5 7 to 1.

## 2.09 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA70.
  - 2. Provide control equipment complying with NEMA ICS1, NEMA ICS2, and NEMA ICS6; with NFPA70, Class 2 control circuit, maximum 24-Vac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency.
  - 1. Electrical Characteristics: As indicated on the drawings.
  - 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
  - 3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
  - 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  - 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices

with building electrical system and each location where installed.

6. Use adjustable motor-mounting bases for belt-driven operators.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
  1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS6, Type 1 enclosure.
  2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS6, Type 4 enclosure, key operated.
- G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

## 2.10 DOOR ASSEMBLY

- A. Overhead Glass Door: Door formed with hinged sections.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Renlita Doors; As Basis of Design.
- B. Operation Cycles: Not less than the 10,000.

## 2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.12 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

## 2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

### 3.03 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace

damaged and malfunctioning controls and equipment.

### 3.04 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weathertight fit around entire perimeter.
- D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.
- E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780.

### 3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

+ + END OF SECTION + +



**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Electrically operated sectional doors.

1.02 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: As indicated on Drawings.
2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.
3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
  - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
  - b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.03 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
1. Include plans, elevations, sections, and mounting details.
  2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  4. Include diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Flat door sections with sensor edge on bottom section.
  2. Frame for paneled door sections; of each width of stile and rail required.
  3. Panel for raised-panel door sections; not smaller than required to show raised-panel profile.

#### 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

#### 1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.



- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1 Insert requirement.

#### 1.07 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Failure of components or operators before reaching required number of operation cycles.
    - c. Faulty operation of hardware.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
    - e. Delamination of exterior or interior facing materials.
  - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.

#### 2.02 DOOR ASSEMBLY

- A. Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
  - 1. Basis of Design: Subject to compliance with

requirements, provide Overhead Door Corporation; Model 521, or comparable products by one of the following:

- a. C.H.I. Overhead Doors.
  - b. Clopay Building Products.
  - c. Fimbel Architectural Door Specialties.
  - d. Raynor.
  - e. Wayne-Dalton Corp.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.
- D. Installed R-Value: 17.5 deg F x h x sq. ft./Btu.
- E. Aluminum Sections: Solid panels.
- F. Track Configuration: Standard-lift track.
- G. Weatherseals: Fitted to bottom and top and around entire perimeter of door.
- H. Windows: Approximately 24 by 11 inches, with curved corners, and spaced apart the approximate distance as indicated on Drawings; in one row(s) at height indicated on Drawings; installed with glazing of the following type:
1. Insulating Glass: Manufacturer's standard.
- I. Locking Devices: Equip door with locking device assembly.
1. Locking Device Assembly: Cremone type, both jamb sides, locking bars, operable from outside with cylinder.
- J. Counterbalance Type: Manufacturer's standard torsion spring or weight counterbalance.
- K. Electric Door Operator:
1. Usage Classification: Standard duty up to 25 cycles per hour and up to 90 cycles per day.
  2. Operator Type: Manufacturer's standard for door requirements.

3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
  4. Motor Exposure: Interior, clean, and dry.
  5. Emergency Manual Operation: Chain type.
  6. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom section.
    - a. Sensor Edge Bulb Color: Black.
  7. Control Station: Interior-side mounted.
  8. Other Equipment: Portable, radio-control system.
- L. Door Finish:
1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
- M. MATERIALS, GENERAL
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.03 ALUMINUM DOOR SECTIONS

- A. Sections: Extruded-aluminum stile and rail members with dimensions and profiles as indicated on Drawings; members joined by welding or with concealed, 1/4-inch-minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.
1. Aluminum: ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; minimum thickness 0.065 inch for door section 1-3/4 inches deep, and as required to comply with requirements.
  2. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
  3. Provide reinforcement for hardware attachment.

- B. Solid Panels: Aluminum sheet, complying with ASTM B 209, alloy and temper standard with manufacturer for type of use and finish indicated, not less than 0.040 inch thick, set in continuous vinyl channel retained with rigid, snap-in, extruded-vinyl moldings or with rubber or neoprene glazing gasket with aluminum stop.

#### 2.04 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
  - 1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
  - 2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
  - 3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
    - a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.
    - b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

#### 2.05 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-diameter roller tires for 3-inch-wide track and 2-inch-diameter roller tires for 2-inch-wide track.
- D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

## 2.06 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  - 1. Lock Cylinders: Cylinders specified in Section 087100 "Door Hardware".
  - 2. Keys: Three for each cylinder.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.07 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
- B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-

iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

- C. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
- D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.
- E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
- F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

## 2.08 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
  - 1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly

connected to door with drawbar.

- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
1. Electrical Characteristics:
    - a. Phase: Single phase.
    - b. Volts: 115V.
    - c. Hertz: 60.
  2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
  3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
  5. Use adjustable motor-mounting bases for belt-driven operators.
- E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
  - 1. Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.
- L. Portable, Radio-Control System: Consisting of the following:
  - 1. Three-channel universal coaxial receiver to open, close, and stop door.
  - 2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
  - 3. Remote antenna and mounting kit.

## 2.09 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the



range of approved Samples and are assembled or installed to minimize contrast.

## 2.10 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
  - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
  - 3. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
  - 4. Power-Operated Doors: Install according to UL 325.

### 3.03 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

#### 3.04 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
- D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

#### 3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

+ + END OF SECTION + +

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. System 1A - Four-sided Structural-sealant glazed curtain wall assemblies with aluminum trim reveal on exterior.
  - 2. System 1B - Four sided toggle glazed/structural sealant glazed curtainwall assemblies.
- B. Refer to Section 014339, "Exterior Wall Mockup" for esthetic and performance mockups affecting work of this section.

1.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glazed aluminum curtain walls including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General Performance of Curtain Wall Assembly: Comply with performance requirements specified, as determined by testing of structural-sealant-glazed curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Structural-sealant-glazed curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
- C. Structural Loads:

1. Wind Loads: As calculated in accordance with ASCE 7, using parameters given on S001.
  2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
  3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Test according to

ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..
- H. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Differential Floor to Floor Design Displacement:  $L/400$ , where  $L$ =story height.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.69 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 56 as determined according to NFRC 500.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
  2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
- K. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
  2. Designed to produce tensile or shear stress of less than 20 psi.
- L. Deflection of Base of Building Structure:

1. Design to accommodate the worst-case accumulated vertical and horizontal deflections of the cantilevered floor beam members and global and local truss elements, as shown on the structural drawings.
- M. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
  2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

#### 1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For structural-sealant-glazed curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  2. Include full-size isometric details of each vertical-to-horizontal intersection of structural-sealant-glazed curtain walls, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
  4. Include magnitude and location of all anchor loads imposed on the base building structure, for review by the structural engineer of record.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
  2. Anchorage.
  3. Expansion provisions.
  4. Glazing.
  5. Flashing and drainage.
- E. Delegated-Design Submittal: For structural-sealant-glazed curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Preconstruction Laboratory Mockup Testing Submittals:
1. Testing Program: Developed specifically for Project.
  2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
  3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.
- B. Qualification Data: For Installer.
- C. Energy Performance Certificates: For structural-sealant-glazed curtain walls, accessories, and components from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each structural-sealant-glazed curtain wall.

- D. Product Test Reports: For structural-sealant-glazed curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.

#### 1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For structural-sealant-glazed curtain walls to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for postinstallation-phase quality-control program.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated..
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- E. Structural-Sealant Glazing: Comply with ASTM C 1401 for



design and installation of curtain-wall assemblies.

#### 1.08 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.09 PRECONSTRUCTION LABORATORY MOCKUPS

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform testing on preconstruction laboratory mockups.
- B. Build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.
  - 1. Size and Configuration: As indicated on Drawings.
  - 2. Notify Architect seven days in advance of the dates and times when preconstruction laboratory mockups will be constructed and tested.
- C. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory mockups according to requirements in "Performance Requirements" Article. Perform the following tests in the following order:
  - 1. Structural: ASTM E 330 at 50 percent of positive test load.
  - 2. Air Infiltration: ASTM E 283.
  - 3. Water Penetration under Static Pressure: ASTM E 331.
  - 4. Water Penetration under Dynamic Pressure: AAMA 501.1.

