SECTION 085123.13 - HOT-ROLLED STEEL WINDOWS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

MasterSpec includes provisions for LEED 2009, LEED v4, IgCC, and Green Globes. Sustainable design requirements may be inserted in the Section Text using the hypertext links.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Hot-rolled steel windows.

* + - * 1. Related Requirements:

Refer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and are to remain as Editor’s Notes. Remove referenced specification sections within the body of the specification if not applicable to the project.

Section 085123.23 "Cold-Rolled Steel Windows" for steel windows fabricated from cold-rolled members.

[Section 099123 "Interior Painting"] [and] [Section 099114 "Exterior Painting"] for on-site painting of factory prime-coated windows.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.
      1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified, except as noted below, and tabbed (for combined submittals).

Submit Qualification Statements as specified in Quality Control Submittals first.

* + - * 1. Product Data: For each type of product.

Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

Include manufacturer’s installation instructions.

* + - * 1. Shop Drawings:

Plans, elevations, sections, and details.

Detail attachments to other work, and between units, if any.

Hardware and required clearances.

Mullion details, including reinforcement and stiffeners.

Munton details.

Flashing details.

Glazing details.

Accessories.

<**Insert requirements**>.

Retain "Samples for Initial Selection" or "Samples for Verification" paragraph below, or both.

* + - * 1. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for units with factory-applied color finishes.

Include available color or finish selections for hardware and accessories.

* + - * 1. Samples for Verification: Actual sample of finished products for each type of hot-rolled steel window including weather stripping, glazing bead, and hardware.

Size: [**Manufacturers' standard size**] <**Insert size**>.

* + - * 1. Product Schedule: For hot-rolled steel windows.[**Use same designations indicated on Drawings.**]

Retain "Sustainable Design Submittals" paragraph below if required to attain sustainability rating or to track sustainability submittals.

* + - * 1. Sustainable Design Submittals:
        2. Quality Control Submittals:

Test and Evaluation Reports:

Product Test Reports: For each hot-rolled steel window, for tests performed by a qualified testing agency.

Field Quality-Control Submittals:

Field quality-control reports.

If inserting additional entities or specialist, add qualifications to "Quality Assurance" Article.

Qualification Statements: For [**Installer**] [**manufacturer**] [**and**] [**testing agency]**.

Sample warranties.

* + - 1. Contract Closeout Submittals:

Operation and Maintenance Data: For hot-rolled steel windows.

Warranty Documentation:

Manufacturers' special warranties.

Installer's special warranties.

* + - 1. QUALITY ASSURANCE
         1. Qualifications:

Manufacturers: A manufacturer capable of fabricating hot-rolled steel windows that meet performance requirements indicated and of documenting performance by labels, test reports, and calculations.

Installers: [**Fabricator of products**] [**Entity that employs installers and supervisors who are trained and approved by manufacturer**] [**Authorized representative who is trained and approved by manufacturer**].

* + - 1. BENCHMARKS

Coordinate this article with air barrier Sections for building and preconstruction testing of integrated wall benchmarks that include windows; insert additional requirements if applicable.

* + - * 1. Build benchmarks [**to verify selections made under Sample submittals**] [**to demonstrate aesthetic effects**] [**and**] [**to and set quality standards for fabrication and installation**].

Build benchmark [**as indicated on Drawings**] <**Insert benchmark requirements**>.

Approval of benchmarks does not constitute approval of deviations from the Contract Documents contained in benchmarks unless Director’s Representative specifically approves such deviations by Change Order.

* + - 1. FIELD CONDITIONS

Retain this article if Project includes existing construction that requires custom-fabricated window replacements. Insert requirements for field measurements.

* + - * 1. <**Insert requirements**>.
      1. WARRANTY

When warranties are required and available, verify with Director’s Representative that special warranties stated in this article are not less than remedies available to the Facility under prevailing local laws.

