

SECTION 08 51 23
STEEL WINDOWS

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between //----//if not applicable to project. Also delete any other item or paragraph not applicable in section and renumber paragraphs.
3. Single hung or double hung window type described herein may only be used in general maintenance or utility type buildings.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Steel // single hung // // double 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.
 - //b. 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. //

1.2 RELATED WORK

- A. Sealing Joints: Section 07 92 00, JOINT SEALANTS.
- B. Glazing: Section 08 80 00, GLAZING.
- C. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.

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 must be manufacturer's standard or those of other manufacturers regularly engaged in making window accessories and acceptable to window manufacturer.
- 1) Provide items manufactured of materials compatible with balance of window unit material and construction providing desired functional service.
 2. Installer: Approved in writing by manufacturer.

1.4 PERFORMANCE REQUIREMENTS

SPEC WRITER NOTES:

1. AAMA 1503, ASTM E1423, and NFRC 100 provide test procedures for thermal transmittance. However, only NFRC ratings are recognized by DOE and the Energy Star Windows program.
2. All Energy Star qualified window products also bear a label from the National Fenestration Rating Council (NFRC).
3. A NFRC label should include values for U-Factor, Solar Heat Gain Coefficient, and Visible Light Transmittance. It should also indicate the specific product descriptions such as "Model xxx Casement, low-e, argon filled."

A. Energy Efficiency:

1. Thermal Transmittance: Provide windows and curtain walls with a U-factor maximum in accordance with NFRC 100.
2. U-Value: // ____ // Btu/sq. ft. x h x degree F (W/sq. m x K).
3. Solar Heat-Gain Coefficient: Provide windows with a whole-window SHGC maximum of // ____ // determined according to NFRC 200 procedures.
4. Visible Light Transmittance: // ____ // percent.
5. Exterior Reflectivity: // ____ // percent.
6. Color of Tint: // ____ //.

B. Energy Efficiency: Provide Energy Star labeled products as appropriate to climate zone.

C. 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 does 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.
2. Fixed window areas: Maximum air infiltration cannot exceed 0.34 cubic meter per hour per meter (0.06 cubic foot per minute per square foot) of fixed window area.
- D. 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 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project // local/regional materials, // low-emitting materials, // recycled content, // _____// requirements.

1.6 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 trimmembers.
 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.

SPEC WRITER NOTES:

1. Samples required only if project has more than 20 windows.

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 to 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 must have been made within current year.
2. Manufacturer's Certificates:
 - a. State steel members have been given specified thickness of prime coat and/or organic coating finish.
 - b. Indicate manufacturer's and installer's meet qualifications as specified.

1.7 PRE-INSTALLATION CONFERENCE

- A. Convene a meeting on site, after submittals are received and approved but before any work, to review drawings and specifications, submittals, schedule, manufacturer instructions, site logistics and pertinent matters of coordination, temporary protection, governing regulations, tests and inspections; participants to include RE/COR and all parties whose work is effected or related to the work of this section.

1.8 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.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

SPEC WRITER NOTES:

1. Remove reference citations that do not remain in Part 2 or Part 3 of edited specification.
2. Verify and make dates indicated for remaining citations the most current at date of submittal; determine changes from date indicated on the TIL download of the section and modify requirements impacted by the changes.

- B. American Society for Testing and Materials (ASTM):

A123/A123M-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
B633-23	Electrodeposited Coatings of Zinc on Iron and Steel
E283/E283M-19	Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across Specimen
E331-00(2023)	Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

- C. National Fenestration Rating Council (NFRC):

NFRC 100-10	Determining Fenestration Product U-Factors
NFRC 200-10	Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

- D. U.S. Department of Energy (DoE): www.energystar.gov

1.10 WARRANTY

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

PART 2 - PRODUCTS**2.1 MATERIALS**

SPEC WRITER NOTES:

1. Delete items in next articles that are not needed for fabrication or installation of selected units.

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 to 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 rebated extensions and tapered rebate surfaces are not acceptable.
3. Mullions and Transom Bars: Design to withstand a uniform wind load of 960 Pa (20 psf) of window area without deflecting more than 1/175 of span.
4. Weatherstripping: Pile weatherstrip.