5. Structural: ASTM E 330 at 100 percent of positive and negative test loads. Repeat the following:
  - a. Air Infiltration: ASTM E 283.
  - b. Water Penetration under Static Pressure: ASTM E 331.
6. Interstory Drift: AAMA 501.4 at 100 percent of design displacement. Repeat the following:
  - a. Air Infiltration: ASTM E 283.
  - b. Water Penetration under Static Pressure: ASTM E 331.
7. Vertical Interstory Movement: AAMA 501.7. Repeat the following:
  - a. Air Infiltration: ASTM E 283.
  - b. Water Penetration under Static Pressure: ASTM E 331.
8. Thermal Cycling: According to AAMA 501.5. Repeat the following:
  - a. Air Infiltration: ASTM E 283.
  - b. Water Penetration under Static Pressure: ASTM E 331.
9. Structural: ASTM E 330 at 100 and 150 percent of positive and negative test loads. Repeat the following:
  - a. Air Infiltration: ASTM E 283.
  - b. Water Penetration under Static Pressure: ASTM E 331.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals and other materials

- beyond normal weathering.
- d. Water penetration through fixed glazing and framing areas.
- 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.01 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide listed products:
  - 1. Basis of Design: Wausau Window and Wall Systems; SuperWall 8250.
- B. Comparable product by one of the following:
  - 1. Kawneer North America.
  - 2. Oldcastle, Inc.
  - 3. Shuco USA LP.
  - 4. United States Aluminum.
- C. Source Limitations: Obtain all components of curtain-wall system, including framing venting windows, entrances and accessories, from single manufacturer.

### 2.02 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed- aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Glazing System:
    - a. System 1A - Four-sided Structural-sealant glazed curtain wall assemblies with aluminum trim reveal on exterior.
    - 2. System 1B - Four sided toggle glazed/structural sealant glazed curtainwall assemblies.Finish: High-performance organic finish.
    - 3. Fabrication Method: Either factory- or field-fabricated system.
  - B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
  - C. Materials:
    - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      - a. Sheet and Plate: ASTM B 209.
      - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      - d. Structural Profiles: ASTM B 308/B 308M.
    - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
      - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
      - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
      - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.03 SHADOW BOX

- A. Aluminum Back Pan: As specified in Division 07 Section "Metal Plate Panels."

1. Finish: Custom finish as selected by Architect.
- B. Mineral-Wool Board Insulation: As specified in Division 07 Section, "Thermal Insulation."
- C. Air Barrier: As specified in Division 07 Section, "Modified Bituminous Sheet Air Barriers."

#### 2.04 GLAZING

- A. Glazing: Comply with Section 088020 "Exterior Glazing."
- B. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
  1. Color: As selected by Architect from manufacturer's full range of colors.
- C. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
  1. Color: Match structural sealant.

#### 2.05 ACCESSORIES

- A. Mullion Closure: Extruded aluminum, ASTM B 221. Provide at interior side of curtainwalls where interior partitions abut curtain wall mullions, as where indicated on Drawings.
  1. Basis of Design Product: Subject to compliance with requirements provide Mullion Mate by Gordon Interior Specialties Division or approved equal.
- B. Perimeter Transition Flashing: For curtain wall and window transitions to adjacent dissimilar materials for continuity of building envelope air and vapor barrier.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Proglaze ETA flashing system by Tremco Sealants and Waterproofing.
- C. Fasteners and Accessories: Manufacturer's standard

corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  2. Reinforce members as required to receive fastener threads.
- D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.06 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
  1. Profiles that are sharp, straight, and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Physical and thermal isolation of glazing from framing members.
  4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  5. Provisions for field replacement of glazing from exterior.
  6. Provisions for safety railings mounted on interior

face of mullions.

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion.
3. Preparation includes, but is not limited to, cleaning and priming surfaces.
4. Seal joints watertight unless otherwise indicated.
5. Install glazing to comply with requirements in Section 088020 "Exterior Glazing."

- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

- E. Form coping glazed into curtain wall framing, sills, sill closures at interior floor slabs, and closure caps and other trim indicated on Drawings from aluminum extrusions or aluminum sheet of minimum 1/8-inch thickness to sizes and profiles indicated on Drawings, finished to match curtain wall.

## 2.07 ALUMINUM FINISHES

- A. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Custom color as selected by Architect.

## 2.08 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.03 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
  - 7. Seal joints watertight unless otherwise indicated.



- B. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
  - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Install glazing as specified in Section 088020 "Exterior Glazing."
  - 1. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- E. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions, to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

### 3.04 ERECTION TOLERANCES

- A. Erection Tolerances: Install structural-sealant-glazed curtain walls to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of structural-sealant-glazed curtain walls.
  1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform a minimum of two tests in areas as directed by Architect.
  2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.50 cfm/sq. ft..
    - a. Perform a minimum of two tests in areas as directed by Architect.
  3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
  1. Test a minimum of two areas on each building facade.
  2. Repair installation areas damaged by testing.
- D. Structural-sealant-glazed curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

+ + END OF SECTION + +

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes:
  - 1. Glass, glazing and connections for glass curtain walls.
  - 2. Glass, glazing and connections for entry vestibule walls and ceilings.
  - 3. Frameless glass entry doors and door hardware.
- B. Refer to Section 014339, "Exterior Wall Mockup" for esthetic and performance mockups affecting work of this section.

1.02 SYSTEM DESCRIPTION

- A. Glazing System - General:
  - 1. Design fittings to give flush appearance to exterior surface of curtain wall. Exterior fittings and plates are not permitted.
  - 2. The design of the glass fittings and support is the sole responsibility of glass manufacturer. All fitting sizes must be in accordance with profiles and sizes shown on drawings. Size of fittings is critical to the design of the glass wall.
  - 3. Design spring plate members to prevent high stress concentration at the hole positions and to accommodate the following:
    - a. Negative and positive wind loading.
    - b. Seismic loads.
    - c. Thermal movement.
    - d. Construction tolerances.
    - e. Live load and dead load movements.
  - 4. Incorporate movement diaphragms of stainless steel and durable flexible discs in connections to accommodate oversize holes in spring plate members which allow for thermal movement and glass manufacturing tolerances.
  - 5. Design system to accommodate unitized pre-fixing of

items to glass prior to erection.

B. Curtain Wall System:

1. Design curtain wall to be bottom loaded type, transferring dead load to base of wall.
2. Design curtain wall to permit access to full glass surface for manual cleaning of interior and exterior surfaces.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Wind Loads: As calculated in accordance with ASCE 7, using parameters given on S001.
2. Glass Deflection: Maximum 1/175 of span measured at design wind pressure and live load.

B. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with with ASCE 7 and applicable code.

C. Curtain Wall Air Infiltration: Maximum 0.06 cfm/sf of curtain wall area.

1. Test Method: ASTM E283.
2. Test Pressure Differential: 6.24 psf.

D. Curtain Wall Water Leakage: None with test pressure difference of 15.00 psf.

1. Test Method: ASTM E331.

E. Curtain Wall Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside face of glass.

F. Expansion / Contraction: System to provide for expansion and contraction within system components and supporting structure caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental affect to system components.

1.04 ACTION SUBMITTALS

A. Shop Drawings: Signed and sealed by professional engineer.

1. Indicate materials and methods, indicate coordination

with adjacent construction.

2. Indicate system dimensions, tolerances, anticipated deflection under load, affected related Work, perimeter and termination details.
  3. Include shop and field sealant joint locations and sizes, including tolerances and maximum/minimum joint sizes required.
  4. Include magnitude and location of all anchor loads imposed on the base building structure, for review by the structural engineer of record.
- B. Product Data: Material description and installation instructions for tapes, compounds, gaskets and other materials.
- C. Samples:
1. Submit sample of glass and glazing materials required for the Project. Samples of glass shall be 12 inch by 12 inch, samples of sealant or gasket shall be 12 inch.
  2. Submit sample of spring plate complete with glass, bolt and accessories.
- D. Quality Assurance Compliance: Submit letters from glass manufacturer's authorized representative and from the project installer stating compliance with Contract Documents.
1. Submit letter signed by glass manufacturer representative with company's authorization stating that installer is approved and qualified to install system.
  2. Submit list of installer qualifications including representative similar projects. Indicate project name, location, scope, building owner, architect, and date construction was completed. Indicate contact name and telephone number for building owner and architect.
- E. Calculations: Signed and sealed by professional engineer.
1. Submit calculations proving structural glazing systems performance and compliance with specified loads.
  2. Indicate location and magnitude of loads transferred

to building framing and foundations.

