



## 08100

### Steel Doors and Frames

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### A. Summary

This section contains general design criteria for steel doors and frames.

### B. System Design and Performance Requirements

Whenever possible, door sizes, frame sizes, and details must conform to stock industry standards. Use custom sizing and detailing only to match existing conditions or as necessary for specific functional needs. In general, nominal door dimensions must be 3' x 7' x 1-3/4".

#### 1. Frame Construction

- a. Steel frame facings must be a standard 2" for such elements as doors, transoms, sidelights, and borrowed lights. Other approved frame sizes must match existing conditions or respond to specific functional requirements.
- b. Interior door frames must be 16 gauge. Exterior door frames must be 14 gauge and galvanized.
- c. Frames must be one-piece, fully welded, with mitered corners and stops. Grind exposed surfaces smooth, with no joints anywhere on the frame.
- d. Removable glazing stops must be located on the secure side of controlled access openings and must be prepared for countersink style, tamperproof screws.
- e. Frames must be reinforced as necessary for required hardware.
- f. Exterior door frames shall be thermally broken.



### 2. Frame Mortises and Reinforcement

- a. Frames must be mortised, reinforced, drilled, and tapped for all mortise hardware, using templates provided by the hardware supplier.
- b. Dimensions for steel reinforcements welded to frames:
  - Hinge and pivot reinforcements must be 3/16" x 1-1/2" x 9"
  - Closers and holders must be 12 gauge x 14" x frame width
  - Floor clips must be 16 gauge x 3-1/2"
- c. Provide mortar-tight, full enclosure steel cover boxes over all mortises.

### 3. Frame Anchors

Provide at least three anchors at each jamb. Use anchor types appropriate for the wall construction.

### 4. Doors Construction

- a. Construction standards for interior, non-fire rated steel doors:
  - 1-3/4" thick
  - Seamless flush doors
  - SDI-100 Grade II
  - Minimum 18-gauge, cold-rolled steel sheet, with honeycomb core material
- b. The core material for fire rated doors shall be per manufacturer's fire label requirements. Options include and shall be verified with each door manufacturer: Honeycomb (up to 3 hr), Polyurethane (up to 3 hr), Polystyrene or Steel stiffened (up to 3 hr)
- c. Construction standards for exterior doors:
  - 1-3/4" thick
  - Seamless flush doors
  - SDI-100 Grade III
  - Minimum 16-gauge, zinc-coated, galvanized steel sheet, with a polystyrene or polyurethane core
  - Minimum U-value of .24
  - Top edge closed flush
  - All doors with glazing shall be factory glazed.



### 5. Door Mortises and Reinforcement

- a. Doors must be mortised, reinforced, drilled, and tapped for all mortise hardware, using templates provided by the hardware supplier.
- b. Dimensions for steel reinforcements welded to frames:
  - Hinge and pivot reinforcements must be 3/16" x 1-1/2" x 9"
  - Closers and holders must be 12-gauge x 3-1/2" x 14'
- c. Provide reinforcements, as required, to receive surface-mounted hardware.
- d. Removable stops in doors for glazing or louvers must be located on the secure side of the door.

### 6. Fire-Rated Doors and Frames

Fire-rated doors and frames must be constructed in accordance with the current edition of Underwriters Laboratories, Inc. They must bear the appropriate permanent labels and may only be modified in the field by certified personnel.

### 7. Finishing

Doors and frames must be thoroughly cleaned and prepared to receive a baked-on, rust-inhibitive primer. Provide all doors factory finished.

## C. Submittals

Shop drawings must include a schedule of doors and frames indicating:

- Gauge
- Configuration
- Fire-label
- Anchor types and spacing
- Location of cut-outs for hardware and reinforcement
- Door elevations
- Hardware group
- Core material
- Internal reinforcement
- Closure method
- Cut-outs for glazing or louvers



## D. Product Standards

Products must conform to the following standards:

- ANSI A224.1 – Test Procedure and Acceptance Procedure for Prime Painted Steel Surfaces
- ASTM A366 – Steel Carbon, Cold-Rolled Sheet, Commercial Quality
- ASTM A525 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- ASTM A526 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
- ASTM E152 – Methods of Fire Tests of Door Assemblies
- DHI (Door Hardware Institute)
- NFPA 80 – Fire Doors and Windows
- NFPA 252 – Fire Tests for Door Assemblies
- SDI-100 – Standard Steel Doors and Frames
- SDI-105 – Recommended Erection Instructions for Steel Frames
- UL 10B – Fire Tests of Door Assemblies
- UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies

## E. Manufacturers

Subject to compliance with the design requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

- Amweld Building Products
- Ceco Corporation
- Curries Manufacturing
- Republic Builders Products Corporation
- Steelcraft Manufacturing
- Equal SDI Member, as approved by Yale University

## F. Accessories or Special Features

Provide resilient rubber silencers.