SPEC WRITER NOTES:

1. Finishes 5.c. and d. may be selected for use in office areas of general maintenance or utility type buildings.

B. Hardware:

1. Equip all operable sash with latching device which can be secured from inside.
2. Provide item, type, and function of hardware as specified under individual window type.
3. Attach hardware securely to windows with corrosion resisting bolts or machine screws; do not use sheet metal screws.
4. Fit and test hardware for each window at factory to ensure satisfactory operation and security.

5. Provide non-magnetic type stainless steel exposed hardware with satin finish; white bronze with satin finish; yellow bronze with dull (oxidized) finish.
 6. Use steel or malleable iron hinges, with nonferrous pins, or with steel pins and non-ferrous bushings or washers.
- C. Fasteners: Stainless steel or aluminum materials; zinc-coated or cadmium plated steel; prime exposed heads of coated or plated fasteners and finish to match adjacent material.

2.2 WINDOW FINISH

SPEC WRITER NOTES:

1. On most projects, phosphate treatment and factory-applied prime coat is satisfactory.
 2. Specify hot-dip galvanized, phosphate treated, and prime coat finish only for hot-rolled solid-section windows in areas where corrosion is prevalent.
- A. Prime Coat: After fabrication, steel windows, fins, mullions, cover plates and associated parts to 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 to 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.
 4. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
 5. Touch-up abraded surfaces with same enamel specified for factory finish coat, except that it must be Class A (Air-Drying) - same as original.
- //C. Zinc Coated Finish: Clean and provide solid hot-rolled steel shapes with:
1. Hot dip galvanized (ASTM A123) and/or Electrodeposited (ASTM B633) or equivalent finish.
 2. Phosphate treatment, prime painted and factory finish in color as selected, from manufacturer's standard colors.
 3. Use galvanize repair compound where galvanized surfaces need field or shop repair. Apply compound in accordance with manufacturer's printed directions.//

2.3 GLAZING

- A. As specified in Section 08 80 00, GLAZING.
- B. Windows to be factory glazed prior to delivery to project site.
- C. Do not provide weep holes through glazed areas.

2.4 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. Provide screen frames of same material and finish as specified for windows. //
 - //b. Provide aluminum screen frames with natural finish. //
 - 2. Screens:
 - a. Provide type re-wireable with 18 x 16 mesh cloth of aluminum, or fiberglass.
 - b. Nominal wire diameter of the cloth cannot be less than 0.25 mm (0.011 inch) for aluminum.
 - c. Hold wire cloth taught with removable spline.
 - d. Provide removable type screens.
 - 3. Design screens to be re-wireable and removable from inside building.
 - 4. Fit and install each screen so as to cover windows individually and be free from interference with window hardware without sacrificing protection against insects.

2.5 FABRICATION

- A. General:
 - 1. Fabricate steel windows in accordance with approved shop drawings.
 - 2. Form sections in one piece, straight, true and smooth. Prior to fabrication, clean all hot rolled steel sections by shot blasting.
 - 3. Provide drips and weep holes in accordance with manufacturer's standard practice.
 - 4. Attachment of manufacturer's metal nameplates not be permitted on any window surface.
- B. Frame:
 - 1. Modified channel shapes.
 - 2. Corners of frame and ventilators mitered or coped then solidly welded.
 - 3. Head and jamb members to have integral screen-stops.

