



SERIES W50 CA-IN AW-PG55-C CASEMENT INSWING WINDOW

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish and install aluminum windows as shown in bid drawings and as per specifications stipulated in this section.
- B. Factory-installed glass & glazing

1.2 ITEMS FURNISHED BUT NOT INSTALLED *(Enter description and quantity of items such as extra sash, screens, glass units, hardware, etc. for attic stock)*

1.3 ITEMS INSTALLED BUT NOT FURNISHED *(Enter description and quantity of items such as air conditioners, louvers, duct work to be installed in locations as directed by Architect)*

1.4 RELATED SECTIONS

- A. Section 07 90 00 - Joint Protection.
- B. Section 08 41 00 - Entrances and Storefronts.
- C. Section 08 70 00 - Hardware.

1.5 REFERENCES

- A. AAMA - American Architectural Manufacturers Association:
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-17 "North American Fenestration Standard/Specification for Windows, Doors, and Skylights"
 - 2. AAMA 502-12 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
 - 3. AAMA 611-14 - Voluntary Specification for Anodized Architectural Aluminum
 - 4. AAMA 701/702-11 - Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
 - 5. AAMA 800-16 - Voluntary Specifications and Test Methods for Sealants.
 - 6. AAMA 902-14 - Voluntary Specification for Sash Balances.
 - 7. AAMA 910-10 - Voluntary 'Life Cycle' Specifications and Test Methods for AW Class Architectural Windows and Doors.
 - 8. AAMA 1503-09 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections.
 - 9. AAMA 2603-15 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 10. AAMA 2604-13 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 11. AAMA 2605-13 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM – American Society for Testing and Materials:
 - 1. ASTM E283(2012) - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E330/330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference.

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3. ASTM E331-00 (2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 4. ASTM E547-00 (2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential..
 5. ASTM F588-14 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact
 6. ASTM E2190-10 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. NFRC - National Fenestration Rating Council.
1. NFRC 100-2020 - Procedure for Determining Fenestration Product U Factors.
 2. NFRC 102-2020 - Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.
 3. NFRC 200-2020 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
 4. NFRC 500-2020 - Procedure for Determining Fenestration Product Condensation Resistance Values.
- D. IGCC - Insulating Glass Certification Council.
- E. SGCC - Safety Glazing Certification Council.
1. ANSI Z97.1-2009 - American National Standard for Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test.
 2. 16 CFR 1201 - Consumer Product Safety Commission Safety - Standard for Architectural Glazing Materials - codified at Title 16, Part 1201 of the Code of Federal Regulations.
- F. ANSI Z97.1 - American National Standard For Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test/Consumer Products Safety Commission CPSC 16 CFR 1201.
- G. LEED: The Leadership in Energy & Environmental Design; U.S. Green Building Council (USGBC).

1.6 SUBMITTALS

- A. Submit administrative requirements under provisions of Section 01 30 00.
- 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:
1. Elevation for each style window specified indicating its size, glazing type, muntin type, and design.
 2. Manufacturer's head, jamb, and sill details; section views for each window type specified.
- D. Schedules:
1. Provide a window schedule indicating the type, size, color, and operation of each unit specified. Coordinate with window mark types found in the Contract Drawings.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, samples may be subsequently installed on the project.

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- G. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.

1.7 SYSTEM DESCRIPTION

A. Operation: Inswing Casement

B. AAMA Rating: AW-PG55-C when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-17 at the size of 48" x 72"

C. Construction: 5 inch frame depth. Wall thickness: 0.080" frame/sill; 0.080" sash. Factory finished extruded aluminum frame and sash members with integral structural fiberglass reinforced polyamide thermal barrier.

D. Glazing: 1 1/4 inch insulating glass; monolithically bonded to the sash frame with double-sided structural glazing tape (SGT) on the interior, and the exterior edge shielded by a polyamide glazing bead with an integral bulb gasket.

1.8 HARDWARE:

A. Handle: Lever handle mounted to sash interior with concealed screws. Turning the handle shall activate a concealed aluminum slide bar with integral sash locks to engage keepers attached to the frame on multiple points around the sash perimeter as required by window size.

B. Hinges: Extruded aluminum butt-type hinges with heavy-duty stainless steel pin to rotate vent inward on vertical axis (turn operation)

1.9 WEATHERSTRIPPING:

A. Frame: EPDM "gooseneck" type gasket with integral grooves fitted into the frame extrusion to provide a continuous primary seal between frame and sash. EPDM gasket to be joined and sealed at corners.

