SECTION 085413 - FIBERGLASS WINDOWS

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

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section includes fiberglass-framed windows.
      2. PREINSTALLATION MEETINGS

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

* + - * 1. Preinstallation Conference: Conduct conference at [Project site] <**Insert location**>.

Retain subparagraphs below if required. If retaining, revise to include product-specific requirements.

Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

Review, discuss, and coordinate the interrelationship of fiberglass windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.

Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

If needed, insert list of conference participants not mentioned in Section 013100 "Project Management and Coordination."

* + - 1. ACTION 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 Data as specified in Quality Control Submittals first.

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

Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for fiberglass windows.

Include manufacturer’s installation instructions.

* + - * 1. Shop Drawings: For fiberglass windows.

Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

Retain "Samples" Paragraphparagraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each color specified, [**2 by 4 inches (50 by 100 mm)**] <**Insert dimensions**> in size.
        2. Samples for Initial Selection: For units with factory-applied finishes.

Include Samples of hardware and accessories involving color selection.

* + - * 1. Samples for Verification: For fiberglass windows and components required, prepared on Samples of size indicated below:

Exposed Finishes: [**2 by 4 inches (50 by 100 mm)**] <**Insert dimensions**>.

Exposed Hardware: Full-size units.

* + - * 1. Product Schedule: For fiberglass windows. Use same designations indicated on Drawings.
      1. INFORMATIONAL SUBMITTALS
         1. Quality Control Submittals:

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

Qualification Data: For manufacturer and Installer.

Product Test Reports: For each type of fiberglass window, for tests performed by a qualified testing agency.

Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

Field quality-control reports.

Sample Warranties: For manufacturer's warranties.

* + - 1. QUALITY ASSURANCE
         1. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
         2. Installer Qualifications: An installer acceptable to fiberglass window manufacturer for installation of units required for this Project.
         3. MockupBenchmarks: Build mockupbenchmarks to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

Indicate portion of wall represented by mockupbenchmark on Drawings or draw mockupbenchmark as separate element.

Build mockupbenchmark of typical wall area as shown on Drawings.

Approval of mockupbenchmarks does not constitute approval of deviations from the Contract Documents contained in mockupbenchmarks unless ArchitectDirector’s Representative specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockupbenchmarks.

Subject to compliance with requirements, approved mockupbenchmarks may become part of the completed Work if undisturbed at time of Substantial Completion.

Insert "Field Conditions" Article and requirements for field measurements for existing construction that requires custom-fabricated window replacements.

* + - 1. WARRANTY

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

* + - * 1. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that fail in materials or workmanship within specified warranty period.

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

Failure to meet performance requirements.

Structural failures including excessive deflection, water leakage, and air infiltration.

Faulty operation of movable sash and hardware.

Deterioration of materials and finishes beyond normal weathering.

Failure of insulating glass.

Verify available warranties and warranty periods for units and components. Some manufacturers might insist that warranty periods begin on date of manufacture or sale.

Warranty Period:

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

Warranty period for glazing units varies by type.

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

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

* + - 1. MANUFACTURERS
         1. Source Limitations: Obtain fiberglass windows from single source from single manufacturer.
      2. WINDOW PERFORMANCE REQUIREMENTS

See the Evaluations for discussions of performance requirements. Coordinate performance requirements with types of window operation (for example, casement or double hung), glass type, and other variables. If performance requirements vary among types of windows, insert language to differentiate requirements among window types or show requirements in a schedule on Drawings.

* + - * 1. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

Retain requirements for WDMA certification and labeling if needed. Not all manufacturers that test products according to AAMA/WDMA/CSA 101/I.S.2/A440 requirements participate in WDMA's third-party certification program for listing and labeling windows.

Window Certification: WDMA certified with label attached to each window.

* + - * 1. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

Fiberglass windows are generally unavailable in Class AW.