4. Integrally roll continuous flange at jambs and heads to form a caulking stop between facing and backing masonry.
 5. Finish exposed and contact surfaces smooth, flush, with adjacent surfaces.
- C. Sills: Sills to have stepped rebates to receive lower sash bottom rail, which must be kept clear of sill wash. Sills cannot 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:
1. Rails to be tubular.
 2. Stiles may be tubular or modified channel shape.
 3. Stiles and rails formed in one piece from single strips.
 4. Make sash rebates minimum 15 mm (19/32 inch).
 5. Make interior horizontal top surfaces of both meeting rails flat and in same plane.
 6. Meeting rails to have tight contact with wedge blocks at jambs when sash is closed.
 7. Cope, end-lap and weld all corners of sash.
- E. Muntins: Tenon and weld steel tee muntin sections to perimeter frame; 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 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

to be welded to back of frames, and be minimum 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. Anchoring:

1. Use hot-dip galvanized steel anchors. Secure anchors and fastenings to heads, jambs, and sills of openings, and fasten securely to windows or frames.
2. Use anchors recommended by window manufacturer for specific type of construction and conceal.
3. Anchor each frame at jambs with minimum of three adjustable steel anchors.
- //4. Provide perforated anchor stems for mortar keying with anchor flanges of sufficient width to provide sliding friction fit inside frames; extend perforated stems not less than 100 mm (4 inches) into masonry. //
- //5. For anchorage at concrete walls // and prepared openings // , equip frames with manufacturer's standard bent-clips located approximately 150 mm 6 inches from each end and at midpoint. //

2.6 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.
 2. Provide trim to be used for plaster key with flanges expanded or perforated; provide with attachments for anchorage.
 3. Slightly round exposed edges.
 4. Coat back side of trim to masonry.
 5. Make provisions for fastening of metal plastering base.

2.7 BALANCES (SPIRAL AND EXTENSION SPRING BALANCES)

- A. Equip // single // double // hung windows with following type balance: Provide oil-tempered steel springs and develop full strength of balances.
1. Balance Arm: Spiral and extension spring sash balance.
 2. Encase balances in jambs (two each sash) and attach to sash through slot in inside and outside grooves of jambs.
 3. Provide each balance with 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.

4. Attach end of spiral rod at end of casing to head of frame and bottom of sash.

2.8 OPERABLE HARDWARE (SINGLE/DOUBLE HUNG WINDOWS)

- A. Ventilators: 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 underside 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:

SPEC WRITER NOTES:

1. Select and coordinate hardware finish with that indicated in article 2.1. Delete items in next article if not needed for selected units.

1. Bronze material. // _____ material. //
2. Hop attached.

2.9 WEATHERSTRIPPING

- A. Install weatherstripping, as standard with manufacturer, at head, jambs, sill, and meeting rails of sash and of impost.
- B. Apply weatherstripping to both integral grooves of adapter; secure adapter to frame surface.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify window openings conform with details, dimensions and tolerances shown on window manufacturer's approved shop drawings.
- B. Notify Contractor of conditions which may adversely affect window installation, for repair, prior to commencement of window installation. Do not proceed with window installation until unsatisfactory conditions have been corrected.

- C. Wash-down of adjacent masonry must be completed prior to erection of windows to prevent damage to window finish by cleaning materials.

3.2 INSTALLATION

- A. Install windows specified with experienced personnel as approved by window manufacturer.
- B. Build in windows as work progresses or install without forcing into prepared window openings.
- C. Protect ventilators and operating parts against dirt and building materials by keeping closed and locked to frame.
- D. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and sub-frames in mastic sealant recommended by window manufacturer.
- E. 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 must be properly sealed watertight with an approved sealant as specified in Section 07 92 00, JOINT SEALANTS, and neatly pointed. Finished work must have weathertight joints.
- F. Protect window equipment during construction.
- G. 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.
- H. 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.
- B. Clean interior and exterior surfaces of window units of spattering spots, and other foreign matter to present a neat appearance and to prevent fouling of weathering surfaces and weatherstripping, or interference with operation of hardware.

C. Clean and touch up abraded surfaces; replace with new windows any stained, discolored, or abraded windows that cannot be restored to original condition.

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