B. Sash: Two rows of compression type bulb gasket, one on the interior and one on the exterior

1.10 PERFORMANCE REQUIREMENTS

A. Air, Water and Structural Performance Requirements:

When tested in accordance with cited test procedures, windows shall meet or exceed the following performance criteria, as well as those indicated in AAMA/WDMA/CSA 101/I.S.2/A440-17 for performance grade of unit specified unless otherwise noted herein.

1. Air Test Performance Requirements:

- a. Performance: Air infiltration maximum 0.10 cfm per square foot at 6.27 psf pressure differential, and air exfiltration maximum 0.10 cfm per square foot at 1.57 psf pressure differential when tested in accordance with ASTM E283 for compression seal products.

2. Water Test Performance Requirements:

- a. No uncontrolled water leakage at 12.12 psf static pressure differential when tested in accordance with ASTM E331 and ASTM E547.

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3. Structural Test Performance Requirements:
 - a. Uniform Load Deflection Test
 - 1) No deflection of any unsupported span L of test unit (framing rails, muntins, mullions, etc.) in excess of L/175 at both a positive and negative load of design test pressure when tested in accordance with ASTM E330.
 - 2) Structural reinforcing that is not standard on units being furnished is not allowed.
 - b. Uniform Load Structural Test:
 - 1) Unit to be tested at 1.5 x design test pressure, both positive and negative, acting normal to plane of wall in accordance with ASTM E330.
 - 2) No glass breakage; permanent damage to fasteners, hardware parts, or anchors; damage to make windows inoperable; or permanent deformation of any main frame or ventilator member in excess of 0.2% of its clear span.
- B. Forced Entry Resistance Test: ASTM F 588, Type and Grade as indicated for each Product.
- C. Thermal Performance Requirements
 1. Perform thermal computer simulation in accordance with the configuration specified in NFRC 100, NFRC 200, and NFRC 500.
 2. Computed Thermal Transmittance (U-Value) shall not exceed (value determined based on glazing element) BTU/hr/sq.ft./°F for the whole window assembly.
 3. Computed Solar Heat Gain Coefficient (SHGC) shall not exceed (value determined based on glazing element) for the whole window assembly.

1.11 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All windows specified in this section shall be supplied by a manufacturer which has been fabricating/manufacturing commercial grade aluminum windows of similar quality and performance for a minimum of ten (10) years.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing windows of the same type and scope as specified, preferably AAMA certified installers.
- C. Provide test reports from AAMA accredited laboratory certifying that window units are found to be in compliance with AAMA/WDMA/CSA 101/I.S.2/A440-17 and performance standards listed above.
 1. Test reports shall be accompanied by the window manufacturer's letter of certification stating that the tested window meets or exceeds criteria for the appropriate AAMA/WDMA/CSA 101/I.S.2/A440 test.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommendations.
- B. Protect units against damage from the elements, construction activities, and other hazards before, during, and after installation.

1.13 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 absolute limits.

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1.14 WARRANTY

- A. Refer to Crystal Window & Door Systems, Ltd. standard warranty.
- B. Optional Extended Warranty (contact your Crystal sales representative).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: **Crystal Window & Door Systems, Ltd.**, which is located at: 31-10 Whitestone Expressway, Flushing, NY 11354; Tel: 718. 961.7300; Tel: 800. 472.9988; Fax: 718.460.4594; Web: www.crystalwindows.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 Aluminum:

- A. Extruded aluminum prime billet 6063-T5 or 6063-T6 alloy for primary components; 6063-T5, 6063-T6, or 6061-T6 for structural components; all meeting the requirements of ASTM B221.
- B. Aluminum sheet alloy 5005 H 32 (for anodic finish), meeting the requirements of ASTM B209 or alloy 3003 H 14 (for painted or unfinished sheet).

2.3 Thermal Barrier:

- A. Structural Thermal Barrier:
 - 1. Structural thermal barriers shall consist of polyamide nylon 6.6 struts reinforced with glass fibers oriented in all three axis. Main frame members shall use twin polyamide struts not less than 18.6mm in length. Sash members shall use a polyamide strut not less than 29.7mm in length.
 - 2. Polyamide struts shall be mechanically crimped into aluminum profiles using integral extruded races. Aluminum races shall be mechanically knurled as per polyamide strut manufacturer's recommendations. Shear strength of finished assembly shall be per AAMA TIR-A8-04.
 - 3. Non-Structural Thermal Barriers: Non-structural thermal barriers are used only in conjunction with structural thermal barriers. The purpose of non structural thermal barriers is to enhance thermal performance of the primary structural thermal barriers (polyamide struts) by inhibiting heat transfer through thermal radiation and convection. Non structural thermal barriers shall not be used as primary load carrying members.
 - 4. Rigid non structural thermal barriers shall be constructed of extruded polyvinylchloride (PVC).