* + - * 1. Special Warranty: [**Manufacturer agrees**] [**Installer agrees**] [**Manufacturer and Installer agree**] to repair or replace components of hot-rolled steel windows that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures, including <**Insert type of failure**>.

Faulty operation of <**Insert components**>.

Deterioration of metals, metal finishes, and other materials beyond normal [**weathering**] [**use**].

<**Insert conditions relating to specified products**>.

<**Insert failure modes**>.

Verify warranty periods for units and components.

Warranty Period:

Window: [**Two**] [**Three**] <**Insert number**> years from date of Substantial Completion.

Warranty period for finish depends on type.

Finish: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in this Section are neither recommended nor endorsed by the AIA or Deltek. Before selecting manufacturers and products, verify availability, suitability for intended applications, and compliance with minimum performance requirements.

Product options commonly available from manufacturers are included in square brackets throughout the Section Text. Not every manufacturer listed can provide every option offered; verify availability with manufacturers.

* + - 1. MANUFACTURERS
      2. SOURCE LIMITATIONS

Retain this article to limit sources for the entire Section. Source limitations may also be specified in individual articles if desired.

* + - * 1. Obtain hot-rolled steel windows from single source from single manufacturer.
      1. PERFORMANCE REQUIREMENTS

Performance requirements in this article include paragraphs for structural, air-leakage, and water-penetration performance based on ASTM standards. See the Evaluations. If using AAMA standards to specify performance, see Section 085113 "Aluminum Windows" for sample text.

* + - * 1. SWI Standards: Comply with applicable requirements in SWI's "Architect's Guide to Steel Windows and Doors" and "Specifications - Solid Hot Rolled Sections," except where more stringent requirements are indicated.

Usually, indicate on Drawings design loads determined by Project's structural engineer. Verify requirements of authorities having jurisdiction. See the Evaluations for additional information.

* + - * 1. Structural Wind Loads: As indicated on Drawings.

Limits indicated in "Deflection Limits" paragraph below are based on BCNYS requirements for framing members supporting glass.

* + - * 1. Deflection Limits: Design glass framing system to limit deflection of glass edges in a direction perpendicular to glass plane to less than 1/175 of glass-edge length for each individual glazing light or 3/4 inch, whichever is less, at design pressures.

ASTM E330 test method evaluates structural performance of hot-rolled steel windows and not structural performance of contiguous construction.

* + - * 1. Structural: Test in accordance with ASTM E330 as follows:

When tested at positive and negative wind-load design pressures, hot-rolled steel windows do not evidence deflection exceeding specified limits.

When tested at [**150**] <**Insert number**> 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**] <**Insert number**> percent of span.

Minimum test duration in accordance with ASTM E330 is 10 seconds, which is historically U.S. practice.

Test Durations: As required by design wind velocity, but not less than [**10**] <**Insert number**> seconds.

The ECCNYS requires limits on air leakage for exterior windows that are expressed in a different unit of measure than is used in options in "Air Leakage for Weather-Stripped Sash" paragraph below. Consult hot-rolled steel window manufacturers and verify that products comply with requirements of authorities having jurisdiction. See the Evaluations.

* + - * 1. Air Leakage for Weather-Stripped Sash: Not more than [**0.37 cfm/ft.**] <**Insert value**> of sash crack length at a differential pressure across the windows of [**6.24 lbf/sq. ft.**] <**Insert value**> when tested in accordance with ASTM E283.
        2. Air Leakage for Non-Weather-Stripped Sash: Not more than 1.0 cfm/ft. of sash crack length at a differential pressure across the windows of 1.56 lbf/sq. ft. when tested in accordance with ASTM E283.
        3. Water Penetration for Weather-Stripped Sash: No leakage for 15 minutes when window is subjected to a rate of flow of 5 gal./h/sq. ft. with a differential pressure across the window of [**2.86 lbf/sq. ft.**] <**Insert value**> when tested in accordance with ASTM E331.

