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## SECTION 085113 - ALUMINUM WINDOWS

### **TIPS:**

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## PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section Includes:

1. Aluminum windows for exterior locations.

#### B. Related Requirements:

1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

## 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
  3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
  4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
  6. Coordinate glass to match storefront.

## 1.3 ACTION SUBMITTALS

- A. Product Data:
1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings:
1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, [**2 by 4 inches (50 by 100 mm)**] <Insert dimensions> in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
1. Include Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
1. Exposed Finishes: [**2 by 4 inches (50 by 100 mm)**] <Insert dimensions>.
  2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- B. Field Quality-Control Submittals:
  - 1. Field quality-control reports.
- C. Sample warranties.
- D. Qualification Statements: For manufacturer and Installer.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturers: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
  - 2. Installers: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

#### 1.6 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockup as indicated on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.

- e. Failure of insulating glass.
2. Warranty Period:
- a. Window: [10] <Insert number> years from date of Substantial Completion.
  - b. Glazing Units: [Five] [10] [20] <Insert number> years from date of Substantial Completion.
  - c. Aluminum Finish: [10] [20] <Insert number> years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

### 2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. 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.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  - 1. Minimum Performance Class: [R] [LC] [CW] [AW] [As indicated on Drawings] <Insert class>.
  - 2. Minimum Performance Grade: [15] [20] [25] [30] [35] [40] [45] [50] [60] [80] [As indicated on Drawings] <Insert grade>.
- C. 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>.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of [0.40] [0.30] [0.27] <Insert value>.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance in accordance with AAMA 1503, showing a CRF of [45] [52] <Insert value>.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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1. Temperature Change: [**120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces**] <Insert temperature change>.
- G. Sound Transmission Class (STC): Rated for not less than [**26**] [**30**] [**41**] <Insert rating> STC when tested for laboratory sound transmission loss in accordance with ASTM E90 and determined by ASTM E413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than [**22**] [**26**] [**30**] <Insert rating> OITC when tested for laboratory sound transmission loss in accordance with ASTM E90 and determined by ASTM E1332.
- I. 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.
  1. Large-Missile Test: For glazing located within [**30 ft. (9.1 m)**] <Insert dimension> of grade.
  2. Small-Missile Test: For glazing located between **30 ft. (9.1 m)** and [**60 ft. (18.3 m)**] <Insert dimension> above grade.

## 2.3 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide All Weather Architectural Aluminum; [**Series 5000**] [**Series 6000**] [**Series 6100**] or comparable product by one of the following:
  1. EFCO Corporation.
  2. Kawneer North America; an Arconic company.
  3. TRACO.
  4. <Insert manufacturer's name>.
- B. Types: Provide the following types in locations indicated on Drawings:
  1. Casement: [**Outswing**] [**Inswing**].
  2. Projected, awning.
  3. Projected, hopper.
  4. Single hung.
  5. Double hung.
  6. Horizontal sliding.
  7. Fixed.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  1. Thermally Broken Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

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- a. Thermally broken extruded aluminum, Type 6063 age hardened to T-6 rating for strength and durability.

## D. Glazing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cardinal Glass.
  - b. Guardian Glass.
  - c. Pilkington Glass.
  - d. Vitro Architectural Glass.
  - e. <Insert manufacturer's name>.

## E. Glass: ASTM C1036, Type 1, q3.

1. Clear Annealed Glass: Class 1.
2. Low-Iron Annealed Float Glass: Class I; with visible light transmission of not less than 91 percent and SHGC of not less than 0.87.
3. Tinted Annealed Float Glass: Class 2, [blue] [gray] [green].
4. Kind: Fully tempered [where indicated on Drawings] <Insert requirements>.

## F. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C1172 with two plies of float glass.

1. Float Glass: [Annealed] [Heat strengthened] [Fully tempered] [As required by performance requirements indicated].
2. Inner Ply: Clear.
3. Interlayer: [0.090 inch (2.29 mm)] [As required by performance requirements indicated] <Insert requirements>.
4. Outer Ply: [Clear] [Gray] [Bronze] [Green] <Insert tint>.
5. Low-E Coating: [Sputtered on second surface] [Sputtered on third surface] [Sputtered on second or third surface] <Insert coating>.

