



## SECTION 08 51 13.50

### ALUMINUM CASEMENT, AWNING OR HOPPER WINDOWS

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#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Aluminum Casement Hinged windows (Series 670).
- B. Aluminum Casement Awning hinged windows (Series 670).
- C. Aluminum Casement Push-out hinged windows (Series 670).
- D. Aluminum Casement Hopper hinged windows (Series 670).

##### 1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 06 20 00 - Finish Carpentry.
- C. Section 07 90 00 - Joint Protection.
- D. Section 08 32 13 - Sliding Aluminum-Framed Glass Doors.
- E. Section 08 35 13.13 - Accordion Folding Doors.
- F. Section 08 44 16 - Glazed Bronze Curtain Walls.

##### 1.3 REFERENCES

- A. Aluminum Anodizers Council (AAC):
  - 1. AAC Class 1 - Anodized Architectural Aluminum Coatings.
- B. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA/WDMA/CSA/101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.
  - 2. AAMA 611.98 - Voluntary Specification for Anodized Architectural Aluminum.
  - 3. AAMA 2605 - Voluntary Specifications, Performance Requirements and Test Procedures for Pigmented for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- C. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

- D. ASTM International (ASTM):
  - 1. ASTM C1036 - Standard Specification for Flat Glass.
  - 2. ASTM E 283 - Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - 3. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - 4. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
  - 5. ASTM E774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
- E. Consumer Product Safety Commission (CPSC):
  - 1. CPSC 16CFR-1201 - Safety Standard for Architectural Glazing Materials.
- F. National Fenestration Rating Council (NFRC):
  - 1. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
  - 2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Show dimensions of aluminum windows, elevations, details of all window sections, anchorage and installation details, hardware, and interface with other products.
- D. Verification Samples: For each finished product specified, two samples, minimum size 6 inches (152 mm) square, representing actual product, color, and patterns.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of all components.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide aluminum windows by a single source manufacturer with at least 5 years documented experience.
- B. Installer Qualifications: Installer with documented experienced in the installation of manufacturer's aluminum window systems or similar products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Remodel mock-up area as required to produce acceptable work.
- D. Pre-Installation Meetings: Conduct pre-installation meetings to verify project requirements, substrate conditions, construction documents, details and manufacturer's warranty requirements.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver products and materials in manufacturer's original, unopened, undamaged crating and pallets with identification labels intact.
- B. Storage and Protection: Protect stored products from damage. Store products upright in dry, well ventilated area out of direct sunlight, under cover, protected from weather, moisture and excessive dryness and construction activities.

## 1.7 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## 1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.9 WARRANTY

- A. Provide manufacturer's standard limited warranty against defects in workmanship and materials.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Substitutions: Not permitted.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

### 2.2 ALUMINUM CASEMENT WINDOWS

- A. Basis of Design: Series 670: Aluminum Casement Hinged Windows as manufactured by Western Window Systems.
  - 1. Aluminum casement hinged windows, thermally broken, including frames, sills, and glazing to sizes indicated on the Drawings.
  - 2. Performance Requirements:
    - a. Air Infiltration Per ASTM E 283: .06 cfm/sf at test pressure of 1.57 psf.
    - b. Water Infiltration Per ASTM E 547: no water penetration at 9.19 psf.
    - c. Uniform Load Structural Per ASTM E 330: 75 psf.
    - d. Uniform Load Design Pressure: 50 psf.
    - e. Overall Design Pressure Rating: DP 50.
    - f. Certifications:
      - 1) AAMA/WDMA/CSA/101/I.S.2/A440.
        - a) CW PG50 grade rating for casement windows.
      - 2) NFRC 100 for U-factor.
      - 3) NFRC 200 for Solar Heat Gain Coefficient (SHGC).
  - 3. Frames and Sills: Thermally broken.
    - a. Extruded aluminum, 6063-T5.
      - 1) Width: 16 to 42 inches (406 to 1067 mm) maximum.