2.4 GLASS

- A. Glazing Materials:
 - 1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical. Design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 2. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 3. Strength: Where float glass is indicated, provide annealed float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
 - 4. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated.

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- a. U-Factors: Total-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.4 computer program, expressed as BTU/sq.ft x h x deg F (W/sq. m x K).
 - b. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7.4 computer program.
 - c. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
 - d. Condensation Resistance NFRC 500
 5. Float Glass: ASTM C 1036, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated.
 6. Coated Glass: ASTM C 1376, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated, of kind and condition indicated.
 7. Laminated Glass: ASTM C 1172, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated, of kind and condition indicated.
- B. Insulating Glass Units:
1. Factory-assemble units consisting of sealed lites of glass separated by a PPG Intercept Spacer system consisting of a one-piece, metallic, U-channel design that creates an effective thermal barrier to help reduce conducted heat loss through the window.
 2. Insulating glass units shall be sealed with an integral dessicant matrix and a butyl sealant extruded around the entire perimeter of the spacer to achieve a seal. The sealant applied is to be Dual Seal Equivalent (DSE). Interspace to be filled with air or argon gas as required by thermal computer simulation.
 3. Insulating Glass Types: Low-E coated, insulating glass units.
 - a. Overall Unit Thickness: 1", 1-1/4", 1-1/2"
 - b. Thickness of Each Glass Lite: 3/32", 1/8", 3/16", 1/4, 5/16"
 - c. Outdoor Lite: Class 1 (Clear) float glass, fully tempered float glass, or laminated glass
 - d. Interspace Content: Air or Argon Gas.
 - e. Indoor Lite: Class 1 (Clear) float glass, or fully tempered float glass or laminated glass
 - f. Low-E Coating: Sputtered on second or third surface, pyrolitic on fourth surface
 - g. Glass Winter Night time U-Value: 0.27 maximum.
 - h. Solar Heat Gain Coefficient: 0.46 maximum.
 - i. Provide safety glazing labeling, if necessary.

2.5 WINDOW ACCESSORIES

Provide the following accessories as specified in the contract drawings. Finish to match window frames or as selected by the Architect:

- A. Wrap Around Panning
- B. Preset Panning
- C. Snap Trim/Clips
- D. Expanders
- E. Receptors
- F. Subsills and Subsill Anchors
- G. Mullions and Mullion Covers
- H. Exterior Sills

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- I. Interior Stools
 - J. Muntins
- 2.6 FINISHES
- A. Conforming to AAMA 2604-13 specification, finish on all extruded aluminum shall consist of zero or near-zero VOC, organic POWDER COAT with a baked on super-durable thermosetting polyester resin, electro-statically applied on five-stage pre-treated aluminum surface. Equivalent to 50% Kynar polyvinylidene fluoride liquid paint finishes. Powder coat material to be as manufactured by Sherwin Williams or PPG Powder Coatings.
 - B. Color to be selected from Manufacturer's Standard Color Chart (or custom-matched as required by project Architect/Owner).
- 2.7 Insect Screens:
- A. Screen frames shall consist of tubular extruded aluminum profiles with finish to match window frames.
 - B. Fiberglass mesh (18 X 16) with PVC spline.
- 2.8 Steel components including attachment fasteners shall be 300 series stainless steel except as noted.
- 2.9 Thermoplastic or thermo-set plastic caps, housings and other components shall be injection-molded nylon, extruded PVC, or other suitable compound.
- 2.10 Sealants:
- 1. Sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
 - 2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 ANCHORAGE

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- A. Anchor window units and/or assemblies sufficiently to maintain permanent positions when subjected to normal thermal movement, specified building movement and specified wind loads.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Final operating adjustment shall be made after glazing work is complete. Operating sash and ventilator shall operate smoothly and shall be weathertight when in locked position
- C. Touch-up, repair, or replace damaged products before Substantial Completion.

3.6 DISPOSAL OF DEBRIS

- A. Remove all garbage off site and legally dispose of existing windows and debris generated from the installation of the new windows.

3.7 OPTIONAL FIELD TESTING

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspection
 - 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 shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/1.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 times test pressure required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 ADJUSTMENT AND CLEAN UP

- A. Adjust all products, sash, vents, and hardware after installation, as necessary to provide proper operation and a weather tight installation
- B. Remove any labels and dirt from the window.