First option in "Thermal Transmittance" paragraph below is ECCNYS default value for U-factor for a window with clear insulating glass; default values must be used for code purposes for products without NFRC certification. Consult hot-rolled steel window manufacturers and verify that products comply with requirements of authorities having jurisdiction. See the Evaluations.

* + - * 1. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of [**0.80 Btu/sq. ft. x h x deg F**] [**0.25 Btu/sq. ft. x h x deg F**] [**0.35 Btu/sq. ft. x h x deg F**] [**0.45 Btu/sq. ft. x h x deg F**] [**0.55 Btu/sq. ft. x h x deg F**] <**Insert value**>.

First option in "Solar Heat-Gain Coefficient (SHGC)" paragraph below is based on ECCNYS default value for SHGC for a window with clear insulating glass; default values must be used for code purposes for products without NFRC certification. Second option is based on ENERGY STAR requirements for North-Central Climate Zone. Third option is based on ENERGY STAR requirements for South-Central and Southern Climate zones. Consult hot-rolled steel window manufacturers and verify that products comply with requirements of authorities having jurisdiction. See the Evaluations.

* + - * 1. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of [**0.70**] [**0.40**] [**0.25**] [**0.18**] <**Insert value**>.

Retain "Condensation Resistance" paragraph below for projects where required. "CR" is the designation used by NFRC to rate "condensation resistance." See the Evaluations for further discussion.

* + - * 1. Condensation Resistance: Provide hot-rolled steel windows with a CR of [**20**] [**25**] [**40**] <**Insert value**> minimum, determined in accordance with NFRC 500.
        2. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Differential values in "Temperature Change" subparagraph below are suitable for most of United States.

Temperature Change: [**120 deg F, ambient; 180 deg F material surfaces**] <**Insert temperature change**>.

Retain "Crack Tolerances" paragraph below for non-weather-stripped windows.

* + - * 1. Crack Tolerances: Test each type and size of required window unit, with sash closed and locked, for compliance with tolerances indicated in SWI's "Architect's Guide to Steel Windows and Doors" and "Specifications - Solid Hot Rolled Sections."

If forced-entry resistance is required, retain "Forced-Entry Resistance" paragraph below. Verify which manufacturers have tested products and can demonstrate compliance. Grade 10 is lowest level of measured performance.

* + - * 1. Forced-Entry Resistance: Comply with Performance [**Grade 10**] <**Insert grade**> requirements when tested in accordance with ASTM F588.

Retain "Blast Resistance" paragraph below for hot-rolled steel windows required to resist explosions. Verify requirements with Design Team and insert requirements for other blast hazard mitigation testing standards if required. Verify which manufacturers have tested products and can demonstrate compliance.

* + - * 1. Blast Resistance:

Ratings in "Performance Condition" subparagraph below are based on the severity of fragments generated during an airblast test. See the Evaluations.

Performance Condition: [**1**] [**2**] [**3a**] [**3b**] [**4**] [**5**] in accordance with GSA-TS01.

Retain "Windborne-Debris-Impact Resistance" paragraph below to suit Project. The BCNYS establishes criteria for buildings in hurricane-prone locations. In paragraph, "enhanced" option applies to essential facilities and has additional requirements. Verify requirements of authorities having jurisdiction. Verify which manufacturers have tested products and can demonstrate compliance.

* + - * 1. Windborne-Debris-Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [**1**] [**2**] [**3**] [**4**] for [**basic**] [**enhanced**] protection.

Insert increased heights if different from those in "Large-Missile Test" and "Small-Missile Test" subparagraphs below.

Large-Missile Test: For glazing located within [**30 ft.**] <**Insert dimension**> of grade.

Small-Missile Test: For glazing located between 30 ft. and [**60 ft.**] <**Insert dimension**> above grade.

Retain "Fire-Test-Response Characteristics" paragraph below if fire-protection-rated units are required. Fire-rated windows are required to be glazed with labeled fire-protection-rated glazing material and to have automatic closing devices on operable sash; sizes are limited by NFPA 80. Verify which manufacturers have tested products and can demonstrate compliance. Indicate rating and testing agency's design designation on Drawings.