3. Demonstrate that stresses induced in glass by fittings are compatible with glass strength and performance requirements.
- F. Test Reports: Submit test reports from an independent laboratory in the United States certifying that the fully suspended structural glazing system proposed for this use has been tested. Proposed deviations without test reports will not be considered.
- G. Manufacturer's Installation Instruction: Special installation requirements.

#### 1.05 QUALITY ASSURANCE

- A. Sole Source Responsibility:
1. Provide glazing materials and system design including system accessories by glazing system manufacturer.
  2. Provide installation by installer approved by glazing system manufacturer.
  3. Installer is responsible for supplying and erecting complete structural glazing system, coordinating and maintaining tolerances between structure and glazing system with individual suppliers and manufacturers, and installation of glazing system.
- B. Where tempered and laminated glass are indicated, provide type of products which comply with 16 CFR, Part 1201 for category II materials.

#### 1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.
1. Installer must have installed with his own forces a minimum of three other projects using products and systems specified in this section.
- C. Design structural support framing components under direct supervision of Professional Engineer experienced in design

of this Work and licensed at project location.

#### 1.07 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Attendees: Representatives of the glass and glazing materials manufacturers, sealant manufacturer, glazing installer, Architect and Owner.
  - 2. Review glazing procedure and schedule, including method of delivering and handling glass, and installing glazing materials.
  - 3. Confirm chemical compatibility of glazing materials and framing sealants with each other and with like materials used in glass fabrication.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle work in accordance with AAMA MCWM-1 - Curtain Wall Manual.
- B. Protect prefinished metal surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

#### 1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when surface temperature is less than 40 degrees F.
- B. Maintain specified minimum temperature during and after installation of sealants.

#### 1.10 WARRANTY

- A. Manufacturer Warranty: Provide twelve year warranty for design integrity, weatherability and durability of system. Partial multiple warranties of various project elements will not be accepted.
- B. Installer Warranty: Warrant installation for period of 5 years for installation and repairs of failures. Provide written requirements for notification of installer and terms for maintaining warranty provisions.
- C. Warranties submitted under this Section shall not deprive Owner of other rights or remedies that Owner may have under

other provisions of Contract Documents and laws of governing jurisdictions and is in addition to and runs concurrently with other warranties made by Contractor under requirements of Contract Documents.

## **PART 2 - PRODUCTS**

### **2.01 STRUCTURAL GLASS WALL SYSTEM**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cricursa.
2. Cristacurva.
3. Agnora.

### **2.02 GLASS**

A. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering, heat soaked.

1. Maximum Roller Wave Distortion: 0.0007 inches peak to valley.
2. Glass must be certified to be tempered to a minimum compressive strength of 16,000 PSI. Glass tempered to lower strengths will not be accepted.
3. Fabricate tempered glass with roller-wave distortion parallel to bottom edge of glass as installed.

B. Clear Laminated Glass: ASTM C1172; with clear interlayer.

1. Construction: Four glass lights and three interlayers.
  - a. Light Thickness: 6 mm minimum, each.
  - b. Total Thickness: 28 mm minimum.
2. Interlayer: Clear ionoplast.
  - a. Basis of Design: SentryGlas by Kuraray.
  - b. Interlayer Thickness: 35 mil, minimum.

C. Wall Panel, Ceiling Panel, and Fin Glass: Laminated glass unit.

D. Entrance Door Glass: Fully tempered single light, minimum 18 mm thick.



- E. All edges will be ground flat with a frosted appearance unless otherwise noted.
- F. All edgework, holes and notches in the tempered glass panels will be completed before tempering and shall comply with the following:
  - 1. Dimensional tolerance on panel size will be 1 mm of the theoretical dimension required.
  - 2. Squareness of each panel will be within 3 mm.
  - 3. Bow allowance is 0.1 percent.
  - 4. The positional tolerances on all holes will be 1 mm from a single datum point.
- G. All glass must be manufactured in a factory where the quality control procedures are created under the terms of ISO 9000 and are independently monitored.
- H. Prestress glass around holes to a level which is compatible with the design and use of the fittings. Check by differential surface refractometer on stress level.

### 2.03 FITTINGS

- A. Top and Bottom Channels: Stainless steel Grade 316, size and shape indicated, with allowance to accommodate installation gaskets and centering and setting blocks.
- B. Fitting: Stainless steel Grade 316, polished finish.
- C. Spring Plates: Fitting manufacturer's standard compatible with the performance requirements.
  - 1. Provide tolerance capability to accommodate full range of movements.
    - a. Thermal movements occurring as a result of differential coefficients of thermal expansion within the range specified. The components used within the system shall withstand noiselessly all thermal movements without any buckling, distortion, cracking, failure of joint seals or undue stress on the glass or fixing assemblies.
    - b. Deflection of edge beams due to loading applied after erection of the cladding to magnitude specified.
    - c. Maximum side sway of structure due to wind load to the magnitude specified or seismic movement to

- the degree specified.
  - d. Deflection due to self weight of the system.
  - e. Inward and outward movements due to the design wind loads specified.
- D. Bolts: Countersunk, bright machine finished, socket head with hexagonal shank, stainless steel Type 303.
- 1. Exterior plates, caps, disks or buttons are not permitted.
- E. Bushings: Nylatron Polyamide.
- F. Gaskets: Fully vulcanized fiber, neoprene or precured silicone.

#### 2.04 FRAMELESS GLASS ENTRANCE DOORS

- A. Aluminum Extrusions: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5.
- 1. Stainless-Steel Cladding: ASTM A 666, Type 304.
- B. Fitting Configuration:
- 1. Manual-Swinging, All-Glass Entrance Doors Sidelights and Transoms: Continuous rail fitting at top and bottom.
- C. Rail Fittings:
- 1. Material: Stainless-steel-clad aluminum.
  - 2. Height:
    - a. Top Rail: 3-1/2 inches.
    - b. Bottom Rail: 10 inches.
  - 3. Profile: As indicated.
  - 4. End Caps: Manufacturer's standard precision-fit end caps for rail fittings.
- D. Accessory Fittings: Match rail-fitting metal and finish for the following:
- 1. Overhead doorstop.
  - 2. Center-housing lock.
  - 3. Glass-support-fin brackets.
- E. Transom Bars: Stainless steel.
- F. Anchors and Fastenings: Concealed.

## 2.05 ENTRANCE DOOR HARDWARE

- A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of rail fittings.
- B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
  - 1. Swing: Single acting.
    - a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
  - 2. Opening-Force Requirements:
    - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
- C. Cylinders: Six-pin cylinder, BHMA A156.5, Grade 1.
- D. Exit Devices: UL 305.
  - 1. Function: Operation by push-pull when inside operator is locked down (dogged).
  - 2. Latching: At threshold or floor plate.
  - 3. Style: Tubular, horizontal push bar and vertical pull.
  - 4. Provide exit devices on both leaves of pairs of doors.
- E. Threshold: Not more than 1/2 inch high.

## 2.06 GLAZING SEALANTS

- A. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.
  - 1. Dow Corning; 795 Silicone Building Sealant.
  - 2. Pecora; 895.

3. General Electric Silicones; SilPruf.

## 2.07 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  1. Run grain of directional finishes with long dimension of each piece.
  2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  3. Directional Satin Finish: No. 4.

## 2.08 SOURCE QUALITY CONTROL AND TESTS

- A. Heat soak tempered glass in accordance with DIN 18516-4.
  1. Full Heat Soaking: Heat soak each tempered glass lite before final fabrication.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Examine surfaces receiving the Work. Verify dimensions of in-place and subsequent construction. Follow the recommendations of the FGMA as to inspection procedures. Do not begin work until unsatisfactory conditions have been corrected. Installation of work shall constitute acceptance of the related construction.