## G. Special Requirements

Maintain a maximum diagonal distortion of 1/16" from corner to corner.



## H. Installation Guidelines

1. Install frames in accordance with SDI-105.
2. Install doors in accordance with DHI publication, “The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builders Hardware.”
3. Install fire-rated doors and frames in accordance with NFPA 80.

## I. Cleaning and Adjusting

Adjust hardware for smooth and balanced door operation.

***End of Section***



## 08200

### Wood Doors

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### A. Summary

This section contains general design criteria for wood doors.

### B. System Design and Performance Requirements

1. Historic, reproduction, special, or custom doors are detailed by the architect.
2. Use hollow-core, flush interior doors only at residential properties.

### C. Submittals

Submit the following design and construction documentation to Yale University.

#### 1. Shop Drawings

- a. Indicate elevations of each door type, location, size, fire rating, swing, undercuts, stile and rail reinforcement, internal blocking for hardware attachment, and cut-outs for glazing.
- b. Note fire-rated door frames and their rating.
- c. Indicate large-scale drawings of veneer layout.
- d. Note each frame condition.
- e. Designate the work to be provided by other trades and coordinate accordingly.

#### 2. Product Data

Provide the door manufacturer's technical product data for each type of door and frame specified, including core details, factory finishing, and fire test data.



### 3. Samples

Provide four samples of factory finishing for color approval.

### 4. Notarized Certificates of Compliance

Provide a notarized certificate of compliance indicating compliance with NWWDA 1A, requirements.

### 5. Closeout

Provide a written warranty signed by the door manufacturer, installer, and contractor agreeing to replace defective doors. The warranty must cover the cost of refinishing, hardware installation, and re-hanging defective doors.

## D. Product Standards

Products must conform to the following standards.

- ANSI/BHMA 115-W – Wood Door Preparation Standards
- ASTM E152 – Methods of Fire Tests of Door Assemblies
- AWS – Quality Standards of Architectural Woodwork Institute
- NFPA 80 – Fire Doors and Windows
- UL 10B – Fire Tests of Door Assemblies
- UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies

## E. Manufacturers

Subject to compliance with the design requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following.

- Algoma Hardwoods, Inc.
- Eggers Industries
- Marshfield Door Systems, Inc.
- Graham Wood Doors



### F. Materials

1. Flush interior wood doors must conform to AWS standards and have a quality grade of AWS Premium. Flush interior wood doors must also meet the following additional criteria.
  - 1-3/4" thick
  - Solid core
  - Five-ply construction
  - Solid-particle core bonded to stiles and rails using Type 1 waterproof glue
  - Agrifiber core doors can be used for 20, and 45 minute doors. (Contributes to LEED MR5.1)
  - Fully threaded to the head wood screws shall be provided for wood doors other than mineral core and engineered core doors.
2. The architect selects the face veneers.
3. Flush interior wood doors intended to receive a painted finish must have birch veneer faces.
4. Hollow-core, flush interior wood doors must be 1-3/4", AWS custom or premium grade, with closed-grain hardwood faces.
5. Blocking shall be provided for all door closer, exit devices, and locksets regardless if blocking is not required by manufacturer. Size of blocking shall be based upon hardware used, and manufacturers' requirements.

### G. Finish

Factory finish doors in accordance with AWS Quality Standard, Section 1500 and with Architect's selection of the color finish determined by the Architect.

### H. Special Requirements

1. Maintain a maximum diagonal distortion of 1/16" from corner to corner.
2. Provide a custom copper cap across the top of all custom exterior wood doors.
3. Conceal wiring between the door frame and door in hinges and within the door for security and power assist wiring needs at historic or custom wood doors.