* + - * 1. Fire-Test-Response Characteristics: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

Some companies manufacture products with improved noise reduction; insert requirements if needed.

* + - * 1. <**Insert requirements**>.
      1. HOT-ROLLED STEEL WINDOWS <**Insert drawing designation**>

Copy this article and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

"Types" paragraph below may not be needed if window type is indicated by a product name or designation. Verify availability of window types with manufacturers.

* + - * 1. Types: Provide the following window types in locations indicated on Drawings:

Casement: [**Outswing**] [**Inswing**].

Pivoting: [**Horizontally**] [**Vertically**].

Projected: [**Awning**] [**Hopper**].

Fixed.

Retain one option in "Hot-Rolled Steel Windows" paragraph below. See SWI's requirements for specific weights and sizes for each option. Not all listed manufacturers fabricate all types of hot-rolled steel windows listed below; most fabricate heavy intermediate windows.

* + - * 1. Hot-Rolled Steel Windows: Provide frame and sash members formed from hot-rolled, new billet steel sections. Provide combined weight of frame and sash members and depth of frame or sash members according to the SWI specifications category for [**Light Intermediate**] [**Standard Intermediate**] [**Heavy Intermediate**] [**Heavy Custom**] hot-rolled steel windows.

Retain "Thermally (Improved) (or) (Broken) Design" subparagraph below for hot-rolled steel windows that use thermal spacers or struts to improve the window's U-factor. Designs are not the same among manufacturers that offer thermally improved or broken products. Consult manufacturers to determine availability and type of isolation used.

Thermally [**Improved**] [**or**] [**Broken**] Design: Provide frame and sash members designed to isolate interior and exterior surfaces for improved thermal performance.

Some manufacturers offer other high-performance finishes. Consult manufacturers for availability.

* + - * 1. Window Finish: [**Galvanized**] [**Galvanized and factory primed**] [**Factory primed**] [**Baked enamel or powder coat**] [**High performance, organic**].

Retain "Color and Gloss" subparagraph below if retaining fourth or fifth option in "Window Finish" paragraph above.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Mullions: Formed of hot-rolled steel matching window units; with anchors for support to structure and for installation of window units and having sufficient strength to withstand design pressure indicated. Provide mullions of profile indicated and with cover plates. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

Retain "Muntins" paragraph below to suit Project. Use of muntins may affect energy performance of window. If retaining, verify that energy performance requirements can still be met.

* + - * 1. Muntins: Solid hot-rolled steel T-shaped sections [**fully welded**] [**tenoned and riveted**] to perimeter frame with intersections interlocked and welded.

Normally, retain "Glazing Stops" paragraph below for windows glazed using glazing stops. Retain second option for fire-protection-rated windows. Not all hot-rolled steel window systems require glazing stops. See Section 088000 "Glazing" for glazing compound. Some products have hot-rolled steel profiles that simulate glazing with compound, but are glazed with glazing stops.

* + - * 1. Glazing Stops: Provide manufacturer's standard screw-applied or snap-on glazing stops fabricated from [**extruded or formed sheet aluminum**] [**formed steel or stainless steel**]; coordinate with Section 088000 "Glazing" for glazing system indicated. Finish glazing stops with same finish as window units if fabricated of steel; otherwise, provide manufacturer's standard finish. Match color to window units.

Retain "Glazing Clips" paragraph below if hot-rolled steel windows are glazed with compound. Some manufacturers of residential products with small lite sizes can provide models prepared for glazing with compound.

* + - * 1. Glazing Clips: Where face glazing (without glazing stops) is indicated, furnish glazing clips for concealment in glazing compound.

Normally, retain "Weather Stripping" paragraph below; delete if windows are not weather stripped.