### 3.02 INSTALLATION

- A. Install glazing system in accordance with manufacturer's instructions and approved shop drawings.
- B. Employ only experienced glaziers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.
- C. Seal glass plate to plate joints with silicone sealant.

Joint dimensions shall be designed to be compatible with sealant properties and live load movement of the structure.

- D. Bolt Torque: Torque bolts to torques specified on shop drawings using calibrated tool. Lock torqued bolts into position to prevent backoff. Reset calibrations regularly to ensure accurate torquing.
- E. Maintain minimum temperature of 40 degrees F. during glazing unless the manufacturer of glazing material specifically agrees to application of this material at lower temperature. If job progresses or other conditions require glazing work when temperature is below 40 degrees F. (or below the minimum temperature recommended by manufacturer), consult the manufacturer and establish minimum provisions required to ensure satisfactory work.
- F. Clean glazing connectors receiving glazing materials of deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants. Wipe metal surfaces with Xylol or Toluol.
- G. Inspect each unit of glass immediately before installation. Glass which has significant impact damage at edges, scratches or abrasion of faces, or any other evidence of damage shall not be installed.
- H. Perimeter Sealant Installation.
  - 1. Prime surfaces to receive glazing sealants where required, in accordance with manufacturer's recommendations, using recommended primers.
  - 2. Install sealant in accordance with manufacturer's instructions.
- I. Locate setting blocks, if required by the drawings, at the quarter points of sill, but no closer than 6 inches to corners of glass. Use blocks of proper sizes to support the glass in accordance with manufacturer's recommendations.
- J. Provide spacers to separate glass from spring plates.
- K. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face all glass, which has dissimilar faces, with matching faces in the same direction.

- L. Butt Glazed Method (Sealant Only) Installation:
  - 1. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.
  - 2. Temporarily secure small diameter non-adhering foamed rod on back side of joint.
  - 3. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod. Tool sealant surface smooth to concave profile.
  - 4. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.
  - 5. Remove masking tape.
- M. Install and lubricate door hardware.
  - 1. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
- N. Clean excess sealant from glass and support members immediately after application, using solvents or cleaners recommended by manufacturers.

### 3.03 CURING, PROTECTION, AND CLEANING

- A. Cure sealants in accordance with manufacturer's instructions to attain maximum durability and adhesion to glass.
- B. Clean exposed surfaces after installation.

### 3.04 MANUFACTURER'S FIELD SERVICES

- A. Engage manufacturer's field representative to observe installation.
  - 1. Monitor and report installation procedures and unacceptable conditions.
  - 2. Verify installation complies with specifications and manufacturer's installation instructions.

### 3.05 CLEANING

- A. Remove protective material from prefinished metal surfaces.

- B. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.06 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect finished Work from damage.

+ + END OF SECTION + +





## **087100 - DOOR HARDWARE**

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### **PART 1 - GENERAL**

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

#### 1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the door and door frames on which they are installed.
- B. This Section includes the following:
  - 1. Hanging Devices See paragraph 2.2.A.
  - 2. Active Leaf Locking Devices See paragraph 2.2.B.
  - 3. Inactive Leaf Locking Devices See paragraph 2.2.C.
  - 4. Door Control Devices See paragraph 2.2.D.
  - 5. Door Closing Devices See paragraph 2.2.E.
  - 6. Push Units See paragraph 2.2.F.
  - 7. Pull Units See paragraph 2.2.G.
  - 8. Door Protection Plates See paragraph 2.2.H.
  - 9. Miscellaneous Equipment See paragraph 2.2.I.
  - 10. Thresholds and Door Seals See paragraph 2.2.J.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 8 Section "Standard Steel Doors and Frames".
  - 2. Division 8 Section "Flush Wood Doors" for factory pre-fitting and pre-machining of doors for door hardware.
  - 3. Division 8 Section "Stile and Rail Wood Doors" for factory pre-fitting and pre-machining of doors for door hardware.
  - 4. Division 8 Section "Stainless Steel Doors and Frames".
  - 5. Division 8 Section "Aluminum Entrance Doors and Frames".

#### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Product data including manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with the requirements.
- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on the hardware indicated, organize a schedule into "hardware groups" indicating complete designations of every item required for each door or opening. include the following information:
  - a. Type, style, function, size, and finish of each hardware item.
  - b. Name and manufacturer of each item.
  - c. Fastenings and other pertinent information.
  - d. Location of each hardware group cross referenced to the indications on the Drawings both on the floor plans and in the door and frame schedule.
  - e. Explanation of all abbreviations, symbols, and codes contained in the schedule.
  - f. Mounting locations for all hardware.
  - g. Door and frame sizes and materials.
  - h. Keying information.
2. Submittal Sequence: Submit final schedule at the earliest possible date particularly where acceptance of the hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with the schedule the product data, samples, shop drawings of other work affected by the door hardware, and other information essential to the coordinated review of the schedule.
3. Submittal Sequence: Submit initial draft of final schedule along with essential product data in order to facilitate the fabrication of the other work that is critical in the Project construction schedule. Submit final schedule after samples, product data, coordination with shop drawing of other work, delivery schedules, and similar information has been completed and accepted.
4. Keying Schedule: Submit a separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks and cylinders has been fulfilled.

D. Samples of each type of exposed hardware unit in the finish indicated and tagged with the full description for coordination with the schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through the submittal, review, and field comparison process may, after final check of operation, be incorporated into the work, within the limitations of the keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other related work to confirm that adequate provisions are made for locating and installing door hardware to comply with the indicated requirements.

#### 1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware from a single manufacturer as indicated in this section.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, complexity and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to the Owner, Architect, and Contractor, at reasonable times during the course of the work, for consultation.
  - 1. The supplier is required to meet with the Owner to finalize the keying requirements and to prepare a detailed keying schedule for the Owner's approval.
- C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and the requirements of the authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Warnock Hersey, Factory Mutual or other testing and inspecting organization acceptable to the authorities have jurisdiction for use on types and sizes of doors indicated in compliance with the requirements of fire-rated door and door frame labels.

#### 1.05 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to the final approved hardware schedule, and includes basic installation instructions with each item or package.
- B. Packaging of door hardware is the responsibility of the supplier. As material is received by the hardware supplier at his warehouse from the various manufacturers, he shall sort and repackage in containers clearly marked with the appropriate hardware group numbers to match group numbers of the approved hardware schedule. Two or more identical groups may be packed in the same container.
- C. Deliver individually packaged door hardware items promptly from the supplier's warehouse to the place of installation (fabrication shop or Project site).
- D. Inventory door hardware jointly with the representatives of the hardware supplier and the hardware installer until each jointly agrees that the count is correct.
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that the completion of the work will not be delayed by hardware losses both before and after installation.

1.06 MAINTENANCE

- A. Maintenance tools and instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Provide the Owner with a list of Product Warranties indicating how long each item is covered under the manufacturer's warranty.

**PART 2 - PRODUCTS**

2.01 KEYING AND KEY CONTROL

- A. Great Grand Masterkey, Grand Masterkey, Master Key and Construction Masterkey all cylinders to the existing Schlage Everest D124 Keyway System as directed by the Owner and/or Architect.
- B. After receipt of an approved/approved as noted Hardware Schedule, prior to ordering any locking devices, hardware supplier shall arrange through the General Contractor for a meeting with the Architect and/or Owner to discuss keying for this job. A Keying Layout Schedule shall be submitted for review within ten (10) days after such meeting.
- C. Furnish the following quantities of keys: Four (4) Grand Master Keys, Four (4) Masterkeys and Three (3) Change Keys for each lock or cylinder.
- D. Furnish one Key Cabinet, including envelopes, labels, tags with self-locking clips, receipt forms, three-way index, temporary markers, permanent markers, and standard metal hinged-type panel type cabinet for wall mounting. Key Cabinet shall have a capacity of a 150 percent more than the number of cylinders under this Contract.
- E. All Cylinders shall be standard type (NON-IC).
- F. Provide Schlage cylinders for Items 101, 102, 105, 119 to 121, 123, **125**.