### I. Installation Guidelines

1. Verify that doors are free of defects prior to hanging.





2. Install doors in accordance with the manufacturer's requirements and AWI quality standards.
3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Glass to be factory installed on all rated doors, per NFPA 80 - 2010 edition.

### **J. Quality Control**

Conform to National Wood Window and Door Association industry standard I.S.1: Architectural Wood Flush Doors and the requirements of AWS Quality Woodwork Standards, Section 1300: Architectural Flush Doors, Premium Grade.

### **K. Cleaning and Adjusting**

Adjust hardware for smooth and balanced door operation.

***End of Section***



## 08500

### **Metal Windows**

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### **A. Summary**

This section contains general design criteria for metal windows. Yale University has developed a specification for steel windows, which must be used by the architect.

### **B. System Design and Performance Requirements**

1. Provide security screen design and application as approved by the Yale University Security Committee.
2. Metal windows must be commercial grade, high-performance windows of types required by the design or required to match existing window units.
3. Provide hardware for all operable windows.
4. Performance criteria:
  - Water infiltration—none at 20% of the design wind pressure
  - Air infiltration—none at 20% of the design wind pressure
    - Fixed windows: 0.06 cfm per linear foot
    - Operable windows: 0.10 cfm per linear foot of crack
  - Thermal performance—the same as specified for insulating glass units
  - Acoustical performance—sound transmission class rating of 30–32
  - Deflection—not to exceed 1/175 of the unsupported spans



## C. Submittals

Submit the following documentation and samples to Yale University.

### 1. Shop Drawings

Provide shop drawings showing materials in place on the building, including coordination of related and adjoining work. Insert drawings and erection diagrams. Show the relative layout for all adjacent walls, beams, columns slabs, ceilings, and similar elements. Drawings must include elevations, floor plans, sections, and details. Details must be full-size and fully drawn, not outlined. Provide isometric details of any conditions, as requested by the architect.

### 2. Calculations

Provide structural calculations, sealed by a professional engineer licensed in the applicable state, and prepared in compliance with referenced documents and these standards. Where specifications and code differ, the more stringent requirements take precedence. Test reports are not an acceptable substitute for calculations.

### 3. Samples

Submit samples of all materials to be encompassed in the work in the size and quantity required by the project documents, including extrusions, glass samples, and technical data.

### 4. Product Data

Submit manufacturers' product data and specifications for any materials or fabrication techniques used in the curtain wall work. Include instructions or recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where test methods are indicated.



### D. Manufacturers

Subject to compliance with the design requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following. Equivalent products from other manufacturers must be approved by Yale University.

#### 1. Steel Windows

- Hopes Windows
- Crittall Windows

#### 2. Aluminum Windows

- Kawneer
- Tubelite
- Wausau
- As approved by Yale University

### E. Materials

Provide aluminum shapes and thicknesses as shown and as required to meet performance requirements. Use an alloy, with adequate structural characteristics, that is suitable for extruding and for finishing as specified. Comply with ASTM B221 requirements for extrusions and ASTM B209 requirements for sheet and plate. Formed sheet members must be at least .090" thick. Form curved shapes accurately to the radius shown.

### F. Accessories or Special Features

1. For each double hung operable window, provide unit aluminum framed screens, with plastic mesh insect screening.
2. For historic steel casement windows, the screens must be pull-down, interior mounted, retractable insect screens by Phantom Screens, or an equivalent product approved by Yale University.

### G. Special Requirements

Provide a mock-up representative of the proposed window units. Test the mock-up unit to the standards indicated elsewhere in this section.



### **H. Installation Guidelines**

Install windows in accordance with the manufacturer's instructions and approved shop drawings, or with more stringent requirements indicated.

### **I. Quality Control**

1. Perform the work in accordance with the AAMA – Metal Curtain Wall, Window, Store Front Entrance – Guide Specifications Manual. Maintain one copy of the manual on site. Engage a single firm to assume undivided responsibility for fabrication and installation and for the coordination of all metal window work components. This firm must demonstrate not less than five years successful experience in the fabrication and installation of similar work.
2. Window manufacturers must have windows tested by a qualified independent laboratory.

### **J. Cleaning and Adjusting**

The contractor must remove all mastic smears or other unsightly marks caused by their workers. The contractor is responsible for any damage to, or disfigurement of, the work caused at any time by other trades, as well as for final cleaning and washing of glass and aluminum. The wall contractor must advise the contractor of proper and adequate protection and cleaning procedures during the remainder of construction period, so that the system is without damage or deterioration at the time of acceptance.