- 2) Height: 16 to 120 inches (406 to 3048 mm) maximum.
  - 3) Sloped Sill: for improved water drainage.
  - 4) Frame Depth: 4.5 inches (114 mm).
  - b. Stops: Glazing secured with extruded aluminum snap-in stops, removable for glazing and reglazing.
    - 1) Stepped profile with removable stops for re-glazing. Available in multiple dimensions. Accommodates glass sizes from .75 to 1 inch (19 to 25 mm) overall.
      - a) Stops in arches are applied with exposed screws.
  - c. Construction: Structural frame extruded shapes with sash members that are full-hollow (tubular) extrusions.
    - 1) Frame members fitted and mechanically joined at corners with stainless steel screws and sealed with high-grade silicone sealant.
    - 2) Sash members mitered, mechanically joined with crimped aluminum corner keys, and sealed with high-grade silicone sealant.
  - d. Weatherstripping: Bulb vinyl and closed cell foam tape
4. Hardware: Stainless steel.
- a. Exposed Hardware Finish: Painted to match frame finish.
  - b. Exposed Hardware Finish: Brushed nickel finish.
  - c. Single Point Locking System: Windows under 24 inches (610 mm).
  - d. Hidden Multi-Point Locking System: Windows 24 to 120 inches (610 to 3048 mm) high.
  - e. Butt Hinges:
    - 1) Windows Less Than 36 inches (914 mm) High: Two.
    - 2) Windows From 36 up to 60 inches (914 to 1524 mm) High: Three.
    - 3) Windows From 60 up to 84 inches (1524 to 2134 mm) High: Four.
    - 4) Windows From 84 through 120 inches (2134 to 3048 mm) High: Five.
5. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.
- a. Glazing: Argon Filled with LowE coating on No. 2 surface, from Cardinal Glass Industries.
    - 1) Glazing Type: LoE-270 all-climate coated glass.
    - 2) Glazing Type: LoE-366 high performance glass.
    - 3) Glazing Type: LoE-340 laminated, solar, and glare control glass.
    - 4) Glazing Type: As determined by the Architect.
    - 5) Glazing Type: \_\_\_\_\_.
    - 6) Enhanced Low-E Coating Used with Glazing Type Above: LoE-i89 enhanced winter performance glass.
    - 7) Overall Thickness: 3/4 inch (19 mm).
    - 8) Overall Thickness: 7/8 inch (22 mm).
    - 9) Overall Thickness: 1 inch (25 mm).
    - 10) Overall Thickness: As determined by the Architect.
    - 11) U-Factor: 0.48.
    - 12) U-Factor: As determined by the Architect.
    - 13) U-Factor: \_\_\_\_\_.
6. Aluminum Finish: Provide same finish on inside and outside.
- a. Anodized Finish AAC - Class 1 Color: Satin.
    - 1) Per AAMA 611.98.
  - b. Anodized Finish AAC - Class 1 Color: Dark bronze.
    - 1) Per AAMA 611.98.
  - c. Paint Finish per AAMA - 2605 minimum.

- 1) Color: Hillside bronze.
  - 2) Color: Bison beige.
  - 3) Color: Navajo white.
  - 4) Color: Briar.
  - 5) Color: Stonish beige.
  - 6) Color: Autumn night.
  - 7) Color: Warmtone.
  - 8) Color: Cinnamon toast.
  - 9) Color: Western white.
  - 10) Color: As determined by the Architect.
  - 11) Color: \_\_\_\_\_.
7. Screening: Extruded aluminum frames finished to match the window's frame color. Attached to window with an easy-to-use concealed ball catch system.
- a. Mesh: 18 x 16 charcoal-colored vinyl-coated fiberglass mesh.
  - b. Swing-Out Casements: Screens mount to window frame interior.
- B. Basis of Design: Series 670: Aluminum Awning Hinged Windows as manufactured by Western Window Systems.
1. Aluminum casement awning hinged windows, thermally controlled, including frames, sills, and glazing to sizes indicated on the Drawings.
  2. Performance Requirements:
    - a. Air Infiltration Per ASTM E 283: .10 cfm/sf at test pressure of 1.57 psf.
    - b. Water Infiltration Per ASTM E 547: no water penetration at 9.19 psf.
    - c. Uniform Load Structural Per ASTM E 330: 75 psf.
    - d. Uniform Load Design Pressure: 50 psf.
    - e. Overall Design Pressure Rating: 50 psf.
    - f. Certifications:
      - 1) AAMA/WDMA/CSA/101/I.S.2/A440.
        - a) CW PG50 grade rating for awning windows.
      - 2) NFRC 100 for U-factor.
      - 3) NFRC 200 for Solar Heat Gain Coefficient (SHGC).
  3. Operation: Motorized double scissor-arm.
  4. Operation: Manual double scissor-arm with roto operator.
  5. Operation: Manual double scissor-arm with folding crank handles.
  6. Frames and Sills: Thermally broken.
    - a. Extruded aluminum, 6063-T5.
      - 1) Width: 21 to 60 inches (533 to 1524 mm) maximum.
      - 2) Height: 16 to 48 inches (406 to 1219 mm) maximum.
      - 3) Sloped Sill: for improved water drainage.
      - 4) Frame Depth: 4.5 inches (114 mm).
    - b. Stops: Glazing secured with extruded aluminum snap-in stops, removable for glazing and reglazing.
      - 1) Stepped profile with removable stops for re-glazing. Available in multiple dimensions. Accommodates glass sizes from .75 to 1 inch (19 to 25 mm) overall.
    - c. Construction: Structural frame extruded shapes with sash members that are full-hollow (tubular) extrusions.
      - 1) Frame members fitted and mechanically joined at corners with stainless steel screws and sealed with high-grade silicone sealant.
      - 2) Sash members mitered, mechanically joined with crimped aluminum corner keys, and sealed with high-grade silicone sealant.
    - d. Weatherstripping: Bulb vinyl and closed cell foam tape.
  7. Hardware: Stainless steel.
    - a. Exposed Hardware Finish: Painted to match frame finish.