END OF SECTION



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SECTION 08 51 13
ALUMINUM WINDOWS

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1.4 RELATED SECTIONS

- A. Section 07 90 00 - Joint Protection.
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1.5 REFERENCES

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3. ASTM E331-00 (2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
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 3. Installation methods.
- C. Shop Drawings:
1. Elevation for each style window specified indicating its size, glazing type, muntin type, and design.
 2. Manufacturer's head, jamb, and sill details; section views for each window type specified.
- D. Schedules:
1. Provide a window schedule indicating the type, size, color, and operation of each unit specified. Coordinate with window mark types found in the Contract Drawings.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, samples may be subsequently installed on the project.

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- G. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.

1.7 SYSTEM DESCRIPTION

- A. Operation: Fixed
- B. AAMA Rating: AW-PG75-FX when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-17 at the size of 83-3/4"X79-1/2"
- C. Construction: 5 inch frame depth. Wall thickness: 0.080" frame/sill; 0.080" sash. Factory finished extruded aluminum frame and sash members with integral structural fiberglass reinforced polyamide thermal barrier.
- D. Glazing: 1 inch, 1 1/4 inch, or 1 1/2 inch insulating glass; monolithically bonded to the sash frame with double-sided structural glazing tape (SGT) on the interior, and the exterior edge shielded by a polyamide glazing bead with an integral bulb gasket.

1.8 HARDWARE: (None)

1.9 WEATHERSTRIPPING:

- A. Compression type EPDM wedge gasket on the interior glazing bead.

1.10 PERFORMANCE REQUIREMENTS

- A. Air, Water and Structural Performance Requirements:

When tested in accordance with cited test procedures, windows shall meet or exceed the following performance criteria, as well as those indicated in AAMA/WDMA/CSA 101/I.S.2/A440-17 for performance grade of unit specified unless otherwise noted herein.

1. Air Test Performance Requirements:
 - a. Performance: Air infiltration maximum 0.06 cfm per square foot at 6.24 psf pressure differential, and air exfiltration maximum 0.06 cfm per square foot at 6.24 psf pressure differential when tested in accordance with ASTM E283 for compression seal products.
2. Water Test Performance Requirements:
 - a. No uncontrolled water leakage at 15 psf static pressure differential when tested in accordance with ASTM E331 and ASTM E547.
3. Structural Test Performance Requirements:
 - a. Uniform Load Deflection Test
 - 1) No deflection of any unsupported span L of test unit (framing rails, muntins, mullions, etc.) in excess of L/175 at both a positive and negative load of design test pressure when tested in accordance with ASTM E330.
 - 2) Structural reinforcing that is not standard on units being furnished is not allowed.
 - b. Uniform Load Structural Test:
 - 1) Unit to be tested at 1.5 x design test pressure, both positive and negative, acting normal to plane of wall in accordance with ASTM E330.
 - 2) No glass breakage; permanent damage to fasteners, hardware parts, or anchors; damage to make windows inoperable; or permanent deformation of any main frame or ventilator member in excess of 0.2% of its clear span.



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- B. Forced Entry Resistance Test: ASTM F 588, Type and Grade as indicated for each Product.
- C. Thermal Performance Requirements
 - 1. Perform thermal computer simulation in accordance with the configuration specified in NFRC 100, NFRC 200, and NFRC 500.
 - 2. Computed Thermal Transmittance (U-Value) shall not exceed (value determined based on glazing element) BTU/hr/sq.ft./°F for the whole window assembly.
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1.11 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All windows specified in this section shall be supplied by a manufacturer which has been fabricating/manufacturing commercial grade aluminum windows of similar quality and performance for a minimum of ten (10) years.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing windows of the same type and scope as specified, preferably AAMA certified installers.
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1.12 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommendations.
- B. Protect units against damage from the elements, construction activities, and other hazards before, during, and after installation.

1.13 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 absolute limits.

1.14 WARRANTY

- A. *Refer to Crystal Window & Door Systems, Ltd. standard warranty.*
- B. *Optional Extended Warranty (contact your Crystal sales representative).*

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: **Crystal Window & Door Systems, Ltd.**, which is located at: 31-10 Whitestone Expressway, Flushing, NY 11354; Tel: 718. 961.7300; Tel: 800. 472.9988; Fax: 718.460.4594; Web: www.crystalwindows.com

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- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 Aluminum:

- A. Extruded aluminum prime billet 6063-T5 or 6063-T6 alloy for primary components; 6063-T5, 6063-T6, or 6061-T6 for structural components; all meeting the requirements of ASTM B221.
- B. Aluminum sheet alloy 5005 H 32 (for anodic finish), meeting the requirements of ASTM B209 or alloy 3003 H 14 (for painted or unfinished sheet).