* + - * 1. Weather Stripping: Manufacturer's standard compressible weather stripping, complying with AAMA 701/702, ASTM C509, or ASTM C864 and designed for permanently resilient sealing under compression and for complete concealment when sash is closed.
      1. GLAZING

Hot-rolled steel windows are typically manufactured for field glazing. Hot-rolled steel windows are typically glazed with conventional glazing tapes and gaskets. Coordinate requirements with glass and glazing specified in Section 088000 "Glazing."

* + - * 1. Glass and Glazing System: See Section 088000 "Glazing" for glass units and glazing requirements for hot-rolled steel windows.
      1. HARDWARE
         1. General: Provide manufacturer's standard [**nonremovable**], [**solid-bronze**] [**malleable-iron**] [**die-cast-metal**] hardware, with operating components of stainless steel, carbon steel complying with AAMA 907, brass, bronze, or other corrosion-resistant material designed to smoothly operate, tightly close, and securely lock hot-rolled steel window sash; and sized to accommodate sash weight and dimensions.

Retain "Self-Closing Device for Fire-Rated Windows" paragraph below for fire-rated, hot-rolled steel windows; verify components with manufacturer. Coordinate with other window hardware to ensure compatibility with self-closing device.

* + - * 1. Self-Closing Device for Fire-Rated Windows: Manufacturer's standard heat-activated self-closing device, complying with NFPA 80.

Coordinate casement window hardware with "Self-Closing Device for Fire-Rated Windows" paragraph above to ensure compatibility between self-closing device and other hardware.

Verify hardware requirements and availability with manufacturers.

* + - * 1. Casement Window Hardware:

Operation:

Retain "Gear-Type Rotary Operator" or "Manually operated push/pull" subparagraph below. Gear-type rotary operator is used for outswing casement windows only and may be used with or without screens.

Gear-Type Rotary Operator: Complying with AAMA 901 when tested in accordance with ASTM E405, Test Method A; located on jamb at sill.

Retain first subparagraph below if simultaneous operation of sash pairs is desired.

Provide operating device that opens and closes sashes simultaneously, securely closing them at both jambs without use of additional manually controlled locking devices.

Roto Operator Handle Type and Style: [**As selected by Director’s Representative from manufacturer's full range of types and styles**] <**Insert type and style**>.

Manually operated push/pull.

Hinges:

Retain "Friction Hinges," "Friction Hinges for Emergency Escape and Rescue," "Butt Hinges," or "Extension Hinges or Pivots" subparagraph below. Friction hinges are required for use with manually operated sash.

Friction Hinges: Concealed, four-bar friction hinges with adjustable slide shoes complying with AAMA 904; two per sash.

Retain "Friction Hinges for Emergency Escape and Rescue" subparagraph below if sashes are intended for emergency-escape and rescue use. If only certain sashes are intended for egress, indicate locations on Drawings. Revise subparagraph if heavy-duty hinges are required.

Friction Hinges for Emergency Escape and Rescue: Standard-duty, concealed, four-bar friction egress hinges with adjustable slide shoes; two per sash where indicated. Provide hinge designed to achieve 90-degree sash opening.

Hinge types in "Butt Hinges" and "Extension Hinges or Pivots" subparagraphs below are suitable for use only with rotary operators. Revise if sash size requires more than two hinges.

Butt Hinges: Heavy-duty, three-knuckle butt hinges with nylon bushings; two per sash.

Extension Hinges or Pivots: Nonfriction type; two per sash.

Locks:

Revise "Type" subparagraph below if sash size requires two or more locks. If outswing casement windows are equipped with insect screens, screen wickets may be required; coordinate with lock type. Concealed multipoint lock with captive locking strike and head in last option below is used in blast or windborne-debris-impact applications.

Type: [**Cam handle with keeper**] [**Lift-type, locking handle with keeper**] [**Custodial cam-action lock with keeper**] [**Linear operator with standard concealed multipoint lock**] [**Linear operator with concealed multipoint lock with captive locking strike and head**] <**Insert type**>.

Style: [**As selected by Director’s Representative from manufacturer's full range of styles**] <**Insert style**>.