- b. Exposed Hardware Finish: Brushed nickel finish.
  - c. Hidden multi-point locking system.
  - d. Hinges: Heavy duty concealed four bar hinges.
8. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.
- a. Glazing: Argon Filled with LowE coating on No. 2 surface, from Cardinal Glass Industries.
    - 1) Glazing Type: LoE-270 all-climate coated glass.
    - 2) Glazing Type: LoE-366 high performance glass.
    - 3) Glazing Type: LoE-340 laminated, solar, and glare control glass.
    - 4) Glazing Type: As determined by the Architect.
    - 5) Glazing Type: \_\_\_\_\_.
    - 6) Enhanced Low-E Coating Used with Glazing Type Above: LoE-i89 enhanced winter performance glass.
    - 7) Overall Thickness: 3/4 inch (19 mm).
    - 8) Overall Thickness: 7/8 inch (22 mm).
    - 9) Overall Thickness: 1 inch (25 mm).
    - 10) Overall Thickness: As determined by the Architect.
    - 11) U-Factor: 0.49.
    - 12) U-Factor: As determined by the Architect.
    - 13) U-Factor: \_\_\_\_\_.
9. Aluminum Finish: Provide same finish on inside and outside.
- a. Anodized Finish AAC - Class 1 Color: Satin.
    - 1) Per AAMA 611.98.
  - b. Anodized Finish AAC - Class 1 Color: Dark bronze.
    - 1) Per AAMA 611.98.
  - c. Paint Finish per AAMA - 2605 minimum.
    - 1) Color: Hillside bronze.
    - 2) Color: Bison beige.
    - 3) Color: Navajo white.
    - 4) Color: Briar.
    - 5) Color: Stonish beige.
    - 6) Color: Autumn night.
    - 7) Color: Warmtone.
    - 8) Color: Cinnamon toast.
    - 9) Color: Western white.
    - 10) Color: As determined by the Architect.
    - 11) Color: \_\_\_\_\_.
10. Screening: Extruded aluminum frames finished to match the window's frame color. Attached to window with an easy-to-use concealed ball catch system.
- a. Mesh: 18 x 16 charcoal-colored vinyl-coated fiberglass mesh.
  - b. Swing-Out Awnings: Screens mount to window frame interior.
- C. Basis of Design: Series 670: Aluminum Casement Push-Out Hinged Windows as manufactured by Western Window Systems.
- 1. Aluminum casement awning hinged windows, thermally controlled, including frames, sills, and glazing to sizes indicated on the Drawings.
  - 2. Performance Requirements:
    - a. Air Infiltration Per ASTM E 283: .20 cfm/sf at test pressure of 1.57 psf.
    - b. Water Infiltration Per ASTM E 547: no water penetration at 6 psf.
    - c. Uniform Load Structural Per ASTM E 330: 60 psf
    - d. Uniform Load Design Pressure: 40 psf.
    - e. Overall Design Pressure Rating: DP 40.
    - f. Certifications:
      - 1) AAMA/WDMA/CSA/101/I.S.2/A440.
        - a) CW PG40 grade rating for casement windows.

