

**SECTION 08 51 13
ALUMINUM WINDOWS**

PART 1 - GENERAL**1.1 DESCRIPTION**

- A. Aluminum windows of type and size shown, complete with hardware, related components and accessories.
- B. Types:
 - 1. Casement
 - 2. Fixed
- C. Provide protection and security screens where and as indicated on the drawings and as specified within Section 08 56 66.

1.2 DEFINITIONS

- A. Accessories: Mullions, staff beads, casings, closures, trim, moldings, panning systems, sub-sills, clips anchors, fasteners, weather-stripping, screens, mechanical operators, and any other necessary components required for fabrication and installation of window units.
- B. Uncontrolled Water: Water not drained to the exterior, or water appearing on the room side of the window.
- C. Window surrounds are defined as the area extending 2 feet, plus or minus 1 foot, from the edges of the window opening around the entire perimeter of the window opening.

1.3 RELATED WORK

- A. Sustainable Design: Section 01 81 11
- B. Insulation: Section 07 21 13 Thermal Insulation
- C. Sealants: Section 07 92 00, Joint Sealants
- D. Glazing: Section 08 80 00, GLAZING.
- E. Screens: 08 56 66, Security & Protection Window Screens
- F. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.
- E. Store products in manufacturer's unopened packaging until ready for installation.

- F. All windows shall be fabricated and stored on-site prior to any demolition or construction beginning.

1.5 QUALITY ASSURANCE

- A. Approval by contracting officer is required of products or service of proposed manufacturers and installers.
- B. Approval will be based on submission of certification by Contractor that:
 - 1. Manufacturer regularly and presently manufactures the specified windows as one of its principal products.
 - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.
- C. Provide each type of window produced from one source of manufacture.
- D. Quality Certified Labels or certificate:
 - 1. Architectural Aluminum Manufacturers Association, "AAMA label" affixed to each window indicating compliance with specification.
 - 2. Certificates in lieu of label with copy of recent test report (not more than 2 years old) from an independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA 101/I.S.2/A440 for type of window specified.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by COR.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by COR.
 - 3. Refinish mock-up area as required to produce acceptable work.
- D. It is the contractors responsibility to repair/and or replace existing damage/defects to the window surrounds.

1.6 SUBMITTAL

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Window location chart; typical window elevations.
 - 2. Identifying parts of window units by name and kind of metal or material, show construction details, locking systems, mechanical operators, trim, installation and anchorages.
 - 3. Include glazing details and standards for factory glazed units.
- C. Manufacturer's Literature and Data:

1. Manufacturer's specifications and test reports or waiver from an AAMA-accredited laboratory.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

D. Certificates:

1. Certificates as specified in paragraph QUALITY ASSURANCE.
2. Indicating manufacturers and installers qualifications.
3. Manufacturer's Certification that windows delivered to project are identical to windows tested.

E. Test Reports:

Copies of test reports as specified in paragraphs QUALITY ASSURANCE and FIELD QUALITY CONTROL.

- F. Samples: Prepare one full size sample (Type C) with all hardware, components, glazing, and specified factory finish. Upon approval from COR, full sized sample may be installed on the job.

Also provide the following samples:

1. Main framing member, 12-inch- long, full-size sections of extrusions with factory-applied color finish.
2. Window Corner Fabrication: 12-by-12-inch- long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
3. Hardware: Full sized with factory applied finishes.
4. Weather Stripping: 12-inch-long sections.

1.7 WARRANTY

Warrant windows against malfunctions due to defects in thermal breaks, hardware, materials and workmanship, subject to the terms of Article "WARRANTY OF CONSTRUCTION", FAR clause 52.246-21.

A. Manufacturer's Warranties:

1. Windows: Manufacturer shall warrant for one year against defects in material and workmanship under normal use.
2. Insulating Glass Units: Glass manufacturer shall warrant seal for ten years against visual obstruction from film formation or moisture collection between internal glass surfaces, excluding that caused by glass breakage or abuse.
3. Paint Finish: PPG Duranar® organic finish conforming to AAMA 2605-11 shall be warranted for twenty years against chipping, peeling, blistering, cracking, chalking, or fading.