2.3 Thermal Barrier:

- A. Structural Thermal Barrier:
1. Structural thermal barriers shall consist of polyamide nylon 6.6 struts reinforced with glass fibers oriented in all three axis. Main frame members shall use twin polyamide struts not less than 18.6mm in length. Sash members shall use a polyamide strut not less than 29.7mm in length.
 2. Polyamide struts shall be mechanically crimped into aluminum profiles using integral extruded races. Aluminum races shall be mechanically knurled as per polyamide strut manufacturer's recommendations. Shear strength of finished assembly shall be per AAMA TIR-A8-04.
 3. Non-Structural Thermal Barriers: Non-structural thermal barriers are used only in conjunction with structural thermal barriers. The purpose of non structural thermal barriers is to enhance thermal performance of the primary structural thermal barriers (polyamide struts) by inhibiting heat transfer through thermal radiation and convection. Non structural thermal barriers shall not be used as primary load carrying members.
 4. Rigid non structural thermal barriers shall be constructed of extruded polyvinylchloride (PVC).

2.4 GLASS

- A. Glazing Materials:
1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical. Design glass to resist design wind pressure based on glass type factors for short-duration load.
 2. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 3. Strength: Where float glass is indicated, provide annealed float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
 4. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated.
 - a. U-Factors: Total-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.4 computer program, expressed as BTU/sq.ft x h x deg F (W/sq. m x K).
 - b. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7.4 computer program.
 - c. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
 - d. Condensation Resistance NFRC 500
 5. Float Glass: ASTM C 1036, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated.
 6. Coated Glass: ASTM C 1376, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated, of kind and condition indicated.
 7. Laminated Glass: ASTM C 1172, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated, of kind and condition indicated.

SERIES W50I FX PICTURE WINDOW

- B. Insulating Glass Units:
1. Factory-assemble units consisting of sealed lites of glass separated by a PPG Intercept Spacer system consisting of a one-piece, metallic, U-channel design that creates an effective thermal barrier to help reduce conducted heat loss through the window.
 2. Insulating glass units shall be sealed with an integral dessicant matrix and a butyl sealant extruded around the entire perimeter of the spacer to achieve a seal. The sealant applied is to be Dual Seal Equivalent (DSE). Interspace to be filled with air or argon gas as required by thermal computer simulation.
 3. Insulating Glass Types: Low-E coated, insulating glass units.
 - a. Overall Unit Thickness: 1", 1-1/4", 1-1/2"
 - b. Thickness of Each Glass Lite: 3/32", 1/8", 3/16", 1/4", 5/16"
 - c. Outdoor Lite: Class 1 (Clear) float glass, fully tempered float glass, or laminated glass
 - d. Interspace Content: Air or Argon Gas.
 - e. Indoor Lite: Class 1 (Clear) float glass, fully tempered float glass or laminated glass
 - f. Low-E Coating: Sputtered on second or third surface , pyrolytic on fourth surface
 - g. Glass Winter Night time U-Value: 0.27 maximum.
 - h. Solar Heat Gain Coefficient: 0.46 maximum.
 - i. Provide safety glazing labeling, if necessary.

2.5 WINDOW ACCESSORIES

Provide the following accessories as specified in the contract drawings. Finish to match window frames or as selected by the Architect:

- A. Wrap Around Panning
- B. Preset Panning
- C. Snap Trim/Clips
- D. Expanders
- E. Receptors
- F. Subsills and Subsill Anchors
- G. Mullions and Mullion Covers
- H. Exterior Sills
- I. Interior Stools
- J. Muntins

2.6 FINISHES

- A. Conforming to AAMA 2604-13 specification, finish on all extruded aluminum shall consist of zero or near-zero VOC, organic POWDER COAT with a baked on super-durable thermosetting polyester resin, electro-statically applied on five-stage pre-treated aluminum surface. Equivalent to 50% Kynar polyvinylidene fluoride liquid paint finishes. Powder coat material to be as manufactured by Sherwin Williams or PPG Powder Coatings.
- B. Color to be selected from Manufacturer's Standard Color Chart (or custom-matched as required by project Architect/Owner).

SERIES W50I FX PICTURE WINDOW

- 2.7 Insect Screens:
 - A. Screen frames shall consist of tubular extruded aluminum profiles with finish to match window frames.
 - B. Fiberglass mesh (18 X 16) with PVC spline.
- 2.8 Steel components including attachment fasteners shall be 300 series stainless steel except as noted.
- 2.9 Thermoplastic or thermo-set plastic caps, housings and other components shall be injection-molded nylon, extruded PVC, or other suitable compound.
- 2.10 Sealants:
 - 1. Sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
 - 2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 ANCHORAGE

- A. Anchor window units and/or assemblies sufficiently to maintain permanent positions when subjected to normal thermal movement, specified building movement and specified wind loads.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Final operating adjustment shall be made after glazing work is complete. Operating sash and ventilator shall operate smoothly and shall be weathertight when in locked position.
- C. Touch-up, repair, or replace damaged products before Substantial Completion.