### **K Warranty**

1. Provide a five-year manufacturer's warranty to cover the complete system for failure to meet specified requirements.
2. The warranty must state that glass is guaranteed against breakage due to defects in glass material, fabrication of insulating units, and/or installation for a period of five years after substantial completion.
3. Insulating glass units (vision or spandrel) must carry a 10-year manufacturer's warranty against delaminating; obstruction of vision due to fogging; collection of dust or dirt in the enclosed space; and cracking, peeling, or flaking of coatings.
4. Spandrel glass must carry a five-year manufacturer's warranty against peeling or flaking of opacifying film.
5. The silicone sealants must carry a 20-year manufacturer's warranty against adhesive or cohesive failure and discoloration or change in appearance due to fluid migration of porous substrate. The warranty must state that the silicone sealants will perform as a watertight weatherseal.
6. Painted finish systems must carry a 10-year warranty from the manufacturer and applicator against peeling, fading, chalking, crazing, cracking, flaking, or other damage, as well as changes in appearance or performance beyond normal weathering.

***End of Section***



## 08600

### Wood Windows

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### A. Summary

This section contains general design criteria for wood windows.

### B. System Design and Performance Requirements

1. Wood windows may be used only in historically-designated buildings, or as required by the project.
2. Wood window units must have a warranted factory finish and require minimal exterior maintenance. Aluminum cladding or high-performance paint finishes are acceptable. Windows must comply with the general requirements of ANSI A200-1 and the Window and Door Manufacturers Association publication, "Industry Standards for Wood Window Units."
3. Provide operable windows in buildings without air conditioning. Yale University will review operable windows in buildings with air conditioning on case-by-case basis.
4. Windows must facilitate window washing. For existing buildings, incorporate an operating or removable sash above the second story.
5. Window and curtain wall systems must meet the performance requirements of NWWMA I.S. 2, Class A.
6. Thermal transfer must have a maximum U-value of 0.66.
7. The condensation resistance factor must be a minimum of 47.
8. Plastic units are unacceptable.
9. Vinyl clad finished are allowed in specific cases if approved by Yale University.



### **C. Submittals**

The contractor must provide shop drawings, product data, and samples of each window unit specified.

### **D. Manufacturers**

Subject to compliance with the design requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following.

- Anderson Windows
- Marvin Windows
- Pella/Rolscreen Company
- Eagle Windows

### **E. Hardware**

Provide heavy-duty hardware made of non-rusting material or steel protected by a rust-resistant finish.

### **F. Glazing**

To ensure a single source of responsibility for performance, specify the glazing of windows and caulking of openings as part of the window installation.

### **G. Testing**

The window manufacturer must have had their product tested by an independent laboratory. The same testing must be performed on 2% of window openings. The contractor is responsible for additional independent testing for each unit that fails the initial test.

### **H. Warranty**

The contractor, manufacturer, or installer must sign and furnish a 10-year, written warranty for window systems from the date of substantial completion. The warranty must state that the contractor, manufacturer, or installer will correct all deficiencies during the warranty period. The warranty must cover—at no cost to Yale University—the removal and replacement of window systems, as well as labor for leaks, glass defects, hardware malfunctions, deterioration of finishes, and other deficiencies caused by defective materials and faulty workmanship.

***End of Section***





## 08700

### Finish Hardware

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### A. Summary

This section contains general design criteria for finish hardware.

### B. Materials

Finish hardware materials must conform to the following standards.

#### 1. Hinges, Butts and Pivots

- a. Hinges, butts and pivots must be full-mortise, five-knuckle, self-lubricating, ball-bearing type.
- b. Approved manufacturers include:
  - Hager
  - Lawrence
  - McKinney
  - Stanley
  - Rixson-Firemark
  - Other manufacturers of approved, equivalent materials.
- c. Provide non-removable pins for out-swinging exterior doors and for lockable interior doors. Provide non-rising pins at all other doors.
- d. Provide no fewer than three hinges per door up to a height of 90". Provide one additional hinge for each additional 30" in height.