- B. Project Survey: Installer and manufacturer's representatives shall visit site one year after date of completion; to inspect and recommend maintenance procedures. This site visit shall be at no additional cost to the Owner.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Field measure openings before ordering. Be responsible for proper fit of field measured products.
- B. No window opening shall be left open overnight.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- 90.1-07.....Energy Standard of Buildings
- C. American Architectural Manufacturers Association (AAMA):
- 101/I.S.2/A440-11.....Windows, Doors, and Unit Skylights
- 502-11Field Testing of Newly Installed Fenestration Products
- 505-09.....Dry Shrinkage and Composite Performance Thermal Cycling Test Procedures
- 701/702-11Pile Weatherstripping and Replaceable Fenestration Weatherseals
- 800-10Test Methods for Sealants
- 901-10Rotary & Linear Operators in Window Applications
- 904-09Multi-bar Hinges in Window Applications
- 910-10 'Life Cycle' Specifications and Test Methods for AW Class Architectural Windows and Doors
- 1503-09.....Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
- 2605-11Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- CW-10-04Care and Handling of Architectural Aluminum from Shop to Site

TIR-A8-08.....Structural Performance of Poured and Debridged
Framing Systems

D. American Society for Testing and Materials (ASTM):

E 90-09.....Test Method for Laboratory Measurement of
Airborne Sound Transmission Loss of Building
Partitions

E283-04Standard Test Method for Determining Rate of
Air Leakage Through Exterior Windows, Curtain
Walls, and Doors Under Specified Pressure
Differences Across the Specimen

E330-10Standard Test Method for Structural Performance
of Exterior Windows, Doors, Skylights, and
Curtain Walls by Uniform Static Air Pressure
Difference

E331-09Standard Test Method for Water Penetration of
Exterior Windows, Skylights, Doors, and Curtain
Walls by Uniform Static Air Pressure Difference

E547-09Standard Test Method for Water Penetration of
Exterior Windows, Skylights, Doors, and Curtain
Walls by Cyclic Static Air Pressure
Differential

E2190-10Standard Specification for Insulating Glass
Unit Performance and Evaluation

F588-07Standard Test Methods for Measuring the Forced
Entry Resistance of Window Assemblies,
Excluding Glazing Impact

E. National Fenestration Rating Council (NFRC):

NFRC 100-2010.....Determining Fenestration Product U-Factors

NFRC 102-2010Measuring the Steady-State Thermal
Transmittance of Fenestration Systems

NFRC 200-2010.....Determining Fenestration Product Solar Heat
Gain Coefficient and Visible Transmittance at
Normal Incidence

NFRC 500-2010Determining Fenestration Product Condensation
Resistance Values

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

PART 2- PRODUCTS**2.1 MATERIALS - GENERAL**

- A. Aluminum Extrusions; Sheet and Plate: AAMA 101/I.S.2/A440.
- C. Weather-strips: AAMA 101/I.S.2/A440; except leaf type weather-stripping is not permitted.
- D. Fasteners: AAMA 101/I.S.2/A440. Screws, bolts, nuts, rivets and other fastening devices to be non-magnetic stainless steel.
 - 1. Fasteners to be concealed when window is closed. Where wall thickness is less than 3 mm (0.125 inch) thick, provide backup plates or similar reinforcements for fasteners.
 - 2. Stainless steel self tapping screws may be used to secure Venetian blind hanger clips, vent guide blocks, friction adjuster, and limit opening device.
 - 3. Attach locking and hold-open devices to windows with concealed fasteners. Provide reinforcing plates where wall thickness is less than 3 mm (0.125 inch) thick.
- E. Hardware:
 - 1. Locks: Two position locking bolts or cam type tamperproof custodial locks with a single point control located not higher than five feet from floor level. Locate locking devices in the vent side rail. Fastenings for locks and keepers shall be concealed or non-removable.
 - 2. Locking Device Strikes: Locate strikes in frame jamb. Strikes shall be adjustable for locking tension. Fabricate strikes from Type 304 stainless steel.
 - 3. Fabricate hinges of noncorrosive metal. Hinges may be either fully concealed when window is closed or semi-concealed with exposed knuckles. All exposed knuckle hinges shall have hospital tips, at both ends. Surface mounted hinges will not be accepted.
 - 4. Guide Blocks: Fabricate guide blocks of injection molded nylon. Install guide block fully concealed in vent/frame sill.
 - 5. Hardware for Emergency Ventilation of Windows:
 - a. Provide windows with a hold open linkage for emergency ventilation.
 - b. Hold open hardware shall provide for maximum six inches of window opening and shall include an adjustable friction shoe to provide resistance when closing the window.

- c. Handles shall be removable.
- 6. Hardware for Maintenance Opening of Windows: Opening beyond the six inch position shall be accomplished with a window washers key. The release device shall capture the key when window is in the open position.
- 7. Design operating device to prevent opening with standard tools, coins or bent wire devices.

2.2 FABRICATION - GENERAL

- A. Fabrication to exceed or meet requirements of Physical Load Tests, Air Infiltration Test, and Water Resistance Test of AAMA 101/I.S.2/A440.
- B. Glazing:
 - 1. Factory glazed.
 - 2. Glaze in accordance with Section 08 80 00, GLAZING.
 - 3. Windows re-glazable without dismantling sash framing.
 - 4. Design rabbet to suit glass thickness and glazing method specified.
 - 5. Glaze from interior except where not accessible.
 - 6. Provide removable fin type glazing beads.
- C. Trim:
 - 1. Trim includes casings, closures, and panning.
 - 2. Fabricate to shapes indicated of aluminum not less than 1.6 mm (0.080 inch) thick
 - 3. Extruded or formed sections, straight, true, and smooth on exposed surfaces. Curved sections true to line.
 - 4. Exposed external corners mitered and internal corners coped; fitted with hairline joints.
 - 5. Reinforce 1.6 mm (0.062 inch) thick members with not less than 3 mm (1/8-inch) thick aluminum.
 - 6. Except for strap anchors, provide reinforcing for fastening near ends and at intervals not more than 305 mm (12 inches) between ends.
 - 7. Design to allow unrestricted expansion and contraction of members and window frames.
 - 8. Secure to window frames with machine screws or expansion rivets.
 - 9. Exposed screws, fasteners or pop rivets are not acceptable on exterior of the casing or trim cover system.
- D. Thermal-Break Construction:
 - 1. Manufacturer's Standard.
 - 2. Low conductance thermal barrier.
 - 3. Capable of structurally holding sash in position and together.

4. All Thermal Break Assemblies (Pour & Debridge, Insulbar or others) shall be tested as per AAMA TIR A8 and AAMA 505 for Dry Shrinkage and Composite Performance.
5. Location of thermal barrier and design of window shall be such that, in closed position, outside air shall not come in direct contact with interior frame of the window.

E. Mullions: AAMA 101/I.S.2/A440.

2.3 FIXED WINDOW UNITS

- A. Product: Peerless G341 Fixed Thermal Aluminum Window (or approved equal) as specified herein and as shown on the drawings.
- B. Configuration: Fixed (w/Interior Panel) over Vent with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
- C. Configuration: Fixed (w/Interior Panel) over Fixed over Vent with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
- D. Construction:
 1. Aluminum Extrusions: extruded by the window manufacturer from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.
 2. Window Frame: Extruded aluminum with integral structural thermal break installed by the window manufacturer in the frame members; exterior and interior finishes applied by the window manufacturer; frames assembled by the window manufacturer.
 - a. Frame Depth: 3-1/4 inches (83 mm).
 3. Frame: Double tubular head, sill, and jambs mitre cut and fastened with two Zamac corner gussets per corner; corners sealed by window manufacturer with sealant conforming to AAMA 800-10.
 4. Interior take-out panel: horizontal bottom lift rail, top rail, and both vertical stiles mitre cut and fastened with one stainless steel screw per corner for easy reglazing; unauthorized removal of the panel restricted with two tamperproof screws.
 5. Thermal Break: The thermal break separating the exterior and interior aluminum extrusions shall be a mechanical crimp-in-place system utilizing multi-directional glass fiber reinforced polyamide nylon struts with locking mechanical connections to the aluminum extrusions. The thermal break shall not be compromised by hardware or metal fasteners.