3.6 DISPOSAL OF DEBRIS

SERIES W50I FX PICTURE WINDOW

A. Remove all garbage off site and legally dispose of existing windows and debris generated from the installation of the new windows.

3.7 OPTIONAL FIELD TESTING

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspection
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 shall take place as follows:
1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AMA 502.
 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AMA/WDMA/CSA 101/1.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 times test pressure required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 ADJUSTMENT AND CLEAN UP

- A. Adjust all products, sash, vents, and hardware after installation, as necessary to provide proper operation and a weather tight installation
- B. Remove any labels and dirt from the window.

END OF SECTION



SERIES W50 PO AW-PG55-AP PROJECTED-OUT AWNING WINDOW

SECTION 08 51 13 ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish and install aluminum windows as shown in bid drawings and as per specifications stipulated in this section.
- B. Factory-installed glass & glazing

1.2 ITEMS FURNISHED BUT NOT INSTALLED *(Enter description and quantity of items such as extra sash, screens, glass units, hardware, etc. for attic stock)*

1.3 ITEMS INSTALLED BUT NOT FURNISHED *(Enter description and quantity of items such as air conditioners, louvers, duct work to be installed in locations as directed by Architect)*

1.4 RELATED SECTIONS

- A. Section 07 90 00 - Joint Protection.
- B. Section 08 41 00 - Entrances and Storefronts.
- C. Section 08 70 00 - Hardware.

1.5 REFERENCES

- A. AAMA - American Architectural Manufacturers Association:
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-17 "North American Fenestration Standard/Specification for Windows, Doors, and Skylights"
 - 2. AAMA 502-12 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
 - 3. AAMA 611-14 - Voluntary Specification for Anodized Architectural Aluminum
 - 4. AAMA 701/702-11 - Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
 - 5. AAMA 800-16 - Voluntary Specifications and Test Methods for Sealants.
 - 6. AAMA 902-14 - Voluntary Specification for Sash Balances.
 - 7. AAMA 910-10 - Voluntary 'Life Cycle' Specifications and Test Methods for AW Class Architectural Windows and Doors.
 - 8. AAMA 1503-09 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections.
 - 9. AAMA 2603-15 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 10. AAMA 2604-13 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 11. AAMA 2605-13 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM – American Society for Testing and Materials:
 - 1. ASTM E283-04(2012) - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E330/330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference.

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3. ASTM E331-00 (2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 4. ASTM E547-00 (2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential..
 5. ASTM F588-14 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact
 6. ASTM E2190-10 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. NFRC - National Fenestration Rating Council.
1. NFRC 100-2020 - Procedure for Determining Fenestration Product U Factors.
 2. NFRC 102-2020 - Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.
 3. NFRC 200-2020 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
 4. NFRC 500-2020 - Procedure for Determining Fenestration Product Condensation Resistance Values.
- D. IGCC - Insulating Glass Certification Council.
- E. SGCC - Safety Glazing Certification Council.
1. ANSI Z97.1-2009 - American National Standard for Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test.
 2. 16 CFR 1201 - Consumer Product Safety Commission Safety - Standard for Architectural Glazing Materials - codified at Title 16, Part 1201 of the Code of Federal Regulations.
- F. ANSI Z97.1 - American National Standard For Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test/Consumer Products Safety Commission CPSC 16 CFR 1201.
- G. LEED: The Leadership in Energy & Environmental Design; U.S. Green Building Council (USGBC).

1.6 SUBMITTALS

- A. Submit administrative requirements under provisions of Section 01 30 00.
- 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:
1. Elevation for each style window specified indicating its size, glazing type, muntin type, and design.
 2. Manufacturer's head, jamb, and sill details; section views for each window type specified.
- D. Schedules:
1. Provide a window schedule indicating the type, size, color, and operation of each unit specified. Coordinate with window mark types found in the Contract Drawings.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, samples may be subsequently installed on the project.

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- G. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.

1.7 SYSTEM DESCRIPTION

- A. Operation: Project Out
- B. AAMA Rating: AW-PG55-AP when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-17 at the size of 48" x 72"
- C. Construction: 5 inch frame depth. Wall thickness: 0.080" frame/sill; 0.080" sash. Factory finished extruded aluminum frame and sash members with integral structural fiberglass reinforced polyamide thermal barrier.
- D. Glazing: 1 inch, 1 1/4 inch, or 1 1/2 inch insulating glass; monolithically bonded to the sash frame with double-sided structural glazing tape (SGT) on the interior, and the exterior edge shielded by a polyamide glazing bead with an integral bulb gasket.