2.02 HARDWARE ITEMS

- A. Hanging Devices (000)
  - 1. Furnish the type as listed.
  - 2. Catalog reference.
    - a. Stanley. (Items 001 to 007, 009 to 014.)
    - b. Rixson. (Item 008.)
  - 3. Item Description.
    - a. 001 - Continuous Hinge 662HD Note 1 628
    - b. 002 - Mortise Hinge CB1901ET - NRP Note 2, 3 652
    - c. 003 - Mortise Hinge CB1900ET 652
    - d. 004 - Mortise Hinge CB1900ET - NRP 652
    - e. 005 - Mortise Hinge CB1901ET - NRP 652

f. 006	- Continuous Hinge 662HD		628
g. 007	- Mortise Hinge CB1901ET		652
h. 008	- Top Pivot H340		626
i. 009	- Mortise Hinge CB1901ET	Note 2	652
j. 010	- Mortise Hinge CB1901ET NRP	Note 3	652
k. 011	- Mortise Hinge CB1901ET	Note 2, 3	652
l. 012	- Continuous Hinge 661HD		SPL
m. 013	- Mortise Hinge CB1901ET - NRP	Note 2	652
n. 014	- Mortise Hinge CB1901ET	Note 3	652

4. Notes.

- a. Note A: Furnish two hinges up to 60 inches in height, provide one additional hinge for each additional 30 inches or fraction thereof. Provide five hinges for 10'-0" high doors.
- b. Note B: The hinge size shall be 4.5 x 4.5 for standard weight hinges and 4.5 x 4.5 for heavy weight hinges unless noted otherwise. The length of a continuous hinge shall be one inch less than the nominal opening height, provide rated models as required.
- c. Note 1: Modify the hinge and provide power transfer device SEPT-10 by Securitron.
- d. Note 2: Provide power transfer device SEPT-10 by Securitron.
- e. Note 3: Revise the size to 5.0 x 4.5.

B. Active Leaf Locking Devices (100)

- 1. Furnish the type as listed.
- 2. Catalog reference.
  - a. Von Duprin. (Items 101, 102, 105, 107, 108, 116, 119 to 121, **125.**)
  - b. Schlage. (Items 103, 104, 106, 109 to 115, 117, 118, 122.)
  - c. CRL. (Items 123, 124.)
- 3. Item Description.

a. 101	- Exit Device LD-RXLC-E9849L-FSE-17-LBL		626
b. 102	- Exit Device RXLC-E9849L-FSE-17-F-LBL		626
c. 103	- Cylindrical Lock-set ND70PD-SPA		626
d. 104	- Cylindrical Lock-set ND80PD-SPA		626
e. 105	- Exit Device 9875L-NL-17-F x 575-2		626
f. 106	- Cylindrical Lock-set ND70PD-SPA	Note 1	626
g. 107	- Exit Device 9849L-BE-17-F-LBL		626
h. 108	- Exit Device 9875L-BE-17-F		626
i. 109	- Cylindrical Lock-set ND80PEU-RX-SPA		626
j. 110	- Cylindrical Lock-set ND80PEU-RX-SPA	Note 1	626
k. 111	- Cylindrical Lock-set ND10S-SPA		626
l. 112	- Cylindrical Lock-set ND10S-SPA	Note 1	626
m. 113	- Cylindrical Lock-set ND80PD-SPA	Note 1	626
n. 114	- Cylindrical Lock-set ND53PD-SPA		626
o. 115	- Cylindrical Lock-set ND50PD-SPA		626
p. 116	- Exit Device LD98EO		626
q. 117	- Cylindrical Lock-set ND66PD-SPA	Note 1	626

- |  |            |
|--|------------|
| r. 118 - Cylindrical Lock-set ND44S-SPA        | 626        |
| s. 119 - Exit Device 9849L-17-F-LBL            | 626        |
| t. 120 - Exit Device LD98L-2-17                | 626        |
| u. 121 - Exit Device 9875L-NL-17-F             | 626        |
| v. 122 - Cylindrical Lock-set ND66PD-SPA       | 626        |
| w. 123 - Exit Device PA100F (short) x ES3101   | 630        |
| x. 124 - Dummy Exit Device DH100F (short)      | 630        |
| <b>y. 125 - Exit Device 9875L-06-F x 575-2</b> | <b>626</b> |
4. Notes.
- a. Note A: The trim for all devices shall be as indicated.
- b. Note 1: Provide 7/8" lip to center strike.
- C. Inactive Leaf Locking Devices (200)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. Trimco. (Items 201, 202, **203.**)
  3. Item Description.
 

a. 201 - Automatic Flush Bolts 3810 (2) Note 2	626
b. 202 - Manual Flush Bolts 3917 Note 1, 2	626
<b>c. 203 - Automatic Flush Bolts 3815L (2) Note 2</b>	<b>626</b>
  4. Notes.
    - a. Note 1: Locate the top bolt @ 72" AFF and the bottom bolt @ 12" AFF.
    - b. Note 2: Provide floor strike 3910N-630 set in epoxy cement.
- D. Door Control Devices (300)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. Trimco. (Items 301 to 303.)
    - b. ABH Mfg. (Items 304 to 307.)
  3. Item Description.
 

a. 301 - Floor Stop 7281	626
b. 302 - Wall Stop 1270VX	630
c. 303 - Floor Stop 1231	626
d. 304 - Overhead Concealed Stop 4024	630
e. 305 - Overhead Concealed Stop 4021	630
f. 306 - Overhead Concealed Holder 4014	630
g. 307 - Overhead Concealed Stop 4022	630
  4. Notes.
    - a. None.
- E. Door Closing Devices (400)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. LCN Closers. (Items 401 to 428, 430, **431.**)
    - b. Horton. (Item 429.)
  3. Item Description.
 

a. 401 - Surface Closer 4111-DEL-SCUSH	689
b. 402 - Surface Closer 4111-DEL-SCUSH	Note 1 689
c. 403 - Surface Closer 4111-DEL x ST-2054	SPL
d. 404 - Surface Closer 4011-DEL	Note 1 689

e. 405	- Surface Closer 4111-DEL x ST-1774	Note 1	689
f. 406	- Surface Closer 4111-H x ST-2054		SPL
g. 407	- Surface Closer 4111-DEL-SCUSH x ST-1496		
		<b>Note 1</b>	689
h. 408	- Surface Closer 4011	Note 1	689
i. 409	- Surface Closer 4111-DEL		689
j. 410	- Surface Closer 4011-H		689
k. 411	- Surface Closer 4011-DEL		689
l. 412	- Surface Closer 4111-H		689
m. 413	- Surface Closer 4011-DEL		SPL
n. 414	- Surface Closer 4011-DEL x ST-1544		SPL
o. 415	- Surface Closer 4011-DEL x ST-1544		689
p. 416	- Surface Closer 4011-DEL x ST-1544	Note 1	689
q. 417	- Surface Closer 4111-DEL	Note 1	689
r. 418	- Surface Closer 4111-SCUSH x 4110-18		SPL
s. 419	- Surface Closer 4011 x ST-1544		689
t. 420	- Surface Closer 4011-H		SPL
u. 421	- Surface Closer 4111 x ST-2054		SPL
v. 422	- Surface Closer 4011-DEL x ST-1544		652
w. 423	- Surface Closer 4111-H-SCUSH		689
x. 424	- Surface Closer 4011		SPL
y. 425	- Surface Closer 4111-SCUSH	Note 1	689
z. 426	- Surface Closer 4111-H-SCUSH		SPL
aa. 427	- Surface Closer 4011 x ST-1544		SPL
ab. 428	- Surface Closer 4111-H-SCUSH-SRI		689
ac. 429	- Dual In-Ground Operators 4100-IG	Note 2	
ad. 430	- Surface Closer 4111-SCUSH-DEL	Note 3	SPL
<b>ae. 431</b>	<b>- Surface Closer 4111-DEL-SCUSH x ST-3289</b>		
		<b>Note 1</b>	<b>689</b>

4. Notes.

- a. Note A: Items with ST-1544 designation require a 4020-18 mounting plate.
- b. Note 1: Adjust the spring tension for proper latching of the fire rated door.
- c. Note 2: Both operators are controlled by the smoke evacuation system. The LHR/RH leaf is also operated by switches that will be selected by the Architect.
- d. Note 3: Include 4110-30 CUSH SHOE SUPPORT and 4110-61 BLADE STOP SPACER.