Control Device:

Retain "Limit Device" subparagraph below for outswing casement windows unless window units are operated only for cleaning. Limit devices should always be used if using butt hinges or extension hinges or pivots. They are optional for inswing casement windows. Limit devices are designed to restrict sash opening and are desirable for low sills, child safety, buffering wind, high-rise applications where high winds and safety are important considerations, and windows used for emergency ventilation only.

Limit Device: Adjustable, concealed [**friction adjustor/stay-bar**] [**friction adjustor/stay-bar with release key or tool**].

Retain "Pivoting Windows Hardware" paragraph below for windows that pivot horizontally or vertically. Coordinate pivoting window hardware with "Self-Closing Device for Fire-Rated Windows" paragraph to ensure compatibility between self-closing device and other hardware.

* + - * 1. Pivoting Window Hardware:

Pivot Assembly: Manganese-bronze pivot assembly designed for [**center**] [**off-center**] axis pivoting.

Lock:

Type: Internal, key-operated, limited-access locks; [**one**] [**two**] <**Insert number**> per jamb.

Bronze safety drop bolts.

Bronze cam fasteners.

Control Device:

Limit device: Adjustable, concealed [**friction adjustor/stay-bar**] [**friction adjustor/stay-bar with release key or tool**].

Retain "Projected Window Hardware" paragraph below for projected windows, which include awning windows that project out and hopper windows that project in.

* + - * 1. Projected Window Hardware:

Operation:

Retain "Operating Device" subparagraph below if required. Operating device is necessary for screened awning windows unless the screen contains a wicket for access to the open.

Operating Device: [**Gear-type rotary complying with AAMA 901 when tested in accordance with ASTM E405, Test Method A**] [**Push-bar-type**] [**, underscreen**] sash operator located at sill.

Style: [**As selected by Director’s Representative from manufacturer's full range of styles**] <**Insert style**>.

Manually operated push/pull.

Hinges:

Retain one of first three subparagraphs below. Welded butt hinges may be used on hopper windows if used in conjunction with a stay bar; insert if required.

Concealed, four-bar friction hinges with adjustable slide shoes complying with AAMA 904; two per sash.

Balance arms with adjustable, nonabrasive friction pivots; two per sash.

Balance arms with adjustable, nonabrasive friction shoes; two per sash.

Provide sash operation that permits cleaning of the outside glass face from the interior.

Provide jamb-mounted, sliding, brass friction shoes with screw adjusters.

Locks:

Revise "Type" subparagraph below if two locks are needed on wide units. Concealed multipoint lock with captive locking strike and head in fourth option below is used in blast or windborne-debris-impact applications. "Pole-operated spring catch lock" and "Pole-operated ring cam handle with keeper" options are used for window units with sash more than 72 inches above the floor.

Type: [**Cam handle with strike**] [**Cam handle with keeper**] [**Custodial cam-action lock with keeper**] [**Linear operator with standard concealed multipoint lock**] [**Linear operator with concealed multipoint lock with captive locking strike and head**] [**Pole-operated spring catch lock**] [**Pole-operated ring cam handle with keeper**] <**Insert type**>.

Style: [**As selected by Director’s Representative from manufacturer's full range of styles**] <**Insert style**>.

Retain "Pole Operators" subparagraph below if retaining one of two options for pole-operated lock types in "Type" subparagraph above.

Pole Operators: Tubular-shaped, anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches above floor.

Control Device:

Retain "Limit Device" subparagraph below if limit devices are required on awning windows. These are optional items designed to restrict sash opening and are desirable for low sills, child safety, buffering wind, high-rise applications where high winds and safety are important considerations, and windows used for emergency ventilation only. Limit devices may also be required for awning windows that may open into a pedestrian path of travel.

Limit Device: Adjustable, concealed [**friction adjustor/stay-bar**] [**friction adjustor/stay-bar with release key or tool**] [**support arms with adjustable, limited hold-open**].