Performance class abbreviations: Per Fenestration & Glazing Industry Alliance, [FGIA - Performance Class Overview | AAMA Standards & Ballots (fgiaonline.org)](https://fgiaonline.org/pages/performance-class-overview)

15 psf (720 Pa) for R class (commonly used in one- and two-family dwellings)

25 psf (1200 Pa) for LC class (commonly used for low- and mid-rise multifamily dwellings and other buildings where larger sizes and higher loading requirements are expected)

30 psf (1,440 Pa) for the new CW class (commonly used in low- and mid-rise buildings where larger sizes, higher loading requirements, limits on deflection and heavier use are expected)

Minimum Performance Class: [**R**] [**LC**] [**CW**] [**As indicated on Drawings**] <**Insert class**>.

AAMA/WDMA/CSA 101/I.S.2/A440 establishes a gateway Performance Grade for windows to qualify for each Performance Class. The gateway Performance Grade is 15 for Class R, 25 for Class LC, and 30 for Class CW. For a particular project, the minimum Performance Grade for windows is typically based on the design pressure.

Minimum Performance Grade: [**15**] [**20**] [**25**] [**30**] [**35**] [**40**] [**45**] [**As indicated on Drawings**] <**Insert grade**>.

Retain "Thermal Transmittance" Paragraphparagraph below if required to comply with requirements of authorities having jurisdiction. Options below are per NY State Energy Conservation Code 2020 Table R402.1.2. Revise as necessary for applicable fenestration criteria First option is for Climate Zone 4,, second is for Climate Zone 5 or 6 Option 1, and third is for Climate Zone 6 Option 2.Options below are based on ENERGY STAR requirements. First option is for Northern Climate Zone, second is for North-Central Climate Zone, third is for South-Central Climate Zone, and fourth is for Southern Climate Zone.

* + - * 1. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of [**0.32 Btu/sq. ft. x h x deg F (1.83 W/sq. m x K)**] [**0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K)**] [**0.28 Btu/sq. ft. x h x deg F (1.59 W/sq. m x K)**] .
        2. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of [**0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K)**] [**0.32 Btu/sq. ft. x h x deg F (1.83 W/sq. m x K)**] [**0.35 Btu/sq. ft. x h x deg F (2.0 W/sq. m x K)**] [**0.60 Btu/sq. ft. x h x deg F (3.43 W/sq. m x K)**] <**Insert value.**

Options in "Solar Heat-Gain Coefficient (SHGC)" Paragraphparagraph below are per NY State Energy Conservation Code 2020 Table R402.1.2. Revise as necessary for applicable fenestration criteria. Value listed below is for Climate Zone 4,, Climate Zone 5 and 6 do not have a maximum SHGC.are based on ENERGY STAR requirements. First option is for North-Central Climate Zone, second is for South-Central Climate Zone, and third is for Southern Climate Zone. Northern Climate Zone does not have a maximum SHGC.

* + - * 1. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of [0.40] [**0.30**] [**0.27**] <**Insert value**>.

Retain "Sound Transmission Class (STC)" and "Outside-Inside Transmission Class (OITC)" paragraphs below after verifying availability of test data. STC evaluates construction subject to interior sound frequencies, while OITC evaluates an expanded sound-frequency range more representative of conditions to which the building envelope is subject, such as road, rail, and airplane traffic noise. OITC is generally the preferred evaluation method for exterior windows.

* + - * 1. Sound Transmission Class (STC): Rated for not less than [**26**] [**30**] <**Insert rating**> STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
        2. Outside-Inside Transmission Class (OITC): Rated for not less than [**22**] [**26**] [**30**] <**Insert rating**> OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

Retain "Windborne-Debris Impact Resistance" Paragraphparagraph below to suit Project. The IBC 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. New York State is located in Wind Zone 2 and in a hurricane susceptible region.

* + - * 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. For enhanced protection, delete "Small-Missile Test" Subparagraphsubparagraph.

Large-Missile Test: For glazing located within [**30 feet (9.1 m)**] <**Insert dimension**> of grade.