- 2) NFRC 100 for U-factor.
- 3) NFRC 200 for Solar Heat Gain Coefficient (SHGC).
- 3. Operation: Manual turn of locking handle and light push.
- 4. Frames and Sills: Thermally broken.
  - a. Extruded aluminum, 6063-T5.
    - 1) Width: 16 to 36 inches (406 to 914 mm) maximum.
    - 2) Height: 16 to 72 inches (406 to 1829 mm) maximum.
    - 3) Sloped Sill: for improved water drainage.
    - 4) Frame Depth: 4.5 inches (114 mm).
  - b. Stops: Glazing secured with extruded aluminum snap-in stops, removable for glazing and reglazing.
    - 1) Standard Stop: Stepped profile with removable stops for re-glazing. Available in multiple dimensions. Accommodates glass sizes from .75 to 1 inch (19 to 25 mm) overall.
      - a) Stops in arches are applied with exposed screws.
  - c. Construction: Structural frame extruded shapes with sash members that are full-hollow (tubular) extrusions.
    - 1) Frame members fitted and mechanically joined at corners with stainless steel screws and sealed with high-grade silicone sealant.
    - 2) Sash members mitered, mechanically joined with crimped aluminum corner keys, and sealed with high-grade silicone sealant.
  - d. Weatherstripping: Bulb vinyl and closed cell foam tape.
- 5. Hardware: Stainless steel.
  - a. Exposed Hardware Finish: Painted to match frame finish.
  - b. Exposed Hardware Finish: Brushed nickel finish.
  - c. Hidden multi-point locking system.
  - d. Hinges: Heavy duty concealed four bar hinges with adjustable tensioning device.
- 6. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.
  - a. Glazing: Argon Filled with LowE coating on No. 2 surface, from Cardinal Glass Industries.
    - 1) Glazing Type: LoE-270 all-climate coated glass.
    - 2) Glazing Type: LoE-366 high performance glass.
    - 3) Glazing Type: LoE-340 laminated, solar, and glare control glass.
    - 4) Glazing Type: As determined by the Architect.
    - 5) Glazing Type: \_\_\_\_\_.
    - 6) Enhanced Low-E Coating Used with Glazing Type Above: LoE-i89 enhanced winter performance glass.
    - 7) Overall Thickness: 3/4 inch (19 mm).
    - 8) Overall Thickness: 7/8 inch (22 mm).
    - 9) Overall Thickness: 1 inch (25 mm).
    - 10) Overall Thickness: As determined by the Architect.
    - 11) U-Factor: 0.48.
    - 12) U-Factor: As determined by the Architect.
    - 13) U-Factor: \_\_\_\_\_.
- 7. Aluminum Finish: Provide same finish on inside and outside.
  - a. Anodized Finish AAC - Class 1 Color: Satin.
    - 1) Per AAMA 611.98.
  - b. Anodized Finish AAC - Class 1 Color: Dark bronze.
    - 1) Per AAMA 611.98.
  - c. Paint Finish per AAMA - 2605 minimum.
    - 1) Color: Hillside bronze.
    - 2) Color: Bison beige.

- 3) Color: Navajo white.
- 4) Color: Briar.
- 5) Color: Stonish beige.
- 6) Color: Autumn night.
- 7) Color: Warmtone.
- 8) Color: Cinnamon toast.
- 9) Color: Western white.
- 10) Color: As determined by the Architect.
- 11) Color: \_\_\_\_\_.