* + - 1. INSECT SCREENS

Retain this article if insect screens are needed. Copy and revise article if other types of screens, such as safety protection screens, are required for Project. Coordinate location of screen in first paragraph below with operation of sash.

* + - * 1. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, fully integrated with window. Locate screens on [**inside**] [**outside**] of window and provide for each operable exterior sash. Comply with SMA 1201.

Retain "Aluminum Screen Frames" or "Stainless Steel Screen Frames" paragraph below.

* + - * 1. Aluminum Screen Frames: Manufacturer's standard [**extruded-aluminum**] [**or**] [**formed-tubular-aluminum**] members; with mitered, coped joints, or corner extrusions; concealed fasteners;[**adjustable rollers;**] and removable PVC or PE spline/anchor concealing edge of mesh.

In "Frame Wall Thickness" subparagraph below, retain first option for frames mounted on outside or inside of window; second option is suitable for frames mounted inside only.

Frame Wall Thickness: [**0.04 inch**] [**0.03 inch**] minimum.

Finish:

Retain one of two subparagraphs below. Verify available finishes with manufacturers.

Anodized aluminum in manufacturer's standard color.

[**Baked-enamel or powder-coat**] [**High-performance organic**] finish in [**manufacturer's standard color**] [**color selected by the Director’s Representative from manufacturer's full range**] [**color to match steel windows**].

* + - * 1. Stainless Steel Screen Frames: Fabricate frames of tubular-shaped, nonmagnetic stainless steel members of 0.02-inch minimum wall thickness; in [**ASTM A480, No. 2B cold-rolled, bright finish**] [**finish to match hot-rolled steel window**].

Retain "Glass-Fiber Mesh Fabric," "Aluminum Wire Fabric," "Copper Wire Fabric," "Bronze Wire Fabric," or "Stainless Steel Wire Fabric" paragraph below.

Usually, retain first option in "Glass-Fiber Mesh Fabric" paragraph below. Second option is suitable for areas plagued by small insects, such as no-see-ums. Second option is also suitable for use as a solar screen that blocks up to 65 percent of incident solar heat and glare. Some manufacturers offer a screen that uses a finer mesh that transmits more light; confirm availability and revise paragraph if required.

* + - * 1. Glass-Fiber Mesh Fabric: Complies with ASTM D3656; [**18-by-14 or 18-by-16**] [**20-by-20 or 20-by-30**] count per sq. in. mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration.

Mesh Color: [**Gray**] <**Insert color**>.

* + - * 1. Aluminum Wire Fabric: 18-by-16 count per sq. in. mesh of 0.011-inch- diameter, coated aluminum wire.

Wire-Fabric Finish: [**Natural bright**] [**Charcoal gray**] [**Black**].

Usually, retain "Copper Wire Fabric" or "Bronze Wire Fabric" paragraph below for window screens in historic preservation projects.

* + - * 1. Copper Wire Fabric: 16-by-16 count per sq. in. mesh of 0.011-inch-diameter copper wire.
        2. Bronze Wire Fabric: 18-by-14 count per sq. in. mesh of 0.011-inch-diameter bronze wire with a clear varnish finish.
        3. Stainless Steel Wire Fabric: [**18-by-16**] [**18-by-18**] count per sq. in. mesh of 0.009-inch-minimum diameter, nonmagnetic stainless steel wire, Type 304 or 316.

Retain "Wickets" paragraph below for screened-window units with outward-opening sash if wickets are necessary for sash operation.

* + - * 1. Wickets: Provide [**sliding**] [**or**] [**hinged**] wickets, framed and trimmed for a tight fit and durability during handling.
      1. ACCESSORIES

Retain items in this article that are needed for fabrication or installation of selected units.

* + - * 1. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of hot-rolled steel windows.

Generally, retain "Exposed Fasteners" subparagraph below. Revise if exposed fasteners are permitted.

Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

* + - * 1. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A123. Provide units with sufficient strength to withstand design pressure indicated.

