

**SECTION 08 51 23**  
**STEEL WINDOWS**

SPEC WRITER NOTE:

1. Delete text between // \_\_\_\_\_ // not applicable to project. Edit remaining text to suit project.
2. Section is only required for use at general maintenance or utility type buildings.

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Steel // single hung // double hung // windows.
2. Operating Hardware.

**1.2 RELATED REQUIREMENTS**

SPEC WRITER NOTE: Update and retain references only when specified elsewhere in this section.

- A. Sealing Joints: Section 07 92 00, JOINT SEALANTS.
- B. Window Screen: Section 08 56 66, DETENTION WINDOW SCREENS.
- C. Glazing: Section 08 80 00, GLAZING.
- D. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Windows: Section 13 34 19, METAL BUILDING SYSTEMS.

**1.3 APPLICABLE PUBLICATIONS**

- A. Comply with references to extent specified in this section.
- B. American Architectural Manufacturers Associations (AAMA):
  1. AAMA/WDMA/CSA 101/I.S.2/A440-11 - Windows, Doors, and Skylights.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
  1. 7-10 - Minimum Design Loads For Buildings and Other Structures.
- D. American Welding Society (AWS):
  1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
- E. ASTM International (ASTM):
  1. A123/A123M-15 - Zinc (hot-Dip Galvanized) Coatings on Iron and Steel Products.
  2. E283-04(2012) - Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

3. E330/E330M-14 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
  4. E331-00(2009) - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- F. Builders Hardware Manufacturers Association (BHMA):
1. A156.18-12 - American National Standard for Materials and Finishes.
- G. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.
- H. Society for Protective Coatings (SSPC):
1. SP 5/NACE NO. 1-07 - White Metal Blast Cleaning.

#### 1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting // at project site // minimum 30 days before beginning Work of this section.

SPEC WRITER NOTE: Edit participant list to ensure entities influencing outcome attend.

1. Required Participants:
  - a. Contracting Officer's Representative.
  - b. // Architect/Engineer. //
  - c. // Inspection and Testing Agency. //
  - d. Contractor.
  - e. Installer.
  - f. // Manufacturer's field representative. //

SPEC WRITER NOTE: Edit meeting agenda to incorporate project specific topics.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
  - a. Installation schedule.
  - b. Installation sequence.
  - c. Preparatory work.
  - d. Protection before, during, and after installation.
  - e. Installation.
  - f. Transitions and connections to other work.
  - g. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

**1.5 SUBMITTALS**

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
  1. Layout and installation details, including anchors, support framing and sheet metal trim members.
  2. Elevations of continuous work at 1: 50 (1/4 inch) scale and typical window unit elevations at 1: 20 (3/4 inch) scale.
  3. Full-size section details of typical composite members, including reinforcement.
  4. Hardware.
  5. Accessories.
  6. Glazing details.
  7. Color charts for standard finishes and sealants.
- C. Manufacturer's Literature and Data:
  1. Description of each product.
  2. Installation instructions.
  3. Warranty.
- D. Samples:
  1. Typical sash corner 300 mm (12 inch) long each leg.
  2. Typical muntin section 300 mm (12 inch) long.
  3. Window frame with each specified finish on 300 mm (12 inch) long section.
  4. Hardware, each item.
- E. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- F. Test reports: Certify products comply with specifications.
    1. Windows.
  - G. Certificates: Certify each product complies with specifications.
    1. Factory finish:

- a. Stating steel members have been given specified thickness of prime coat and finish.
- H. Qualifications: Substantiate qualifications comply with specifications.
  - 1. Manufacturer // with project experience list //.
  - 2. Installer // with project experience list //.
  - 3. Welders and welding procedures.
- I. Operation and Maintenance Data:
  - 1. Care instructions for each exposed finish product.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Regularly manufactures specified products.
  - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
    - a. // Project Experience List: Provide contact names and addresses for completed projects //.
- B. Installer Qualifications:
  - 1. Regularly installs specified products.
  - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
    - a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.
  - 3. Approved by manufacturer.

#### **1.7 DELIVERY**

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, // color, // production run number, and manufacture date.
  - 1. Use padded blankets or other approved protective wrapping for glass, decorative metal work, and other exposed elements.
- C. Do not deliver steel window units until work is ready for installation.
- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

#### **1.8 STORAGE AND HANDLING**

- A. Comply with applicable recommendations of Steel Window Institute (SWI).
- B. Store products indoors in dry, weathertight facility.
- C. Protect products from damage during handling and construction operations.

**1.9 WARRANTY**

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

SPEC WRITER NOTE: Specify extended manufacturer's warranties for materials only.

- B. Manufacturer's Warranty: Warrant <specified item> against material and manufacturing defects.

SPEC WRITER NOTE: Specify customarily available warranty period for specified products.

- 1. Warranty Period: Five years.

**PART 2 - PRODUCTS**

**2.1 SYSTEM PERFORMANCE**

- A. Design <product> complying with specified performance:
  - 1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.

SPEC WRITER NOTE: Research for performance required depending on the project condition.

- 2. Thermal Transmittance: // U-\_\_\_\_\_ //, maximum.
- 3. Condensation Resistance: NFRC 500; // CRF // CRF, Minimum.
- 4. Water Resistance: ASTM E331; No uncontrolled penetration at 160 Pa (2.86 psf), minimum, pressure differential.
- 5. Air Infiltration Resistance: ASTM E283; 2.06 cubic meter per hour per meter (0.37 cubic foot per minute per foot) of crack length, maximum at 300 Pa (6.24 psf), minimum, pressure differential.

**2.2 PRODUCTS - GENERAL**

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
  - 1. Provide each product exposed to view from one production run.

## C. Sustainable Construction Requirements:

## SPEC WRITER NOTE:

1. Specify products containing greatest recycled content practicable to maximize material recovery. See EPA Comprehensive Procurement Guidelines (CPG) for guidance about individual products and available recycled content. Section 01 81 13 sets overall project recycled content requirements.

2. Steel recycled content depends upon furnace type. AISC reports industry wide 32 percent for basic oxygen furnace and 93 percent for electric arc furnace.

1. Steel Recycled Content: 30 percent total recycled content, minimum.

**2.3 STEEL WINDOWS**

- A. Operation: // single // double // hung.
- B. Window Members: Hot-rolled steel from new billet steel.
- C. Heavy Intermediate Windows:
  1. Combined Weight: 5.21 kg/m (3.5 lb./ft.) minimum.
  2. Depth: 34 mm (1-5/16 inches) minimum.
- D. Mullions and Transom Bars: Designed to withstand uniform wind load of 960 Pa (20 psf) of window area without deflecting more than 1/175 of span.

**2.4 GLAZING**

- A. Glass and Glazing: As specified in Section 08 80 00, GLAZING.
  1. Factory glaze windows.
  2. Weep holes through glazed areas are not acceptable.

**2.5 INSECT SCREENING**

SPEC WRITER NOTE: Use vinyl clad aluminum insect screen cloth in geographical areas subject to salt, fog or industrial fumes.

- A. Screen Mesh: 18 by 18, AAMA/WDMA/CSA 101/I.S.2/A440.
  1. Screen Cloth: // Aluminum // Vinyl clad aluminum //.
- B. Screen Frame: Formed of electro-galvanized steel, minimum thickness of 0.80 mm (0.03 inch), or of formed or extruded aluminum having a minimum thickness of 1 mm (0.04 inch).
- C. Frame Finish: Match window unit finish type and color, unless otherwise indicated.

**2.6 INTERIOR METAL WINDOW TRIM**

- A. Form window trim of zinc-coated sheet steel.
  - 1. Minimum Thickness:
    - a. Heads and Jambs: 1.2 mm (0.05 inches).
    - b. Stools: 2.33 mm (0.19 inches).
    - c. Moldings: 1.0 mm (0.4 inches).
  - 2. Fabricate trim as welded assembly with hairline mitered corners, dressed flush and smooth.
  - 3. Provide trim used for plaster key with expanded or perforated flanges including attachments for anchoring.
  - 4. Slightly round exposed edges. Coat back side of trim attached to masonry. Make provisions for fastening of metal plastering base.

**2.7 BALANCES (SPIRAL AND EXTENSION SPRING BALANCES)**

- A. Balance Springs: Oil tempered steel.
- B. Balance Arms: Spiral and extension spring sash balance.
  - 1. Balances: Rigid, zinc-coated casing assembled within helically coiled spring with hanger at one end and slotted ferrule at opposite end, and cadmium plated metal spiral rod, equalizing lifting power of spring, operating through ferrule.
  - 2. Encase balances in jambs (two each sash) and attach to sash through slot in inside and outside grooves of jambs.
  - 3. Attach end of spiral rod at end of casing to head of frame and bottom of sash.

**2.8 HARDWARE**

- A. Weather-stripping: Pile weather-strip.
- B. Pulls: Standard bronze lift handle.
- C. Sweep Locks: Provide manufacturer's standard locks at center of ventilator head. Provide two sweep locks for ventilators exceeding 950 mm (38 inches) in width.
- D. Pulls: Manufacturer's standard design two pulls at sill rail of ventilator securely attached to windows with brass or other corrosive-resisting screws, and two pull down bars on underside of upper-sash meeting rail except as otherwise specified.
  - 1. Fit, test and adjust hardware for each window at factory to ensure satisfactory operation and security.
- E. Weatherstripping: Manufacturer's standard.

- F. Provide manufacturer's standard extension pole with hook for opening windows at high window locations. Provide hook receptacle factory attached to ventilators for use with extension poles.
1. Extension Pole Operators: Provide one pole operator and pole hanger for every room with operable windows more than 1500 mm (60 inches) above floor.
  2. Fabricate pole of tubular anodized aluminum with rubber cap at lower end and standard push-pull hook to match hardware design at top end. Provide sufficient length for window operation without reaching more than 1500 mm (60 inches) above floor.
- G. Window Cleaner's Bolts: Provide window cleaner's bolts of standard design, complying with governing regulations. Fabricate bolts of stainless steel or bronze. Reinforce window units or mullions to receive bolts, and provide additional anchorage of units at locations of bolts.
- H. Hardware Finish:

SPEC WRITER NOTE: Select hardware finish from table below and insert into following paragraph. Delete table.

Hardware Finish Symbols		
US	BHMA 156.18	Description
USP	600	Primed for field painting
US15	619	Dull Nickel Plated
US26D	626/652	Satin Chrome Plated
US28	628	Satin Aluminum
US32	629	Bright Stainless
US32D	630	Satin Stainless

1. Complying with ANSI/BHMA A156.18 // \_\_\_\_\_ //.

## 2.9 FABRICATION

- A. General:
1. Fabricate steel windows according to SWI requirements and approved shop drawings.
  2. Factory assemble windows.
  3. Form sections in one piece, straight, true and smooth.
  4. Provide drips and weep holes according to manufacturer's standard.



5. Attachment of manufacturer's metal nameplates is not acceptable on window surface.
- B. Frame: Modified channel shapes with welded miter or coped corners. Fabricate head and jamb members with integral screen-stops. Integrally roll continuous flange at jambs and heads to form a caulking stop between facing and backing masonry.
1. Exposed and Contact Surfaces: Finished smooth, flush, with adjacent surfaces.
- C. Sills: Stepped rabbeted to receive lower sash bottom rail, allowing rail to be kept clear of sill wash. Perforation of sills at any point is not acceptable. Weld strap anchors to underside of sill, or screw to tapped lugs welded to sill.
- D. Sash:
1. Rails: Tubular shape, formed in one piece from single strips.
  2. Stiles: Tubular or modified channel shape formed in one piece from single strips.
  3. Sash Rebates: Minimum 15 mm (19/32 inch), with interior horizontal top surfaces of both meeting rails flat and in same plane.
- E. Muntins: Steel tee sections, tenoned and welded to perimeter frame.
1. Muntin Intersections: Slotted and cross notched.
- F. Glazing: Design windows for interior glazing. Provide continuous removable snap-in metal glazing beads to suit specified glazing.
- G. Mullions: Provide manufacturer's standard or structural shape mullion at multiple unit openings. Make mullions full height of opening and embed to minimum depth of 125 mm (5 inches) into sill, or securely anchor at head and sill with zinc-coated sheet steel extensions, standard bent-clips or offset shapes of 1.7 mm (0.07 inch) thick zinc-coated steel.
- H. For windows and interior metal trim installed as complete units, anchor mullions at head with 5 mm (3/16 inch) steel plate clip bolted to mullion and welded to lintel. Support at sills with 2.3 mm (0.09 inch) thick zinc-coated steel bent clips welded to mullions.
- I. Closures: Miter or cope closure corners and fit with tightly closed joints. Secure closures to window frames with non-corrosive machine screws or expansion rivets, and to masonry with fasteners specified.
- J. Reinforcing: Reinforce window frames for attachment of screens, screen hardware or travel-limit lug. Weld full or limited length 3 mm

(1/8 inch) thick reinforcing plates to back of frames, ensuring sufficient width to securely hold fasteners.

- K. Welding: Dress exposed welds and joints, flush and smooth.
- L. Install weatherstripping at head, jambs, sill, and meeting rails of sash and of impost. Apply weather-strip to both integral weather-strip grooves of aluminum weather-strip adapter. Secure weather-strip adapter to frame surface.
- M. Install window hardware.
- N. Fabricate anchor clips and mullions necessary for installation of windows and hardware for operation of ventilators, including fasteners required for attaching such items to window shall be provided by window manufacturer.

## 2.10 FINISHES

- A. Surface Preparation: Comply with SSPC-SP 5/NACE No. 1.
- B. Apply finishes immediately after cleaning and pretreating.

SPEC WRITER NOTE: Select from one of the following finishes.

- C. Galvanized Finish: ASTM A123/A123M.
- D. Prime Finish: Manufacturer's standard primer for // galvanized-Steel // and // steel //.
- E. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
  - 1. One coat primer.
  - 2. One coat thermosetting topcoat.
  - 3. Dry-film Thickness: 0.05 mm (2 mils) minimum.
  - 4. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- F. High-Performance Paint Finish:
  - 1. Fluorocarbon Finish: 70 percent fluoropolymer resin, 2-coat system.
  - 2. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

## 2.11 ACCESSORIES

- A. Welding Materials: AWS D1.1/D1.1M, type to suit application.
- B. Galvanizing Repair Paint: MPI No. 18.
- C. Screws, Shields, Plugs, and other Fasteners: according to manufacturer's instructions.
- D. Fasteners for Anchoring: Where type, size or spacing of fasteners for securing windows and accessories to building construction is not shown

or specified, use expansion or toggle bolts or screws, instructed by manufacturer to suit application.

1. Provide expansion shield and bolt assemblies having holding power beyond tensile and shearing strength of bolt.
2. Power actuated drive pins is acceptable for securing anchors to concrete if recommended by manufacturer.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Examine and verify substrate suitability for product installation.
  1. Verify window openings are correctly sized and within allowable tolerances.
- B. Protect existing construction and completed work from damage.
- C. Correct substrate deficiencies.
- D. Clean adjacent masonry before window installation to prevent damage to window finish by masonry cleaning materials.

#### **3.2 INSTALLATION**

- A. Install products according to manufacturer's instructions // and approved submittal drawings //.
- B. Install steel windows according to manufacturer's instructions and approved submittal drawings.
- C. Install steel windows ensuring units are square, plumb, and true to line without racking.
- D. Anchor units securely to surrounding construction with a minimum of three adjustable, asphalt coated or galvanized steel anchors with approved fasteners according to manufacturer's instructions.
  1. Bolts or screws: Minimum 6 mm (1/4 inch) diameter and spaced maximum 600 mm (24 inches) on centers.
- E. Seal exterior joints between sash, trim and mullions watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS, and neatly pointed.
- F. Upon complete installation of windows and accessories, and before acceptance of work, adjust movable sash and operating mechanism for free and easy operation, and defects.

#### **3.3 CLEANING**

- A. Remove excess sealant.
- B. Clean exposed steel and glass surfaces. Remove contaminants and stains.

**3.4 PROTECTION**

- A. Protect windows from construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

- - E N D - -