D. Basis of Design: Series 670: Aluminum Hopper Hinged Windows as manufactured by Western Window Systems.

1. Aluminum casement hinged windows, thermally broken, including frames, sills, and glazing to sizes indicated on the Drawings.
2. Performance Requirements:
  - a. Air Infiltration Per ASTM E 283: .20 cfm/sf at test pressure of 1.57 psf.
  - b. Water Infiltration Per ASTM E 547: no water penetration at 9.19 psf.
  - c. Uniform Load Structural Per ASTM E 330: 37.5 psf.
  - d. Uniform Load Design Pressure: 25 psf.
  - e. Overall Design Pressure Rating: DP 25.
  - f. Certifications:
    - 1) AAMA/WDMA/CSA/101/I.S.2/A440-11.
      - a) LC PG25 grade rating for hopper windows.
    - 2) NFRC 100 for U-factor.
    - 3) NFRC 200 for Solar Heat Gain Coefficient (SHGC).
3. Operation: Manual turn of pawl handle or ring pull.
4. Frames and Sills: Thermally broken. Latch with extension pole.
  - a. Extruded aluminum, 6063-T5.
    - 1) Width: 16 to 60 inches (406 to 1524 mm) maximum.
    - 2) Height: 16 to 48 inches (406 to 1219 mm) maximum.
    - 3) Sloped Sill: for improved water drainage.
    - 4) Frame Depth: 4.5 inches (114 mm).
  - b. Stops: Glazing secured with extruded aluminum snap-in stops, removable for glazing and reglazing.
    - 1) Standard Stop: Stepped profile with removable stops for re-glazing. Available in multiple dimensions. Accommodates glass sizes from .75 to 1 inch (19 to 25 mm) overall.
      - a) Stops in arches are applied with exposed screws.
  - c. Construction: Structural frame extruded shapes with sash members that are full-hollow (tubular) extrusions.
    - 1) Frame members fitted and mechanically joined at corners with stainless steel screws and sealed with high-grade silicone sealant.
    - 2) Sash members mitered, mechanically joined with crimped aluminum corner keys, and sealed with high-grade silicone sealant.
  - d. Weatherstripping: Bulb vinyl and closed cell foam tape.
5. Hardware: Stainless steel.
  - a. Exposed Hardware Finish: Brushed nickel finish.
  - b. Butt Hinges:
    - 1) Windows Less Than 36 inches (914 mm) High: Two.
    - 2) Windows From 36 up to 60 inches (914 up to 1524 mm) High: Three.
    - 3) Windows From 60 up to 84 inches (1524 up to 2134 mm) High: Four.
    - 4) Windows From 84 through 120 inches (2134 through 3048 mm)



High: Five.

6. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.
  - a. Glazing: Argon Filled with LowE coating on No. 2 surface, from Cardinal Glass Industries.
    - 1) Glazing Type: LoE-270 all-climate coated glass.
    - 2) Glazing Type: LoE-366 high performance glass.
    - 3) Glazing Type: LoE-340 laminated, solar, and glare control glass.
    - 4) Glazing Type: As determined by the Architect.
    - 5) Glazing Type: \_\_\_\_\_.
    - 6) Enhanced Low-E Coating Used with Glazing Type Above: LoE-i89 enhanced winter performance glass.
    - 7) Overall Thickness: 3/4 inch (19 mm).
    - 8) Overall Thickness: 7/8 inch (22 mm).
    - 9) Overall Thickness: 1 inch (25 mm).
    - 10) Overall Thickness: As determined by the Architect.
    - 11) U-Factor: 0.48.
    - 12) U-Factor: As determined by the Architect.
    - 13) U-Factor: \_\_\_\_\_.
7. Aluminum Finish: Provide same finish on inside and outside.
  - a. Anodized Finish AAC - Class 1 Color: Satin.
    - 1) Per AAMA 611.98.
  - b. Anodized Finish AAC - Class 1 Color: Dark bronze.
    - 1) Per AAMA 611.98.
  - c. Paint Finish per AAMA - 2605 minimum.
    - 1) Color: Hillside bronze.
    - 2) Color: Bison beige.
    - 3) Color: Navajo white.
    - 4) Color: Briar.
    - 5) Color: Stonish beige.
    - 6) Color: Autumn night.
    - 7) Color: Warmtone.
    - 8) Color: Cinnamon toast.
    - 9) Color: Western white.
    - 10) Color: As determined by the Architect.
    - 11) Color: \_\_\_\_\_.
8. Screening: Extruded aluminum frames finished to match the window's frame color. Attached to window with an easy-to-use concealed ball catch system.
  - a. Mesh: 18 x 16 charcoal-colored vinyl-coated fiberglass mesh.
  - b. Swing-In Hopper: Screens mount to window frame exterior.
  - c. Swing-Out Hopper: Screens mount to window frame interior.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- B. Clean and prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Verify dimensions of openings fit net frame dimensions of window system. Verify openings are level, plumb, and square, with no unevenness.
- D. Verify that anchoring surface is in accordance with approved shop drawings.

- E. Commencement of installation constitutes acceptance of conditions.

### 3.2 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions, recommendations, and approved submittals.
- B. Flash and waterproof the perimeter of the opening and frame per manufacturer instructions.
- C. Securely fit frame, level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work.
- D. Thoroughly clean window frames, casings, and glass using materials and methods recommended by the window and glass manufacturer that do not cause defacement of work.

### 3.3 CERTIFICATION

- A. Provide written certification that all components have been successfully operated and will perform in accordance with the intent of this design.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION