

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

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION:**

- A. Section Includes:
  - 1. Steel single hung windows, type and sizes as shown.
  - 2. Hardware.
  - 3. Accessories including, but not limited to, following:
    - a. Mullions, closures, trim, weather-stripping, covers, insect screens, anchors, clips, fasteners, and other components necessary for fabrication and installation complete of windows as specified.

#### **1.2 RELATED WORK:**

- A. Sealing Joints: Section 07 92 00, JOINT SEALANTS.
- B. Glazing: Section 08 80 00, GLAZING.

#### **1.3 QUALITY CONTROL**

- A. QUALIFICATIONS:
  - 1. Approval is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
    - a. Manufacturer who regularly and presently, manufactures and installs steel window units and related accessories as one of its principal products.
    - b. Accessories required for windows shall be manufacturer's standard or those of other manufacturers regularly engaged in making window accessories and acceptable to window manufacturer.
      - 1) Items shall be of materials which shall be compatible with balance of window unit material, and construction shall be that which shall give desired functional service.
  - 2. Installer: Approved in writing by manufacturer.

#### **1.4 PERFORMANCE REQUIREMENTS:**

- A. Air Infiltration Test at Weather-stripped Ventilators:
  - 1. Operable windows: Provided with weather-stripping, such that when tested in closed and locked position in accordance with ASTM E283 before leaving factory, air infiltration shall not exceed 2.06 cubic meter per hour per meter (0.37 cubic foot per minute per foot) of crack length when subjected to a pressure differential across the window of 300 Pa (6.24 psf) equivalent to a wind velocity of 50 miles per hour. Fixed window areas: Maximum air infiltration shall not exceed 0.34 cubic meter per hour per meter (0.06 cubic foot per minute per square foot) of fixed window area.
- B. Water Penetration Test at Weather-stripped Ventilators:

1. Operable windows: Provided with weather-stripping, such that when tested in closed and locked position in accordance with ASTM E331 no water penetrates for 15 minutes when a window is subjected to a rate of flow of 5 gal./hr./sq. ft. with a pressure differential across the window at 160 Pa (2.86 psf).

#### **1.5 SUBMITTALS:**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish following:
- B. Product Data: Furnish for each type of window required, including:
  1. Construction details and fabrication methods.
  2. Profiles and dimensions of individual components.
  3. Data on hardware, including sweep lock, keeper, lift handles, accessories, and finishes.
  4. Recommendations for maintenance and cleaning of window surfaces.
- C. Shop Drawings: Furnish for each type window included in project.
  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.
- D. Samples:
  1. Typical sash corner.
  2. Typical muntin section.
  3. For Initial Color Selection: Submit samples of each specified finish on 300 mm (12 inch) long sections of window members.
  4. Hardware.
- E. Quality Control Submittals:
  1. Test Reports: Window manufacturer provide certified test report from a qualified independent testing laboratory engaged in testing windows to verify that his steel window assembly has been tested in accordance with specified test procedures and products comply with these minimum test performance characteristics indicated. Test reports shall have been made within current year.
  2. Manufacturer's Certificates:
    - a. Stating steel members have been given specified thickness of prime coat and/or organic coating finish.

- b. Indicating manufacturer's and installer's meet qualifications as specified.

#### **1.6 DELIVERY, STORAGE AND HANDLING:**

- A. Comply with applicable recommendations of Steel Window Institute.
- B. Deliver steel window units and related components in manufacturer's original, unopened protective packaging labeled for identification with manufacturer's name and brand and contents. Use padded blankets or other approved protective wrapping for glass, decorative metal work, and other exposed elements.
  - 1. Do not deliver steel window units until work is ready for their installation.
  - 2. Inspect components for damage upon delivery. Do not install steel window units with dimples or dents. Remove and replace damaged components at no additional cost.
- C. Storage: Store steel window units and related components, in positions necessary to prevent twisting, in weathertight and dry storage facility in their original shipping containers with protective wrapping or packaging securely in place, in accordance with manufacturers written instructions.
- D. Protect finish from damage from handling, weather and construction operations before, during and after installation.

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
  - Z97.1-09.....Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
- C. American Society for Testing and Materials (ASTM):
  - A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - B633-07.....Electrodeposited Coatings of Zinc on Iron and Steel
  - C509-06.....Elastomeric Cellular Preformed Gasket and Sealing Material.
  - D2287-96(2010).....Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
  - E283-04.....Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across Specimen.
  - E331-00(R2009).....Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- D. National Fire Protection Association:
  - NFPA 80-10. ....Standard for Fire Doors and Windows.
- E. Steel Structures Painting Council (SSPC):
  - SSPC-SP1... ..Solvent Cleaning.
  - SSPC-SP8... ..Pickling.

## **1.8 WARRANTY:**

Warranty: Submit written warranty, in accordance with General Condition requirements except that warranty period shall be extended to include five (5) years.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

#### **A. Materials:**

1. Frame: Formed from 2.3 mm (12 gauge) galvanized sheet steel.
2. Heavy Intermediate Ventilators: Manufactured from solid hot rolled steel shapes.
  - a. Sections made from new billet steel with flanges rolled integral at mill.
  - b. Ventilator sections shall have glazing rebates providing an unobstructed glazing surface of at least 16 mm (5/8 inch) in height.
  - c. Glazing rebate surfaces must be perpendicular to web or stem of section. Applied glazing rebate extensions and tapered rebate surfaces are not acceptable.
3. Mullions and Transom Bars: Mullions and transom bars shall withstand a uniform wind load of 960 Pa (20 psf) of window area without deflecting more than 1/175 of span.
4. Weather-stripping: Pile weather-strip.
5. Hardware shall be as follows:
  - a. Fastener: Standard bronze sweep lock.
  - b. Pulls: Standard bronze lift handle.
  - e. Balance Arm: Spiral and extension spring sash balance.
6. Paint Finishes:
  - a. Prime Coat: After fabrication, steel windows, fins, mullions, cover plates and associated parts shall be cleaned, properly treated, prime painted with manufacturer's standard prime paint.
  - b. Factory Finish: After fabrication, for type of factory finish selected, steel windows and associated components shall be cleaned, and given following treatments:
    - 1) Pretreatment: Zinc phosphate treated.
    - 2) Primer: Manufacturer's special epoxy primer and oven cured.
    - 3) Finish Coat: Manufacturer's standard color coat finish and oven cured.
  - c. Zinc Coated Optional Finish: All steel except screens, shall be cleaned and:
    - 1) Hot dip galvanized (ASTM A123) and/or Electrodeposited (ASTM B633) or equivalent standards.
    - 2) Zinc coated, phosphate treated and prime painted.
    - 3) Zinc coated, phosphate treated, prime painted and factory finished in color as selected, from manufacturer's standard colors.
    - 4) Use galvanize repair compound where galvanized surfaces need field or shop repair. Apply compound in accordance with manufacturer's printed directions.

7. Glass and Glazing: As specified in Section 08 80 00, GLAZING.
  - a. Windows shall be factory glazed prior to delivery to project site.
  - b. Do not provide weep holes through glazed areas.
8. Accessories:
  - a. Insect Screening:
    - 1) Screen Frame: Formed of electro-galvanized steel having minimum thickness of 0.80 mm (0.032 inch), or of formed or extruded aluminum having a minimum thickness of 1 mm (0.040 inch).
      - a) Screen frames shall be of same material and finish as specified for windows.
    - 2) Screens: Shall be re-wirable with 18 x 16 mesh cloth of aluminum, or fiberglass. Nominal wire diameter of the cloth shall not be less than 0.25 mm (0.011 inch) for aluminum. Wire cloth shall be held taught with removable spline. Screens shall be the removable type. Design screens to be rewirable and removable from inside building.
      - a. Insect screening shall be aluminum alloy.
      - b. Fit and install each screen so as to cover windows individually and be free from interference with window hardware without sacrificing protection against insects.
      - c. 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.
      - d. Screws, shields, plugs or other fastenings into building construction shall be in accordance with manufacturer's recommendations.
      - e. Window Cleaner's Bolts: Provide window cleaner's bolts of standard design, complying with governing regulations and ANSI A39.1. 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.
      - f. Extension Pole Operators: Provide one pole operator and pole hanger for every room that has operable windows more than 1800 mm (6 feet) above floor. 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 (5 feet) above floor.

## **2.2 FABRICATION:**

- A. General: Fabricate steel windows in accordance with approved shop drawings. Form sections in one piece, straight, true and smooth. Prior to fabrication, all hot rolled steel sections shall be cleaned by shot blasting. Provide drips and weep holes in accordance with manufacturer's standard practice.

1. Attachment of manufacturer's metal nameplates, shall not be permitted on any window surface.
- B. Frame: Members shall be modified channel shapes. Corners of frame and ventilators shall be mitered or coped then solidly welded. Head and jamb members shall have integral screen-stops. Integrally roll continuous flange at jambs and heads to form a caulking stop between facing and backing masonry. Exposed and contact surfaces shall be finished smooth, flush, with adjacent surfaces.
- C. Sills: Sills shall have stepped rebates to receive lower sash bottom rail, which shall be kept clear of sill wash. Sills shall not be perforated at any point in their full length. Weld strap anchors to underside of sill, or screw to tapped lugs welded thereto.
- D. Sash: Rails shall be tubular. Stiles may be tubular or modified channel shape. Stiles and rails shall be formed in one piece from single strips. Make sash rebates minimum 15 mm (19/32 inch). Make interior horizontal top surfaces of both meeting rails flat and in same plane. Meeting rails shall have tight contact with wedge blocks at jambs when sash is closed. Cope, end-lap and weld all corners of sash.
- E. Muntins: Steel tee muntin sections shall be tenoned and welded to perimeter frame. Muntin intersections shall be 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 a structural shape mullion at multiple unit openings. Make mullions full height of opening and embed them 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 (14 gauge) zinc-coated steel.
- H. If windows and interior metal window trim are installed as complete units, mullions may be anchored at head by means of 5 mm (3/16 inch) steel plate clip bolted to mullion and welded to lintel, and supported at sill with 2.3 mm (12 gauge) zinc-coated steel bent clips welded to mullion.
- 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. Full or limited length reinforcing plates shall be welded to back of frames, and shall be 3 mm (1/8 inch) thick and of sufficient width to securely hold fasteners.
- K. Welding: Dress all exposed welds and joints, flush and smooth.
- L. 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, recommended by manufacturer for construction material adjacent to window units. Bolts