6. Glazing: Exterior silicone; insulating glass as scheduled; interior Santoprene bulb gasket threaded into aluminum glazing beads; glass glazed by the window manufacturer.
 7. Weatherstrip: Secured in extruded ports; Santoprene bulb seal conforming to AAMA 702-11 in interior aluminum glazing beads.
- D. Performance Requirements: Conformance to FW-AW70 specifications in AAMA/WDMA/CSA 101/I.S.2/A440-05 when tests are performed on the prescribed 60 inches by 99 inches (1524 mm by 2515 mm) minimum test size with the following test results:
1. Air Infiltration: Not to exceed AAMA 101 standard of maximum 0.1 cfm/square foot when tested per ASTM E283-04 at a static air pressure difference of 6.24 psf.
 2. Water Penetration: No uncontrolled water leakage when tested per ASTM E331-09 and ASTM E547-09 at a static air pressure difference of 12 psf.
 3. Uniform Deflection: No more than L/175 when tested per ASTM E330-10 at a static air pressure difference of 70 psf.
 4. Uniform Structural Load: No glass breakage or permanent damage to fasteners, and maximum .2% permanent deformation of the span of any frame member when tested per ASTM E330-10 at a static air pressure difference of 105 psf.
 5. Forced-entry Resistance: Reasonable security against forced entry and the test window shall achieve a Level 10 when tested per ASTM F588-07.
- E. Thermal AAMA Testing: Per AAMA 1503-09, on a 47 inch by 59 inches (1194 mm by 1499 mm) test size glazed with 1 inch (25 mm) insulating glass made with 1/4 inch (6 mm) soft coat low E coating on surface #2, plain air in the airspace made with a polymer-coated stainless steel spacer, and 1/4 inch (6 mm) clear glass, with the following test results:
1. Condensation Resistance Factor: minimum 73 frame CRF and 71 glass CRF.
 2. Thermal Transmittance: maximum 0.34 btu/hr/sq.ft/degree F U value.
- F. Thermal NFRC Testing: Per NFRC 102-2010 on a 47 inch by 59 inches (1194 mm by 1499 mm) test size glazed with 1 inch (25 mm) insulating glass made with 1/4 inch (6 mm) soft coat low E coating on surface #2, plain air in the airspace made with a polymer-coated stainless steel spacer, and 1/4 inch (6 mm) clear glass, with the following test result:

1. Standard Thermal Transmittance to be maximum 0.33
btu/hr/sq.ft/degree F.

G. Acoustical Performance: Testing per ASTM E90-09 on a 46-1/4 inches by 59 inches (1175 mm by 1499 mm) test size glazed with 1 inch (25 mm) insulating glass made with exterior 1/4 inch (6 mm) monolithic glass, 9/16 inch (14 mm) airspace, and interior 1/4 inch (6 mm) monolithic glass: minimum 36 STC and 28 OITC.

2.4 CASEMENT WINDOW UNITS

- A. Product: Peerless G361 Left Hand Casement In-swing Thermal Aluminum Window (or approved equal) as specified herein and as shown on the drawings.
- B. Product: Peerless G365 Right Hand Casement In-swing Thermal Aluminum Window (or approved equal) as specified herein and as shown on the drawings.
- C. Configuration: Vent hinged at the jamb and pulls in to open.
- D. Configuration: Vent under Fixed (w/Interior Panel) with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
- E. Configuration: Vent under Fixed under Fixed (w/Interior Panel) with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
- F. Construction:
 1. Aluminum Extrusions: Extruded by the window manufacturer from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.
 2. Frame: Double tubular head, sill, and jambs mitre cut and fastened with one Zamac corner gusset per corner; tubular integral mullion, if required, fastened with one Zamac gusset per frame member without penetrating the frame member with fasteners; corners sealed by the window manufacturer with sealant conforming to AAMA 800-10.
 3. Vents: Double tubular horizontal and vertical vent rails and stiles mitre cut and fastened with two zamac corner gussets per corner; corners sealed by window manufacturer with sealant conforming to AAMA 800-10.
 4. Interior take-out panel: horizontal bottom lift rail, top rail, and both vertical stiles mitre cut and fastened with one stainless steel screw per corner for easy reglazing; unauthorized