1.8 HARDWARE:

- A. Handle: Lever handle mounted to frame interior. Turning the handle shall activate a concealed aluminum bar pushing the sash outward.
- B. Hinges: Sash shall pivot at the top on two Four-bar HS/SS friction hinges located at top end of each jamb.

1.9 WEATHERSTRIPPING:

- A. Frame: EPDM "gooseneck" type gasket with integral grooves fitted into the frame extrusion to provide a continuous primary seal between frame and sash. EPDM gasket to be joined and sealed at corners.
- B. Sash: Two rows of compression type bulb gasket, one on the interior and one on the exterior

1.10 PERFORMANCE REQUIREMENTS

- A. Air, Water and Structural Performance Requirements:

When tested in accordance with cited test procedures, windows shall meet or exceed the following performance criteria, as well as those indicated in AAMA/WDMA/CSA 101/I.S.2/A440-17 for performance grade of unit specified unless otherwise noted herein.

1. Air Test Performance Requirements:
 - a. Performance: Air infiltration maximum 0.10 cfm per square foot at 6.27 psf pressure differential, and air exfiltration maximum 0.10 cfm per square foot at 1.57 psf pressure differential when tested in accordance with ASTM E283 for compression seal products.
2. Water Test Performance Requirements:
 - a. No uncontrolled water leakage at 15 psf static pressure differential when tested in accordance with ASTM E331 and ASTM E547.
3. Structural Test Performance Requirements:
 - a. Uniform Load Deflection Test
 - 1) No deflection of any unsupported span L of test unit (framing rails, muntins,

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- mullions, etc.) in excess of L/175 at both a positive and negative load of design test pressure when tested in accordance with ASTM E330.
- 2) Structural reinforcing that is not standard on units being furnished is not allowed.
- b. Uniform Load Structural Test:
- 1) Unit to be tested at 1.5 x design test pressure, both positive and negative, acting normal to plane of wall in accordance with ASTM E330.
 - 2) No glass breakage; permanent damage to fasteners, hardware parts, or anchors; damage to make windows inoperable; or permanent deformation of any main frame or ventilator member in excess of 0.2% of its clear span.
- B. Forced Entry Resistance Test: ASTM F 588, Type and Grade as indicated for each Product.
- C. Thermal Performance Requirements
1. Perform thermal computer simulation in accordance with the configuration specified in NFRC 100, NFRC 200, and NFRC 500.
 2. Computed Thermal Transmittance (U-Value) shall not exceed (value determined based on glazing element) BTU/hr/sq.ft./°F for the whole window assembly.
 3. Computed Solar Heat Gain Coefficient (SHGC) shall not exceed (value determined based on glazing element) for the whole window assembly.

1.11 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All windows specified in this section shall be supplied by a manufacturer which has been fabricating/manufacturing commercial grade aluminum windows of similar quality and performance for a minimum of ten (10) years.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing windows of the same type and scope as specified, preferably AAMA certified installers.
- C. Provide test reports from AAMA accredited laboratory certifying that window units are found to be in compliance with AAMA/WDMA/CSA 101/I.S.2/A440-14 and performance standards listed above.
1. Test reports shall be accompanied by the window manufacturer's letter of certification stating that the tested window meets or exceeds criteria for the appropriate AAMA/WDMA/CSA 101/I.S.2/A440 test.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommendations.
- B. Protect units against damage from the elements, construction activities, and other hazards before, during, and after installation.

1.13 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 absolute limits.

1.14 WARRANTY

- A. *Refer to Crystal Window & Door Systems, Ltd. standard warranty.*

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- B. *Optional Extended Warranty (contact your Crystal sales representative).*

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: **Crystal Window & Door Systems, Ltd.**, which is located at: 31-10 Whitestone Expressway, Flushing, NY 11354; Tel: 718. 961.7300; Tel: 800. 472.9988; Fax: 718.460.4594; Web: www.crystalwindows.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 Aluminum:

- A. Extruded aluminum prime billet 6063-T5 or 6063-T6 alloy for primary components; 6063-T5, 6063-T6, or 6061-T6 for structural components; all meeting the requirements of ASTM B221.
- B. Aluminum sheet alloy 5005 H 32 (for anodic finish), meeting the requirements of ASTM B209 or alloy 3003 H 14 (for painted or unfinished sheet).