or screws: Minimum 6 mm (1/4 inch) diameter and spaced not over 600 mm (24 inches) on centers.

1. Expansion shield and bolt assemblies shall provide holding power beyond tensile and shearing strength of bolt.
2. Power actuated drive pins may be used for securing anchors to concrete if recommended by manufacturer.

### **2.3 INTERIOR METAL WINDOW TRIM:**

- A. Form window trim of zinc-coated sheet steel. Use 1.2 mm (18 gauge) for heads and jambs, 2.33 mm (12 gauge) for stools and 1.0 mm (20 gauge) for moldings.
  1. Make trim of welded assembly with hairline mitered corners, dressed flush and smooth. Trim to be used for plaster key, shall have flanges expanded or perforated and provided with attachments for anchorage. Slightly round exposed edges. Coat back side of trim to masonry. Make provisions for fastening of metal plastering base.

### **2.4 BALANCES (SPIRAL AND EXTENSION SPRING BALANCES):**

- A. Equip single hung windows with following type balance: Springs shall be oil tempered steel and shall develop full strength of balances.
  1. Balance Arm: Spiral and extension spring sash balance. Encase balances in jambs (two each sash) and attach to sash through slot in inside and outside grooves of jambs. Each balance shall have a rigid, zinc-coated casing assembled within a helically coiled spring with a hanger at one end and slotted ferrule at opposite end, and have a cadmium plated metal spiral rod, equalizing lifting power of spring, operating through ferrule. Attach end of spiral rod at end of casing to head of frame and bottom of sash.

### **2.5 OPERABLE HARDWARE (SINGLE/DOUBLE HUNG WINDOWS):**

- A. Ventilators: Shall be hung on one sash balance at each jamb.
- B. Provide manufacturer's standard design sweep lock at center of ventilator head rail securely attached to windows with brass or other corrosive-resisting screws. Furnish two (2) sweep locks for ventilators exceeding 950 mm (38 inches) in width.
- C. Provide two pulls of manufacturer's standard design at sill rail of ventilator securely attached to windows with brass or other corrosive-resisting screws, and two pull down bars on under side of upper-sash meeting rail except as otherwise specified.
  1. Fit, test and adjust hardware for each window at factory to insure satisfactory operation and security.
- D. Hardware:
  1. Bronze material.
  2. Hop attached.

## **2.6 WEATHERSTRIPS:**

Install weather-strips, as standard with manufacturer, at head, jambs, sill, and meeting rails of sash and of impost. Weather-strip shall be applied to both integral weather-strip grooves of aluminum weather-strip adapter. Secure weather-strip adapter to frame surface.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION:**

- A. Window openings shall conform with details, dimensions and tolerances shown on window manufacturer's approved shop drawings.
- B. Conditions which may adversely affect window installation shall be brought to Contractors attention, for repair, prior to commencement of window installation. Do not proceed with window installation until unsatisfactory conditions have been corrected.
- C. Washdown of adjacent masonry shall be completed prior to erection of windows to prevent damage to window finish by cleaning materials.

### **3.2 INSTALLATION**

- A. General:
  - 1. Windows specified under this section shall be installed by experienced personnel as approved by window manufacturer.
- B. Install windows in strict accordance with approved shop drawings.
  - 1. Set units plumb, level and true to line, without warp or rack of frames.
  - 2. Anchor units securely to surrounding construction with a minimum of three adjustable, asphalt coated or galvanized steel anchors with approved fasteners in accordance with manufacturer's recommendations.
  - 3. Exterior joints between sash, trim and mullions shall be properly sealed watertight with an approved sealant as specified in Section 07 92 00, JOINT SEALANTS, and neatly pointed. Finished work shall have weathertight joints.
- C. Protect window equipment during construction.
- D. Upon complete installation of all windows and accessories, and before acceptance of work, adjust all movable sash and operating mechanism for free and easy operation, and defects of any nature.
- E. Furnish certificate, signed by both contractor and window manufacturer, stating that installation of windows was done by installers approved by manufacturer of windows.

### **3.3 PROTECTION:**

- A. Protect windows from damage until final inspection and acceptance.

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