- removal of the panel restricted with two tamperproof screws.
5. Water control: continuous compression gasket on the vent interior to utilize pressure equalization and to allow water to drain by gravity.
 6. Window Frame: Extruded aluminum with integral structural thermal break installed by the window manufacturer in the frame and vent members; exterior and interior finishes applied by the window manufacturer; frames and vents assembled by the window manufacturer.
 - a. Frame Depth: 3-1/4 inches (83 mm).
 - b. Fabricated with equal-leg flange frame.
 7. Thermal Break: The thermal break separating the exterior and interior aluminum extrusions shall be a mechanical crimp-in-place system utilizing multi-directional glass fiber reinforced polyamide nylon struts with locking mechanical connections to the aluminum extrusions. The thermal break shall not be compromised by hardware or metal fasteners.
 8. Glazing: Exterior silicone; insulating glass as scheduled; interior Santoprene bulb gasket threaded into aluminum glazing beads; glazed by the window manufacturer.
 9. Weatherstrip: Secured in extruded ports; Santoprene™ seals conforming to AAMA 702-11; flap seal single row mounted on the vent interior on the bottom rail, top rail, and stiles; double-tubular seal single internal row mounted on the head, sill and jamb frame members.
 10. Hardware: Mounted in concealed extruded grooves to avoid penetrating frame or vent members with fasteners; two concealed stainless steel hinges conforming to AAMA 904-09 per vent to rotate the vent on vertical axis:
 - a. One key-operated black handle with multiple point locks per vent.
 - b. One custodial-operated satin black handle with multiple point locks per vent and security wrench tool.
 - c. Key-release limit arms with clear opening dimension of 6".
- G. Performance Requirements: Conformance to C-AW65 when tests are performed on a 48 inches by 71 inches (1219 mm by 1803 mm) minimum test size with the following test results:
1. Air Infiltration: Not to exceed the standard of maximum 0.1

cfm/square foot when tested per ASTM E283-04 at a static air pressure difference of 6.24 psf.

2. Water Penetration: No uncontrolled water leakage when tested per ASTM E331-09 and ASTM E547-09 at a static air pressure difference of 12 psf.
 3. Uniform Deflection: No more than L/175 when tested per ASTM E330-10 at a static air pressure difference of 65 psf.
 4. Uniform Structural Load: No glass breakage or permanent damage to fasteners, and maximum .2% permanent deformation of the span of any frame member when tested per ASTM E330-10 at a static air pressure difference of 97.5 psf.
 5. Forced-Entry Resistance: Latching devices shall provide reasonable security against forced entry and the test window shall achieve a Level 10 when tested per ASTM F588-07.
- H. Thermal NFRC Simulation: Thermal computer simulation per NFRC 100-2010 on a 48 inches by 71 inches (914 mm by 1524 mm) test size glazed with 1 inch (25 mm) insulating made with 1/4 inch (6 mm) soft coat low E coating on surface #2, argon gas in the airspace made with a polymer-coated stainless steel spacer, and 1/4 inch (6 mm) clear glass, with the following test result:
1. Standardized Thermal Transmittance to be maximum 0.328
btu/hr/sq.ft/degree F.

2.5 INSTALLATION ACCESSORIES

- A. Material: Extruded aluminum; nominal 0.062 inch wall; with exposed surfaces finished to match window color and finish performance; concealed fasteners; required weather seals; designed for unrestricted expansion and contraction.
- B. Exterior: Wrap around panning.
- C. Interior: Two-piece snap trim and trim clip.

2.6 FINISH ON EXTERIOR ALUMINUM EXTRUSIONS

- A. Application: on clean extrusions free from objectionable surface blemishes; on exposed surfaces visible when installed product's operating sash are closed.
- B. Coating: PPG Duranar® with resin containing 70% fluoropolymer; thermosetting or approved equal.
 1. Quality Standard: Conforming to AAMA 2605-11, including 10 years Florida exposure and 4000 hours humidity tests.
 2. Pretreatment: Five-stage; zinc chromate conversion coating.