F. Push Units (500)

- 1. Furnish the type as listed.
- 2. Catalog reference.
  - a. Rockwood. (Item 501.)
- 3. Item Description.
  - a. 501 - Push Plate 70RC - 6" x 30" Note 1 630
- 4. Notes.
  - a. Note 1: Locate the top of the plate @ 60" AFF.

- G. Pull Units (600)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. Rockwood. (Items 601.)
  3. Item Description.
    - a. 601 - Door Pull Y109 Note 1 630
  4. Notes.
    - a. Note 1: Locate the top bolt @ 45" AFF. Locate the bolts under the push plate.

- H. Door Protection Plates (700)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. Rockwood. (Items 701 to 704.)
  3. Item Description.
    - a. 701 - Kick Plate K1050-B4E 10"-W.O.D. - 1.5" 630
    - b. 702 - Kick Plate K1050-B4E 10"-W.O.D. - 1.0" 630
    - c. 703 - Kick Plate K1050-B4E 08"-W.O.D. - 1.5" 630
    - d. 704 - Kick Plate K1050-B4E 08"-W.O.D. - 1.0" 630
  4. Notes.
    - a. Not required.

- I. Miscellaneous Equipment (800)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. Trimco. (Items 801 to 803.)
    - b. CRL. (Items 805, 806.)
    - c. Rockwood. (Items 807, 808.)
  3. Item Description.
    - a. 801 - Door Silencer 1229A Note 1 STD
    - b. 802 - Coordinator 3094B2 STD
    - c. 803 - Coordinator 3094B2 x (2) 3096 MB STD
    - d. 804 - Security Switch furnished by the security contractor.
    - e. 805 - Stop and Electric Strike Support ESK2 630
    - f. 806 - Stop PK2 630
    - g. 807 - Coat Hook RM810 (5'-0" AFF) 626
    - h. 808 - Coat Hook RM809 (4'-0" AFF) 626
  4. Notes.
    - a. Note 1: Provide silencers, 3 per single and 2 per pair.

- J. Thresholds and Door Seals (900)
1. Furnish the type as listed.
  2. Catalog reference.
    - a. NGP. (Items 903, 904 to 907.)
  3. Item Description.
    - a. 901 - Head and Jamb Seals 5050C STD
    - b. 902 - Split Smoke Astragal 9675A (2) STD
    - c. 903 - Weather-stripping by the door manufacturer.
    - d. 904 - Astragal Seal 2525C Note 2 STD
    - e. 905 - Entrance Threshold Note 1 STD



- f. 906 - Bottom Sweeps (each leaf) by the door manufacturer.
  - g. 907 - Threshold 426E Note 3      STD
  - h. 908 - Bottom Sweeps 772A (each leaf of Pair) STD
  - i. 909 - Water Shield 16A - W.O.F. STS
  - j. 910 - Roof Threshold - TBD STD
  - k. 911 - Cover Plate for Item 429 Note 4      STD
4. Notes.
- a. Note 1: Allow for the following components: Outside Section 8137 with mitered extensions, center section 8148 (allow for ripping). Inside Section 8137 or BAR2. All units are to be welded into one unit. A sketch will be supplied after the frame shop drawing is approved.
  - b. Note 2: This seal is to be applied to the door manufacturer's standard fire rated astragal.
  - c. Note 3: Install using ¼-20 stainless steel machine screws and lead expansion anchors.
  - d. Note 4: The cover plate is 8" wide ¼" thick satin stainless steel. It needs to be fabricated to accommodate the fittings of Items 429. This cover plate need to be notched into the thresholds shown in details 4 and 5 on A425.

2.03 HARDWARE FINISHES

- A. The finish for all hardware in designated in the item description by the 600 series number established by the Builders Hardware Manufacturer's Association unless indicated otherwise.
- B. The designation STD indicates that the manufacturer's standard finish is designated.
- C. The designation SPL indicates that the item is to be finished to match the door/frame color.

2.04 HARDWARE GROUPS

- A. Each group number represents a collection of hardware items necessary to complete the opening.
- B. Provide sufficient quantities of each item listed along with proper fasteners.
- C. The following chart contains the groups of item components.

Hardware Group	Hanging Device	Active Leaf Locking Devices	Inactive Leaf Locking Devices	Door Control Devices	Door Closing Devices	Push Units	Pull Units	Door Protection Plates	Miscellaneous Equipment	Thresholds and Door Seals
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GRP	000	100	200	300	400	500	600	700	800	900
GROUPS 01 TO 19 are not used in the NEB project.										
20	001	101			401			701	801 804	
	001	101			401			701	804	
21	001	102			402			701	804	901
	001	102			402			701	804	902
22	005 004	106	202	<del>302</del> <del>301</del> 301	406					903
23	003	104		302	404			702		901
24	003	104		303	404			702		901
25	004 004	105	201	302 302	405 405			701 701	802	901 904
26	003	104		302					801	
27	006 006	105	201		407 407			701 701	803	901 904
28	006 006	107 107			402 402			701 701		901 902
29	007	108		303	408			702		901
30	007			302	409	501	601	702	801	
31	003	104		303	410			702	801	
32	008 008	123 123			429				804 805 804	911
33	008 008	124 124			429				806	911
34	009	109		302	411			703	801 804	
35	002	109		302	403				804	903
36	ALL HARDWARE IS PROVIDED BY THE FOLDING DOOR MANUFACTURER.									
37	010	103		302	412			703	801	
38	011	109		302	413				804	903
39	010	104		302					801	
40	009	109		302	413				804	903
41	009	109		304	414				804	903
42	009 003	110	202	302 302	411			701 701	801 804 804	
43	003	111		304					801	
44	009 003	110	202	302 302	411			704 704	801 804 804	
45	003 003	112	202	302						903
46	004 004	113	202	304 304					801	
47	009 003	110	202	304	415			701 701	801 804 804	

Hardware Group	Hanging Device	Active Leaf Locking Devices	Inactive Leaf Locking Devices	Door Control Devices	Door Closing Devices	Push Units	Pull Units	Door Protection Plates	Miscellaneous Equipment	Thresholds and Door Seals
GRP	000	100	200	300	400	500	600	700	800	900
48	004	104		302					801	
49	004	104		304					801	
50	003	114		302					801	
51	006 006	106	202	302 302	410			701 701	801	
52	003 003	113	201	<b>304</b> <del>302</del> 304	<b>416</b> <del>404</del> 416			701 701	802	901 904
53	006 006	113	201	304 304	416 416			701 701	802	901 904
54	010	103		302	403					903
55	003	115		302					801	
56	004	104			402			702		901
57	004	104		302	417			702		901
58	007	108			402			702		901
59	012	116			418					903 905 906
60	013 004	110	202	304 305	403				804 804	903
61	003	103		302	410			703	801	
62	003	103		306	419			703	801	
63	003	111		302						903
64	009 003	110	202	304 305	414				804 804	903
65	006 006	117	202	306 306	419			701 701	801	
66	ALL HARDWARE IS PROVIDED BY THE OVERHEAD DOOR MANUFACTURER.									
67	006	104			402			702		901
68	003 003	106	202	306 305	413					903
69	006	103		303	410			702		901 907 908
70	ALL HARDWARE IS PROVIDED BY THE CANTILEVERD SLIDING DOOR MANUFACTURER.									
71	003	118		302	411			702	801	
72	003	114		302					807 808	903
73	013	109		304	403				804	903
74	013 004	110	202	304 307	403				804 804	903