Small-Missile Test: For glazing located between 30 feet (9.1 m) and [**60 feet (18.3 m)**] <**Insert dimension**> above grade.

* + - 1. FIBERGLASS WINDOWS
         1. Operating Types: Provide the following operating types in locations indicated on Drawings:

Casement: Project [**out**] [**in**].

Awning: Project out.

Single hung.

Double hung.

Horizontal sliding.

Fixed.

AAMA/WDMA/CSA 101/I.S.2/A440 includes requirements for fiberglass and other materials and window components. If more stringent requirements apply, insert them in this article. AAMA 613 Performance requirements and Test Procedures for Organic Coatings on Plastic Profiles. AAMA 623, Performance requirements and Test procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.

* + - * 1. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with [**AAMA 613**] [**AAMA 623**].

Exterior Color: [**As selected by ArchitectDirector’s Representative from manufacturer's full range**] <**Insert color**>.

Interior Finish: [**Matching exterior color and finish**] [**Matching exterior finish, in color selected by ArchitectDirector’s Representative from manufacturer's full range**] [**Wood veneer clad, maple**] [**Wood veneer clad, oak**] <**Insert finish**>.

Retain "Glass," "Windborne-Debris-Impact-Resistant Laminated Glass," "Insulating-Glass Units," or "Windborne-Debris-Impact-Resistant Insulating-Glass Units" Paragraphparagraph below to suit Project, or revise if other type of glazing unit is necessary.

* + - * 1. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.

Codes require fully tempered or laminated labeled safety glass in areas subject to human impact.

Kind: Fully tempered [**where indicated on Drawings**] <**Insert requirements**>.

Retain "Windborne-Debris-Impact-Resistant Laminated Glass" Paragraphparagraph below with "Windborne-Debris-Impact Resistance" Paragraphparagraph in "Window Performance Requirements" Article.

* + - * 1. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C1172 with two plies of float glass.

Float Glass: [**Annealed**] [**Heat strengthened**] [**Fully tempered**] [**As required by performance requirements indicated**].

Inner Ply: Clear.

Interlayer: [**0.090 inch (2.29 mm)**] [**As required by performance requirements indicated**] <**Insert requirements**>.

Outer Ply: [**Clear**] [**Gray**] [**Bronze**] [**Green**] <**Insert tint**>.

Low-E Coating:: [**Pyrolytic on second surface**] [Sputtered on second surface] [**Sputtered on third surface**] [**Sputtered on second or third surface**] <**Insert coating**>.

* + - * 1. Insulating-Glass Units: ASTM E2190.

Glass: ASTM C1036, Type 1, Class 1, q3.

Tint: [**Clear**] [**Gray**] [**Bronze**] [**Green**] <**Insert tint**>.

Kind: Fully tempered [**where indicated on Drawings**] <**Insert requirements**>.

Lites: [Two] [**Three**].

Filling: Fill space between glass lites with [air] [**argon**].

Low-E Coating:: [**Pyrolytic on second surface**] [Sputtered on second surface] [**Sputtered on third surface**] [**Sputtered on second or third surface**] <**Insert coating**>.

Retain "Integral Louver Blinds" Subparagraphsubparagraph below if required. Verify availability with manufacturers.

Integral Louver Blinds: Glass manufacturer's standard, horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of sash.

Operation: [**Tilt only**] [**Tilt, raising, and lowering**].

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

Retain "Windborne-Debris-Impact-Resistant Insulating-Glass Units" Paragraphparagraph below with "Windborne-Debris-Impact Resistance" Paragraphparagraph in "Window Performance Requirements" Article.

* + - * 1. Windborne-Debris-Impact-Resistant Insulating-Glass Units: ASTM E2190 with two lites and complying with impact-resistance requirements in "Window Performance Requirements" Article.

Exterior Lite: ASTM C1036, Type 1, Class 1, q3.

Tint: [**Clear**] [**Gray**] [**Bronze**] [**Green**] <**Insert tint**>.

Kind: [**Heat strengthened**] [**Fully tempered**].