## 2. Locksets and Latchsets

- a. Cores-All cores shall be Best 1C7 removable 7-pin cores. Permanent cores will be purchased directly by the Yale Lock Shop.
- b. Cylinders-All cylinders shall accept Best 1C7 removable 7-pin cores.
- c. Mortise Locks-All mortise locks shall be Sargent 8200 series or Best 45H Line.
- d. Cylindrical Locks-All cylindrical locks shall be Sargent 10 Line, Best 93K series or Schlage ND series.
  1. OPTION: Cylindrical Locks on new construction shall be Sargent 11 Line lockset.
- e. Elevator Switches-All elevator lock-out and on/off switches shall be Best 1W7 series.

## 3. Closers

- a. Use LCN 1461 or Sargent 1431 series closers on low-frequency interior doors.
- b. Use Sargent 351 or LCN 4040 series closers on high-frequency exterior doors.

## 4. Miscellaneous Hardware

- a. Use HES or Von Duprin electric strikes.
- b. Use Sargent 80 series, or Von Duprin 98 series exit devices. At narrow stile doors, use Sargent 80 series or Von Duprin 35A series.
- c. Use Rockwood/Rixson or Ives/Glynn-Johnson, or Trimco for bolts, door trim, protection plates, push/pulls and door stops and holders
- d. Use Rixson, ABH or approved equivalent electromagnetic hold-open devices.
- e. Use Sentrol magnetic switches.
- f. Use door silencers on all interior metal doors.
- g. Use Detex or Sargent auxiliary exit and security alarms at existing doors or doors where security alarm cannot be built into exit devices.
- h. Use Horton, Gyro Tec or Besam power assisted door operators at all major building entrances and vestibules.

## 5. Interior Sliding

Bi-folding and pocket door hardware shall be manufactured by Stanley Hardware, Hettich-Grant or Pemko.



## 6. Closet Hardware

Use Knappe and Vogt, Stanley Hardware, or approved equivalent closet hardware.

## 7. Weatherstripping

Use Reese, Pemko, Nation Guard Products, or Zero International thresholds.

## 8. Fire-Rated Assemblies

Fire-rated assemblies must be UL labeled where required by authorities having jurisdiction

***End of Section***



## 08800

### Glass and Glazing

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### A. Summary

This section contains general design criteria for glass and glazing.

### B. System Design and Performance Requirements

Protect glazed openings from glass breakage caused by vandalism.

### C. Product Standards

1. Glazing materials must conform to standards contained in the Flat Glass Marketing Association glazing manual.
2. Glass type and thickness must meet ASTM 1300 standards in combination with other applicable factors. The minimum thickness for each lite is 6 mm.



## D. Materials

Glass and glazing materials must conform to the following standards.

### 1. Glass Schedule

- Curtain wall—1" thick insulating unit, clear glass, with reflective coating on the second surface
- Aluminum window—1" thick insulating unit, clear glass
- Storefront—1" thick insulating unit, clear glass
- Skylight—1-1/16" thick insulating unit, with tinted exterior pane and clear laminated interior pane
- Handrails—3/8" thick tempered safety glass (non-structural)
- Steel windows—5/8" thick insulating unit, with inner and outer lights of 3/16" annealed glass

### 2. Glazing Sheets

- Primary glass, Federal Specification DD-G-451—clear and tinted float glass and wire glass
- Heat-treated glass products, Federal Specification DD-G-1403—heat-strengthened glass, tempered glass, and spandrel glass
- Coated glass products
- Laminated glass products
- Mirrors, silvering, copper coating, and protective organic coating
- Plastic glazing—acrylic, polycarbonate
- Wire glass
- Fire-rated glazing

### 3. Insulating Glass units

Sealed insulating units must be fabricated from two panes of glass, with air space between. The units must include a dual sealing system, spacer, desiccant, and corner reinforcement. Glass thicknesses and heat strengthening must be determined by manufacturer for wind loading conditions. A 10-year insulation glass warranty is required.



### 4. Lead Caming

- a. Match the existing lead profile for ridges, grooves, width, and thickness.
- b. True lead caming must be 0.4% antimony and 99.6% pure lead.
- c. Applied lead caming must be 0.4% antimony and 99.6% pure lead, with two-sided adhesive.

### 5. Antique Glass

Use antique glass for leaded glazing. Use colored and textured glass manufactured by the SA Bendheim Company to match the variable thickness, texture, and color of the original glass.

***End of Section***