Windborne-Debris-Impact Resistance: Provide anchors and clips of same design used to pass windborne-debris-impact-resistance testing.

* + - * 1. Sealant: For sealants required within fabricated windows, provide manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.
      1. FABRICATION
         1. Fabricate hot-rolled steel windows of type and in sizes indicated to comply with SWI standards. Include a complete system for assembly of components and anchorage of window units.
         2. Provide units that are reglazable without dismantling framing.

Hot-rolled steel windows are usually field glazed. Revise first paragraph below if manufacturer offers factory-glazed windows.

* + - * 1. Prepare windows for site glazing.
        2. Subframes and Operable Sash: Formed of hot-rolled steel of profile indicated. Miter or cope corners, and weld and dress joints smooth.
        3. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
        4. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.
        5. Provide water-shed members above casement sash.
      1. STEEL FINISHES

Retain last option in "Surface Preparation" paragraph below if using baked-enamel or powder-coat finish.

* + - * 1. Surface Preparation: 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"**] <**Insert surface preparation method**>.[**After cleaning, apply a conversion coating suited to the organic coating to be applied over it.**]

Retain "Galvanized Finish" paragraph below if hot-rolled windows have a galvanized finish for corrosion resistance.

* + - * 1. Galvanized Finish: Hot-dip galvanize according to ASTM A123.

Retain "Factory Prime Finish" paragraph below for field-painted steel fabrications.

* + - * 1. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

Retain "Baked-Enamel or Powder-Coat Finish" paragraph below for factory-applied, baked-enamel or powder-coat finish for steel sheet fabrications.

* + - * 1. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
        2. High-Performance Organic Finish: Two-coat PVDF fluoropolymer finish containing not less than [**50**] [**70**] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Verify rough-opening dimensions, levelness of sill plate, and clearances.
          3. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
          4. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLATION OF HOT-ROLLED STEEL WINDOWS
          1. SWI Publication: Comply with applicable requirements in SWI's "Guidelines on How to Install Steel Windows," except where more stringent requirements are indicated.
          2. Comply with manufacturer's written instructions for installing windows, hardware, operators, accessories, and other components.

Retain "Windborne-Debris-Impact Resistance" paragraph below for installations requiring windborne-debris resistance. Proper anchorage of units is necessary to maintain performance as tested.

* + - * 1. Windborne-Debris-Impact Resistance: Anchor hot-rolled steel windows required to have windborne-debris resistance to structure using method, anchor type, and anchor spacing identical to that used in windborne-debris-impact-resistance testing.
        2. Install windows level, plumb, square, true to line, without distortion or impediment to thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
        3. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
        4. Install windows and components to drain condensation, water-penetrating joints, and moisture migrating within windows to the exterior.
        5. Separate corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E2112.
      1. FIELD QUALITY CONTROL

Retain this article if field tests are required. If retaining, indicate number of windows to be tested. Specify field tests for air leakage and water penetration for significant projects.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
        2. Tests and Inspections:

Revise first subparagraph below if more stringent field testing is required for Project. AAMA 502, Test Method A is default unless otherwise indicated.

Test windows for air leakage and water penetration in accordance with AAMA 502, Test Method [**A**] [**B**], by applying same test pressures required for performance.

Testing Extent: [**Three**] [**Three benchmark**] <**Insert number or description**> windows as selected by Director’s Representative and a qualified independent testing and inspecting agency. Test windows immediately after installation.

Window will be considered defective if it does not pass tests and inspections.

* + - * 1. Prepare test and inspection reports.
      1. ADJUSTING, CLEANING, AND PROTECTION
         1. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts as recommended in writing by manufacturer.
         2. Clean factory-finished steel surfaces immediately after installing windows. Comply with manufacturer's written instructions for final cleaning and maintenance. Avoid damaging protective coatings and finishes.
         3. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately in accordance with manufacturer's written instructions.

Retain paragraph below if windows are factory finished.

* + - * 1. Refinish or replace windows with damaged finish.

END OF SECTION 085123.13