Interior Lite: ASTM C1172 clear laminated glass with two plies of float glass.

Float Glass: [**Annealed**] [**Heat strengthened**] [**Fully tempered**] [**As required by performance requirements indicated**].

Interlayer Thickness: [**0.090 inch (2.29 mm)**] [**As required by performance requirements indicated**] <**Insert requirements**>.

Filling: Fill space between glass lites with [air] [**argon**].

Low-E Coating:: [**Pyrolytic on second surface**] [Sputtered on second surface] [**Sputtered on third surface**] [**Sputtered on second or third surface**] <**Insert coating**>.

"Glazing System" Paragraphparagraph below refers to the method by which the glazing unit (glass) is retained within the window sash or frame.

* + - * 1. Glazing System: [**Manufacturer's standard factory-glazing system that produces weathertight seal**] <**Insert glazing requirements**>.

Nonmagnetic stainless steel, Series 300, or superior corrosion-resistant-coated metal hardware may be required to meet specific customer or regional needs and for protection against corrosive environments, such as in urban, coastal, or industrial areas.

* + - * 1. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock fiberglass windows, and sized to accommodate sash weight and dimensions.

Exposed Hardware Color and Finish: [**As indicated by manufacturer's designations**] [**Match ArchitectDirector’s Representative's sample**] [**As selected by ArchitectDirector’s Representative from manufacturer's full range**] <**Insert color and finish**>.

* + - * 1. Projected Window Hardware:

Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

Type and Style: [**Match ArchitectDirector’s Representative's sample**] [**As selected by ArchitectDirector’s Representative from manufacturer's full range of types and styles**] <**Insert type and style**>.

Hinges: [**Manufacturer's standard type for sash weight and size indicated**] [**Stainless-steel hinges with stainless-steel-reinforced, sliding nylon shoes**] <**Insert description**>.

Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 27-1/2 inches (700 mm) tall and two arms on taller sashes.

Retain one option in "Limit Devices" Subparagraphsubparagraph below if limit devices are required. They restrict sash opening for safety. Indicate locations of windows with limit devices on Drawings or in schedules, and coordinate with code requirements for windows for emergency escape and rescue.

Limit Devices: [**Concealed friction adjustor, adjustable stay bar**] [**Concealed support arms with adjustable, limited, hold-open**] <**Insert type**> limit devices designed to restrict sash opening.

Limit clear opening to [**4 inches (100 mm)**] <**Insert dimension**> for ventilation; with custodial key release.

Retain "Pole Operators" Subparagraphsubparagraph below if Project includes manually operated windows more than 72 inches (1800 mm) above floor. Electric operators are also available; if needed, insert requirements.

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 (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.

* + - * 1. Hung Window Hardware:

Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.

Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.[**Provide custodial locks.**]

Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

* + - * 1. Horizontal-Sliding Window Hardware:

Sill Cap/Track: [**Extruded-aluminum track with natural anodized finish**] [**Rigid PVC or other weather-resistant plastic track with manufacturer's standard integral color**] [**Manufacturer's standard**] <**Insert track material and finish**> of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.

Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.[**Provide custodial locks.**]

Roller Assemblies: Low-friction design.

* + - * 1. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
        2. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

Generally, retain "Exposed Fasteners" Subparagraphsubparagraph 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. ACCESSORIES

Retain "Dividers (False Muntins)" paragraph below if dividers are required. Indicate divider patterns on Drawings or insert requirements.

* + - * 1. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.

Quantity and Type: [**One per sash, removable from exposed surface of interior lite**] [**Two per sash, removable from exposed surfaces of interior and permanently located at exterior lite**] [**One permanently located between insulating-glass lites**] <**Insert requirements**>.

Material: [**Manufacturer's standard**] <**Insert material**>.

Pattern: [**As indicated on Drawings**] <**Insert pattern**>.

Profile: [**As selected by ArchitectDirector’s Representative from manufacturer's full range**] <**Insert profile**>.