Hardware Group	Hanging Device	Active Leaf Locking Devices	Inactive Leaf Locking Devices	Door Control Devices	Door Closing Devices	Push Units	Pull Units	Door Protection Plates	Miscellaneous Equipment	Thresholds and Door Seals
GRP	000	100	200	300	400	500	600	700	800	900
75	013 004	110	202	304 304	403				804 804	903
76	009	109		301	413				804	903
77	003 003	106	202	306 305	419			701 701	801	
78	003 003	112	202	302 305	412			701 701	801	
79	ALL HARDWARE IS PROVIDED BY THE TEMPERD GLASS SLIDING DOOR MANUFACTURER. ACCESS CONTROL HARDWARE IS INCLUDED.									
80	003	111		301	420					903
81	003 003	112	202	306 305	421			701 701	801	
82	013 004	110	202	302 302	409			701 701	801 804 804	
83	003 003	113	202	<del>306</del> <del>302</del> 304	<del>419</del> <del>410</del>			701 701	801	
84	007	111		302	410			702	801	
85	003 003	112	202	306 307	421					903
86	003 003	112	202	301 302	406					903
87	003	111		301	420					903
88	013 013	101 101		301 301	403 403				804 804	903
89	009	109		304	422				804	903
90	005 005	<del>125</del> <del>119</del> <del>119</del>	<b>203</b>	<del>302</del> <del>302</del> <del>301</del> <del>301</del>	<del>405</del> <del>405</del> <del>417</del> <del>417</del>			701 701	<b>802</b>	901 902
91	005 005	107 107		301 301	417 417			701 701		901 902
92	005 005	106	202	306 304	421					903
93	003 003	106	202	302 305	410			701 701	801	
94	013 005	110	202	304 304	403			701 701	801 804 804	

Hardware Group	Hanging Device	Active Leaf Locking Devices	Inactive Leaf Locking Devices	Door Control Devices	Door Closing Devices	Push Units	Pull Units	Door Protection Plates	Miscellaneous Equipment	Thresholds and Door Seals
GRP	000	100	200	300	400	500	600	700	800	900
95	006	120			423			702	804	901 907 908 909
96	014	103		306	419			703	801	
97	003	103		302	424					903
98	003	114		304						903
99	007	103		306	422			703	801	
100	004	104			425			702		901
101	012	122			426				804	903 905 906
102	003	111		306	427					903
103	003	111		306	421					903
104	004	121		303	408			702		901
105	003	111		303	408			702		901
106	006	111			428			702		901 908 910
107	010	103			430					903
108	011	109			430				804	903
109	005 004	106	202	302 307	412			704 704	801	
<b>110</b>	<b>004</b>	<b>121</b>			<b>431</b>			<b>702</b>		<b>901</b>
<b>111</b>	<b>003</b>	<b>111</b>		<b>301</b>						<b>903</b>
<b>112</b>	<b>014</b>	<b>108</b>			<b>425</b>			<b>702</b>		<b>901</b>
<b>113</b>	<b>003 003</b>	<b>106</b>	<b>202</b>	<b>306 302</b>	<b>427</b>					<b>903</b>
<b>114</b>	<b>014</b>	<b>103</b>		<b>306</b>	<b>427</b>					<b>903</b>
<b>115</b>	<b>003 003</b>	<b>106</b>	<b>202</b>	<b>306 305</b>	<b>427</b>					<b>903</b>
<b>116</b>	<b>013 004</b>	<b>110</b>	<b>202</b>	<b>302 302</b>	<b>403</b>				<b>804 804</b>	<b>903</b>
<b>117</b>	<b>014</b>	<b>111</b>		<b>301</b>						<b>903</b>

## 2.05 SUBSTITUTIONS

A. Substitutions shall not be permitted as all products are site standards.

## 2.06 SPECIAL INSTRUCTIONS

- A. On a pair of doors with an inactive and an active leaf the active leaf should be the LHR/RH leaf wherever practical.
- B. **Surface hinges provided by the frame/door may be required at Aluminum Frames with jamb details J4 and J6. Provide a credit to eliminate the scheduled hinges and power transfer devices.**

### **PART 3 - EXECUTION**

#### 3.01 INSTALLATION

- A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations and except as otherwise directed by the architect.
  - 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate the removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until the finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with the requirements specified in Division 7 Section "Joint Sealers".
- F. Weather-stripping and seals: Comply with the manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

#### 3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware at each door to ensure the proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
  - 1. Where door hardware is installed more than one month prior to

acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of the hardware and doors. Adjust door control and closing devices to compensate for final operation of the heating and ventilating equipment after the systems have been properly balanced.

- B. Clean adjacent surfaces soiled by the hardware installation.
- C. Instruct the Owner's personnel in the proper adjustment and maintenance of the door hardware and hardware finishes.
- D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by the representatives of the manufacturers of the latch-sets and locksets, exit devices, door control and door closing devices and other major operating items to perform the following work:
  - 1. Examine and re-adjust each item of door hardware as necessary to restore the function of the doors and hardware to comply with the specified requirements.
  - 2. Consult with and instruct the owner's personnel in recommended additions to the maintenance procedures.
  - 3. Prepare a written report of current and predicable problems (of substantial nature) in the performance the hardware.

END OF SECTION 087100





## 088010 - INTERIOR GLAZING

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### PART 1 - GENERAL

#### 1.01 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.
2. Interior borrowed lites.
3. Translucent honeycomb panels.

#### 1.02 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

#### 1.03 SUBMITTALS

- A. LEED Submittals:
1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
- B. Product Data: For each glass product and glazing material indicated.
- C. Samples: For the following products, in the form of 12-inch-square Samples for glass and of 12-inch-long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

- F. Qualification Data: For installers.
- G. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- H. Product Test Reports: For each of the following types of glazing products:
  - 1. Glazing sealants.
  - 2. Glazing gaskets.
- I. Warranties: Special warranties specified in this Section.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- C. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
  - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

#### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

#### 1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

### **PART 2 - PRODUCTS**

#### 2.01 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.

4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

## 2.02 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.

## 2.03 FIRE-RATED GLAZING PRODUCTS

- A. Film-Faced Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of a 3/16-inch-thick, ceramic glazing material polished on both surfaces, faced on one surface with a clear glazing film, and as follows:
  1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
  2. Product: "FireLite NT" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

## 2.04 TRANSLUCENT HONEYCOMB PANELS

- A. Translucent Honeycomb Panels: Light-transmitting, lightweight, acrylic-faced honeycomb panels.
  1. Basis of Design Product: Panelite; Bonded Series, B-EC Type.
  2. Core: Expanded polymer.

3. Mounting Hardware: Manufacturer's standard track.
4. Face Color: As selected by Architect from manufacturer's standard range.

#### 2.05 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
  1. Neoprene.
  2. EPDM.
  3. Silicone.
  4. Thermoplastic polyolefin rubber.
  5. Any material indicated above.

#### 2.06 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
  4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
  1. Neutral-Curing Silicone Glazing Sealants:

- a. Products:
    - 1) Pecora Corporation; 895.
  - b. Type and Grade: S (single component) and NS (nonsag).
  - c. Class: 50.
  - d. Use Related to Exposure: NT (nontraffic).
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

## 2.07 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
- 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.08 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

## 2.09 GLASS SCHEDULE

- A. See Drawings for Glass Type Schedule.

## 2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Minimum required face or edge clearances.
  - 3. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

### 3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials,

unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.



- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.04 TAPE GLAZING

- A. Application: Use tape glazing method for:
  - 1. Interior glazed openings, unless otherwise indicated.
- B. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- C. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- D. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- E. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- F. Do not remove release paper from tape until just before each glazing unit is installed.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

#### 3.05 GASKET GLAZING (DRY)

- A. Application: Use gasket glazing method for:
  - 1. Interior aluminum storefront.
- B. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

- C. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- D. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.06 SEALANT GLAZING (WET)

- A. Application: Use sealant glazing method for:
  - 1. Interior fire rated glazed openings, unless otherwise required by fire rated assembly.
- B. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- C. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- D. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. When contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

+ + END OF SECTION + +



**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Curtain walls.
  - 2. Entrance Doors.
  - 3. Skylights.
- B. Refer to Section 014339, "Exterior Wall Mockup" for esthetic and performance mockups affecting work of this section.

1.02 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.03 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service

conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
  - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
  - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
    - 1) Load Duration: 60 seconds or less.
  - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
    - 1) For insulating glass.
  - d. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- F. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according

to procedures indicated below:

1. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-wide interspace.
2. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
  - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
  - b. Solar Heat Gain Coefficient: NFRC 200.
  - c. Solar Optical Properties: NFRC 300.

#### 1.04 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
  2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
  3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
  4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

#### 1.05 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
  1. VOC Content: For glazing sealants used inside the weatherproofing system, documentation including

printed statement of VOC content.

- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for laminated glass, insulating glass, glazing sealants, and glazing gaskets.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

#### 1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain ultraclear float glass, coated float glass, laminated glass, and insulating glass from single source from single manufacturer for each



glass type.

- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- J. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid

hermetic seal ruptures due to altitude change.

#### 1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

#### 1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating

glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 GLASS PRODUCTS, GENERAL**

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
  1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
  5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.02 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  2. For uncoated glass, comply with requirements for Condition A.
  3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- D. Reflective-Coated Vision Glass: ASTM C 1376.

## 2.03 LAMINATED GLASS

- A. Laminated Glass, General: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  1. Construction: Laminate glass with, polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.
  4. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

## 2.04 INSULATING GLASS

- A. Insulating Glass Manufacturers:
  - 1. AFG Industries, Inc.
  - 2. Guardian Industries Corp.
  - 3. PPG Industries.
  - 4. Viracon.
- B. Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council or Insulating Glass Manufacturers Alliance; with Low E coating on surface 2 and glass elastomer edge seal; purge interpane space with dry air.
  - 1. Total Unit Thickness: 1 inch unless otherwise indicated.
  - 2. Insulating Glass Spacer: Technoform I-Spacer warm edge spacers.
  - 3. Properties:
    - a. Transmittance, Ultra-Violet: 18 percent
    - b. Transmittance, Visible: 70 percent
    - c. Transmittance, Total Solar Energy: 34 percent
    - d. U-Value Winter Nighttime: 0.29
    - e. U-Value Summer Daytime: 0.27
    - f. Shading Coefficient: 0.45
    - g. Solar Heat Gain: 0.39
    - h. Light to Solar Heat Gain (LSG): 1.79
- C. Tempered Insulating Glass: Same as Insulating Glass, Type A except:
  - 1. Outside Pane: Tempered glass.
  - 2. Inside Pane: Tempered glass.

## 2.05 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

#### 2.06 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with non-porous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800.

#### 2.07 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.08 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use

materials that will leave visible marks in the completed work.

### 3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according



to requirements in referenced glazing publications.

- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

#### 3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

#### 3.05 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.06 INSULATING GLASS SCHEDULE

- A. Insulating Glass Unit Type IG-1:
  - 1. Vision glazing at Curtainwall assemblies.
  - 2. Tempered where safety glazing required.
    - a. Provide safety glazing labeling.
  - 3. Overall Unit Thickness: 1 inch.
  - 4. Minimum Thickness of Each Glass Lite: 6 mm.
  - 5. Outdoor Lite: Fully tempered float glass.
  - 6. Interspace Content: Air.
  - 7. Indoor Lite: Annealed or Heat-strengthened float glass to suite application.
  - 8. Low-E Coating: Sputtered on second surface.
  - 9. Outdoor Visible Reflectance: .11 percent maximum.
  - 10. Winter Nighttime U-Factor: .28 maximum.
  - 11. Summer Daytime U-Factor: .26 maximum.
  - 12. Visible Light Transmittance: 64 percent minimum.
  - 13. Solar Heat Gain Coefficient: 27 maximum.
  - 14. Safety glazing required.
- B. Insulating Glass Unit Type IG-2: Same as IG-1 Except:
  - 1. Translucent glazing, with acid etch on surface #1, Frit (100%) on surface #2.
  - 2. Location: Curtain Wall System 2.
  - 3. Exterior Lite: Walker Acid Etched: Velour.
  - 4. Tempered where safety glazing required.

- a. Provide safety glazing labeling.
- C. Insulating Glass Unit Type IG-6:
  - 1. Laminated skylight glazing, fritted on surface #2, acid etch on surface #4.
    - a. Pattern as selected by Architect.

### 3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

+ + END OF SECTION + +



**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Butt-glass walls

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For demountable partitions.

1. Include plans, elevations, details, sections, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings and at storage areas, and required installation, storage, and operating clearances.
2. Indicate details of track and door connections, rail sections, fittings, and hardware components for all wall conditions and door types/hardware sets.
3. Indicate glass type, sizes, and details.
4. Indicate location and installation requirements for hardware and track including floor & ceiling tolerances and direction of travel. Indicate blocking to be provided by others.
5. Indicate bracing requirements and details.
6. Setting Drawings: Show imbedded items and cutouts required in other work.

C. Samples: For each exposed product and for each color and texture specified.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale and coordinated with each other, using input from the installers of the items involved.

B. Product certificates.

C. Product test reports.

#### 1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

#### 1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Partition Components: Furnish a quantity of each type of full-size unit with installation tools and materials equal to two percent of the amount installed, but no fewer than units.

### **PART 2 - PRODUCTS**

#### 2.01 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide glass wall assemblies that comply with specified performance characteristics, Test system by a recognized testing laboratory or agency in compliance with specified test methods.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

E. Acoustical Performance: Where acoustical rating is indicated, provide demountable-partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value

indicated.

## 2.02 SITE-ASSEMBLED DEMOUNTABLE PARTITIONS

- A. General: Site-assembled demountable-partition assembly and components that are the standard products of manufacturer.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Basis of Design: Metrowall, DG Series and LP Series.
    - b. Muraflex, MIMO.
- B. Fire Rating of Partition Assembly: As indicated on Drawings.
- C. Acoustical Rating: STC 35 unless otherwise indicated on Drawings.
- D. Materials:
  - 1. Aluminum Components: Conforming to ASTM B221-08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 2. Glass: Provide fully tempered glass (Kind FT) complying with ASTM C1036 and ASTM C1048 requirements, including glass indicated by reference to type, class, and quality.
  - 3. Adhesives: As recommended by demountable-partition manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.03 GLASS WALL SYSTEM

- A. Glass Walls
  - 1. Tempered or laminated glass conforming to ASTM C1048
  - 2. Thickness: 9/16 inch minimum and 3/4 inch minimum unless thicker glass is required to comply with performance requirements.
  - 3. Vertical Edges: chamfer Polished
  - 4. Seams: Butt joints
  - 5. Aluminum Vertical Glazing Strip where indicated.

6. Top captured by aluminum channel set into Ceiling Track
7. Bottom captured by aluminum channel integral to Base Track assembly
8. Aluminum Finish: Custom color as selected by Architect.

B. Trim

1. Ceiling:
  - a. Size:
    - 1) 3 inches wide x 1-9/16 inches high at DG Series
    - 2) 1-1/4 inches wide x 1-3/4" inches high at LP Series
  - b. Outside 90° Corners: Mitred
  - c. Inside 90° Corners: Mitred
  - d. Inside 3-Way & 4-Way Corners: Lap joint
  - e. Finish: Custom color as selected by Architect.
  - f. To receive the frameless glass door when open
2. Base:
  - a. Size:
    - 1) 3 inches wide x 1-9/16 inches high at DG Series
    - 2) 7/8 inches wide x 3/4" inches high at LP Series
  - b. Outside 90° Corners: Mitred
  - c. Inside 90° Corners: Mitred
  - d. Inside 3-Way & 4-Way Corners: Lap joint
  - e. Finish: Custom color as selected by Architect.
3. Vertical / Jamb:
  - a. Size: 1-5/8 inches wide x 3 inches deep

## 2.04 FABRICATION

- A. General: Fabricate demountable walls for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed



construction.

- B. Panels for Site-Assembled Demountable Partitions: Face panels fabricated and finished in modular widths indicated.
- C. Finish Facings: Factory apply finish-facing materials with appropriate backings, using mildew-resistant nonstaining adhesive.

## 2.05 MATERIALS

- A. Adhesives: As recommended by demountable-partition manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Electric Devices: Integral, concealed raceways to serve electrical power and communication devices indicated on Drawings.
  - 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. General: Install demountable partitions after other finishing operations have been completed.
  - 1. Install partitions rigid, level, plumb, and aligned. Install seals at connections with floors, ceilings, fixed walls, and abutting surfaces to prevent light and sound transmission.
  - 2. Except for filler panels scribed to fixed walls or columns, do not modify manufacturer's standard components.
- B. Suspended-Ceiling System: Do not alter suspended-ceiling system.
- C. Install fire-rated doors and frames according to NFPA 80.

### 3.02 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain demountable partitions.

+ + END OF SECTION + +