2.3 Thermal Barrier:

- A. Structural Thermal Barrier:
1. Structural thermal barriers shall consist of polyamide nylon 6.6 struts reinforced with glass fibers oriented in all three axis. Main frame members shall use twin polyamide struts not less than 18.6mm in length. Sash members shall use a polyamide strut not less than 29.7mm in length.
 2. Polyamide struts shall be mechanically crimped into aluminum profiles using integral extruded races. Aluminum races shall be mechanically knurled as per polyamide strut manufacturer's recommendations. Shear strength of finished assembly shall be per AAMA TIR-A8-04.
 3. Non-Structural Thermal Barriers: Non-structural thermal barriers are used only in conjunction with structural thermal barriers. The purpose of non structural thermal barriers is to enhance thermal performance of the primary structural thermal barriers (polyamide struts) by inhibiting heat transfer through thermal radiation and convection. Non structural thermal barriers shall not be used as primary load carrying members.
 4. Rigid non structural thermal barriers shall be constructed of extruded polyvinylchloride (PVC).

2.4 GLASS

- A. Glazing Materials:
1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical. Design glass to resist design wind pressure based on glass type factors for short-duration load.
 2. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 3. Strength: Where float glass is indicated, provide annealed float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
 4. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated.
 - a. U-Factors: Total-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.4 computer program, expressed as BTU/sq.ft x h x deg F (W/sq. m x K).

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- b. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7.4 computer program.
 - c. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
 - d. Condensation Resistance NFRC 500
 - 5. Float Glass: ASTM C 1036, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated.
 - 6. Coated Glass: ASTM C 1376, Type 1, Quality-Q3, Class 1 (clear) unless otherwise indicated, of kind and condition indicated.
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- 1. Factory-assemble units consisting of sealed lites of glass separated by a PPG Intercept Spacer system consisting of a one-piece, metallic, U-channel design that creates an effective thermal barrier to help reduce conducted heat loss through the window.
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 - 3. Insulating Glass Types: Low-E coated, insulating glass units.
 - a. Overall Unit Thickness: 1", 1-1/4", 1-1/2"
 - b. Thickness of Each Glass Lite: 3/32", 1/8", 3/16", 1/4", 5/16"
 - c. Outdoor Lite: Class 1 (Clear) float glass, fully tempered float glass, or laminated glass
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 - g. Glass Winter Night time U-Value: 0.27 maximum.
 - h. Solar Heat Gain Coefficient: 0.46 maximum.
 - i. Provide safety glazing labeling, if necessary.

2.5 WINDOW ACCESSORIES

Provide the following accessories as specified in the contract drawings. Finish to match window frames or as selected by the Architect:

- A. Wrap Around Panning
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- C. Snap Trim/Clips
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- F. Subsills and Subsill Anchors
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- H. Exterior Sills
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- J. Muntins

SERIES W50 PO AW-PG55-AP PROJECTED-OUT AWNING WINDOW

2.6 FINISHES

- A. Conforming to AAMA 2604-13 specification, finish on all extruded aluminum shall consist of zero or near-zero VOC, organic POWDER COAT with a baked on super-durable thermosetting polyester resin, electro-statically applied on five-stage pre-treated aluminum surface. Equivalent to 50% Kynar polyvinylidene fluoride liquid paint finishes. Powder coat material to be as manufactured by Sherwin Williams or PPG Powder Coatings.
- B. Color to be selected from Manufacturer's Standard Color Chart (or custom-matched as required by project Architect/Owner).

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- A. Screen frames shall consist of tubular extruded aluminum profiles with finish to match window frames.
- B. Fiberglass mesh (18 X 16) with PVC spline.

2.8 Steel components including attachment fasteners shall be 300 series stainless steel except as noted.

2.9 Thermoplastic or thermo-set plastic caps, housings and other components shall be injection-molded nylon, extruded PVC, or other suitable compound.

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- 1. Sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
- 2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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- A. Clean surfaces thoroughly prior to installation.
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- A. Install in accordance with manufacturer's instructions.

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- A. Anchor window units and/or assemblies sufficiently to maintain permanent positions when subjected to normal thermal movement, specified building movement and specified wind loads.

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- A. Remove all garbage off site and legally dispose of existing windows and debris generated from the installation of the new windows.

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 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AMA/WDMA/CSA 101/1.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 times test pressure required to determine compliance with AAMA/WDMA/CSA 101/1.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 ADJUSTMENT AND CLEAN UP

- A. Adjust all products, sash, vents, and hardware after installation, as necessary to provide proper operation and a weather tight installation
- B. Remove any labels and dirt from the window.

END OF SECTION