Color: [**As selected by ArchitectDirector’s Representative from manufacturer's full range**] <**Insert color**>.

* + - * 1. Jamb Extensions: [**Stain-grade Pacific Hemlock**] <**Insert description**>.

Insert requirements for mullion covers and trim pieces, such as brick molds, if needed.

* + - 1. INSECT SCREENS
         1. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

Type and Location: [**Full, inside for project-out**] [**Full, outside for project-in**] [**Full, outside for double-hung**] [**Half, outside for single-hung**] [**Full, outside for sliding**] [**Half, outside for sliding**] sashes.

* + - * 1. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

Finish for Interior Screens: Baked-on organic coating in [**color selected by ArchitectDirector’s Representative from manufacturer's full range**] <**Insert color**>.

Finish for Exterior Screens: [**Baked-on organic coating in color selected by ArchitectDirector’s Representative from manufacturer's full range**] [**Matching color and finish of cladding**] <**Insert finish**>.

Retain "Glass-Fiber Mesh Fabric" or "Aluminum Wire Fabric" Paragraphparagraph below or insert another. Glass-fiber mesh is standard with most manufacturers. Usually, retain first option in "Glass-Fiber Mesh Fabric" Paragraphparagraph. Second option is suitable for areas plagued by small insects such as no-see-ums and is also suitable for use as a solar screen that blocks up to 65 percent of incident solar heat and glare.

* + - * 1. Glass-Fiber Mesh Fabric: [**18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm)**] [**20-by-20 (0.85-by-0.85-mm) or 20-by-30 (0.85-by-0.42-mm)**] <**Insert type**> 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. Comply with ASTM D3656/D3656M.

Mesh Color: [**Manufacturer's standard**] <**Insert color**>.

* + - * 1. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.

Wire-Fabric Finish: [**Natural bright**] [**Charcoal gray**] [**Black**] <**Insert finish**>.

* + - 1. FABRICATION
         1. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.
         2. Glaze fiberglass windows in the factory.
         3. Weather strip each operable sash to provide weathertight installation.

Retain "Mullions" Paragraphparagraph below if required for Project.

* + - * 1. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

Bow and bay window assemblies usually contain casement, double-hung, or fixed window units.

* + - * 1. [**Bow**] [**Bay**] Window Assemblies: Provide [**operating**] [**and**] [**fixed**] units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:

Angled mullion posts with interior and exterior trim.

Angled interior and exterior extension and trim.

Revise first subparagraph below to suit Project. Clear pine head and seat boards are optional features with most manufacturers. Unless wood species is specified, plywood will be supplied.

Clear [**pine**] <**Insert species**> head and seat boards.

Top and bottom plywood platforms.

Exterior head and sill casings and trim.

Support brackets.

* + - * 1. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

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 operational clearances.
          3. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
          4. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLATION
          1. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
          2. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
       3. FIELD QUALITY CONTROL

Retain "Testing Agency" Paragraphparagraph below to identify who shall perform tests and inspections. If retaining second option in paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

* + - * 1. Testing Agency: [**Owner will engage] [Engage]** a qualified testing agency to perform tests and inspections.

Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

Revise "Testing Services" Paragraphparagraph below if more stringent testing is required.

* + - * 1. Testing Services: Testing and inspecting of installed windows shall take place as follows:

Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.

Air-Infiltration Testing:

Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.

Allowable Air-Leakage Rate: [**1.5**] <**Insert number**> times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

Water-Resistance Testing:

Test Pressure: [**Two-thirds**] <**Insert number**> times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.

Allowable Water Infiltration: No water penetration.

Testing Extent: [**Three**] [**Three mockupbenchmark**] <**Insert number or description**> windows of each type as selected by ArchitectDirector’s Representative and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.

Test Reports: Prepared according to AAMA 502.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

* + - * 1. Windows will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. ADJUSTING, CLEANING, AND PROTECTION
         1. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
         2. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

Keep protective films and coverings in place until final cleaning.

* + - * 1. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
        2. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085413