## G. Insulating-Glass Units: ASTM E2190.

1. Glass: ASTM C1036, Type 1, Class 1, q3.
  - a. Tint: [Clear] [Gray] [Bronze] [Green] <Insert tint>.
  - b. Kind: Fully tempered [where indicated on Drawings] <Insert requirements>.
2. Lites: [Two] [Three].
3. Spacer: Bystronic thermal plastic spacer technology.
  - a. Filling: Fill space between glass lites with [air] [argon].
  - b. Low-E Coating: [Sputtered on second surface] [Sputtered on third surface] [Sputtered on second or third surface] <Insert coating>.

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4. 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.
  - a. Operation: [**Tilt only**] [**Tilt, raising, and lowering**].
  - b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color>.
  
- H. Windborne-Debris-Impact-Resistant Insulating-Glass Units: ASTM E2190 with two lites and complying with impact-resistance requirements in "Window Performance Requirements" Article.
  1. Exterior Lite: ASTM C1036, Type 1, Class 1, q3.
    - a. Tint: [**Clear**] [**Gray**] [**Bronze**] [**Green**] <Insert tint>.
    - b. Kind: [**Heat strengthened**] [**Fully tempered**].
  2. Interior Lite: ASTM C1172 clear laminated glass with two plies of float glass.
    - a. Float Glass: [**Annealed**] [**Heat strengthened**] [**Fully tempered**] [**As required by performance requirements indicated**].
    - b. Interlayer Thickness: [**0.090 inch (2.29 mm)**] [**As required by performance requirements indicated**] <Insert requirements>.
  3. Filling: Fill space between glass lites with [**air**] [**argon**].
  4. Low-E Coating: [**Sputtered on second surface**] [**Sputtered on third surface**] [**Sputtered on second or third surface**] <Insert coating>.
  
- I. Glazing System: [**Manufacturer's standard factory-glazing system that produces weathertight seal**] <Insert glazing requirements>.
  1. Dual Glazing System:
    - a. Interior Lite: [**Glass**] <Insert type>.
    - b. Exterior Lite: [**Glass**] [**Insulating-glass unit**] <Insert type>.
  
- J. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  1. Exposed Hardware Color and Finish: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and finish>.
  
- K. [**Casement**] [**and**] [**Awning**] Window Hardware:

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1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested in accordance with ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
    - a. Type and Style: **[Match Architect's sample] [As selected by Architect from manufacturer's full range of types and styles] <Insert type and style>**.
  2. Hinges:
    - a. Casement Windows: Four-bar heavy-duty stainless steel concealed hinges, die-cast zinc cam handles with pole ring, worm-gear rotary control operator with butt hinges, and side-mounted multilocking handle.
    - b. Awning Windows: Four-bar heavy-duty stainless steel concealed hinges, die-cast zinc cam handles with pole ring, worm-gear rotary hardware with loose pin concealed hinges, and side-mounted locking handles.
  3. Cam Handle: Die cast used with RCA 3 miller pole.
  4. Lock: **[Lift-type throw, cam-action lock with keeper] [Key-operated custodial lock with keeper and removable handle] [Concealed multipoint lock operated by single lever handle or lift-type throw] <Insert requirements>**.
  5. Limit Devices: **[Concealed friction adjustor, adjustable stay bar] [Concealed support arms with adjustable, limited, hold-open]** limit devices designed to restrict sash opening.
    - a. Limit clear opening to **[4 inches (100 mm)] <Insert dimension>** for ventilation; with custodial lock.
  6. Window Operator Control Device (WCOD): SafeGard™ WCOD is tested and certified to ASTM F2090.
  7. Pole Operators: RCA 3 miller pole.
- L. Hung Window Hardware:
1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
  2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. **[ Provide key-operated custodial locks.]**
  3. Tilt Latch: Releasing latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- M. Horizontal-Sliding Window Hardware:
1. Sill Cap/Track: **[Extruded-aluminum track with natural anodized finish] [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.
  2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. **[ Provide key-operated custodial locks.]**



3. Roller Assemblies: Low-friction design.

N. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

O. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

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

## 2.4 ACCESSORIES

A. Integral Ventilating System/Device: Where indicated, provide weather-stripped, adjustable, horizontal fresh-air vent, with a free airflow slot, full width of window sash by approximately [**1 inch (25 mm)**] [**3 inches (75 mm)**] when open, complying with AAMA/WDMA/CSA 101/I.S.2/A440. Equip vent bar with an integral insect screen, removable for cleaning.

B. Dividers (False Muntins): Provide extruded-aluminum divider grilles in designs indicated for each sash lite.

1. Type: [**Permanently located at exterior lite**] [**Permanently located between insulating-glass lites**] [**SDL simulated divided lite**] <Insert type>.

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

3. Profile: [**As selected by Architect from manufacturer's full range**] <Insert profile>.

C. Horizontal Louver Blinds: Provide manufacturer's standard, removable, horizontal louver blinds with aluminum slats and polyester fiber cords that are operated by hardware located on inside face of sash.

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

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

D. Subsills: Thermally broken, extruded-aluminum compensation channel in configurations indicated on Drawings.

E. Panning Frame: [**Standard**] [**Custom die**] [**Special panning frame in multiple wall sections**]; extruded-aluminum profiles in sizes and configurations indicated on Drawings.

F. Custom Die Extrusion: [**Recessed custom die**] [**Head frame reversed pan drip edge**] [**no panning on sill, only jambs and head, head standard, or nonstandard drip edge**].

## 2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

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1. Type: Painted roll-formed aluminum frames finished to match window frames factory-drilled/tapped to receive screen attachment hardware.
- B. 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.
  1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
- C. 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.
  1. Mesh Color: [**Manufacturer's standard**] <Insert color>.
- D. Aluminum Wire Fabric: **18-by-16 (1.1-by-1.3-mm)** mesh of **0.011-inch- (0.28-mm-)** diameter, coated aluminum wire.
  1. Wire-Fabric Finish: [**Natural bright**] [**Charcoal gray**] [**Black**] <Insert finish>.

## 2.6 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. 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.
- G. [**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:
  1. Angled mullion posts with interior and exterior trim.
  2. Angled interior and exterior extension and trim.
  3. Exterior head and sill casings and trim.

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- H. 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.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
- D. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
  - 1. Color: **[Clear anodized] [Dark bronze]** .
  - 2. Color: **[As selected by Architect from manufacturer's range of colors and color densities] <Insert color>**.
- E. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
  - 1. Color: **[Clear anodized] [Dark bronze]**.
  - 2. Color: **[As selected by Architect from manufacturer's range of colors and color densities] <Insert color>**.

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- F. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than **[50]** **[70]** percent PVDF resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with **[AAMA 2604]** **[AAMA 2605]** and with coating and resin manufacturers' written instructions.
1. Color and Gloss: **[As indicated by manufacturer's designations]** **[Match Architect's sample]** **[As selected by Architect from full range of industry colors and color densities]** <Insert color and gloss>.
- G. High-Performance Organic Finish (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
1. Color and Gloss: **[As indicated by manufacturer's designations]** **[Match Architect's sample]** **[As selected by Architect from full range of industry colors and color densities]** <Insert color and gloss>.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. 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.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. 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.

- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage]** **[Engage]** a qualified testing agency to perform tests and inspections.
  - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows to take place as follows:
  - 1. Testing Methodology: Testing of windows for air infiltration and water resistance to be performed in accordance with AAMA 502.
  - 2. Air-Infiltration Testing:
    - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    - b. 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.
  - 3. Water-Resistance Testing:
    - a. 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.
    - b. Allowable Water Infiltration: No water penetration.
  - 4. Testing Extent: **[Three]** **[Three mockup]** **<Insert number or description>** windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows to be tested after perimeter sealants have cured.
  - 5. Test Reports: Prepared in accordance with AAMA 502.
- C. Tests and Inspections:
  - 1. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

## 3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately in accordance with manufacturer's written instructions.

END OF SECTION 085113