3. Application: Electrostatic spray by a manufacturer approved Applicator and appropriate oven bake process.
4. Coating Quantity: Minimum one primer coat and one color coat.
5. Dry Film Thickness: Minimum 1.2 mils on exposed surfaces, except inside corners and channels.
6. Color: To match exterior color of Building 20 windows (Eagle Windows "Moss" 149).

2.7 FINISH ON INTERIOR ALUMINUM EXTRUSIONS

- A. Application: on clean extrusions free from serious surface blemishes; on exposed surfaces visible when installed product's operating sash are closed.
- B. Coating: PPG Duranar® with resin containing 70% fluoropolymer; thermosetting; or approved equal. .
 1. Quality Standard: Conforming to AAMA 2605-11, including 10 years Florida exposure and 4000 hours humidity tests.
 2. Pretreatment: Five-stage; zinc chromate conversion coating.
 3. Application: Electrostatic spray by a manufacturer approved applicator and appropriate oven bake process.
 4. Coating Quantity: Minimum one primer coat and one color coat.
 5. Dry Film Thickness: Minimum 1.2 mils on exposed surfaces, except inside corners and channels.
 6. Color: To match exterior color.

PART 3 - EXECUTION

3.1 PROTECTION (DISSIMILAR MATERIALS): AAMA 101/I.S.2/A440.

3.2 INSTALLATION, GENERAL

- A. Install window units in accordance with manufacturer's specifications and recommendations for installation of window units, hardware, operators and other components of work.
- B. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, use expansion or toggle bolts or screws, as best suited to construction material.
 1. Provide bolts or screws minimum 6 mm (1/4-inch) in diameter.
 2. Sized and spaced to resist the tensile and shear loads imposed.
 3. Do not use exposed fasteners on exterior, except when unavoidable for application of hardware.

4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.
5. Locate fasteners to not disturb the thermal break construction of windows.
- C. Set windows plumb, level, true, and in alignment; without warp or rack of frames or sash.
- D. Anchor windows on four sides with anchor clips or fin trim.
 1. Do not allow anchor clips to bridge thermal breaks.
 2. Use separate clips for each side of thermal breaks.
 3. Make connections to allow for thermal and other movements.
 4. Do not allow building load to bear on windows.
 5. Use manufacturer's standard clips at corners and not over 600 mm (24 inches) on center.
 6. Where fin trim anchorage is shown build into adjacent construction, anchoring at corners and not over 600 mm (24 inches) on center.
- E. Replacement Windows:
 1. Do not remove existing windows until new replacement is available, ready for immediate installation.
 2. Remove existing work carefully; avoid damage to existing work to remain.
 3. Perform all other operations (cleaning, patch, etc.) as necessary to prepare openings for proper installation and operation of new units.
 4. Do not leave openings uncovered at end of working day, during precipitation or temperatures below 16 degrees C (60 degrees F.).
- F. Installation work shall be phased as indicated on the Drawings and Specification Section 01 00 00. All staging/phasing shall be reviewed and approved by COR.

3.3 MULLIONS CLOSURES, TRIM, AND PANNING

- A. Cut mullion full height of opening and anchor directly to window frame on each side.
- B. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.
- C. Secure to concrete or solid masonry with expansion bolts, expansion rivets, split shank drive bolts, or powder actuated drive pins.
- D. Toggle bolt to hollow masonry units. Screwed to wood or metal.
- E. Fasten except for strap anchors, near ends and corners and at intervals not more than 300 mm (12 inches) between.

F. Seal units following installation to provide weathertight system.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform tests and inspections and prepare test reports.

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 AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/WDMA 101/I.S.2/NAFS in Part 1 "Performance Requirements" Article.
2. Testing Extent: Twenty (20) windows as selected by COR and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace noncomplying aluminum window and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements

3.5 ADJUST AND CLEAN

A. Adjust ventilating sash and hardware to provide tight fit at contact points, and at weather-stripping for smooth operation and weathertight closure.

B. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes.

C. Remove excess glazing and sealant compounds, dirt, and other substances.

D. Lubricate hardware and moving parts.

E. Clean glass promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.

F. Except when a window is being adjusted or tested, keep locked in the closed position during the progress of work on the project.

3.5 OPERATION DEVICES

- A. Provide wrenches, keys, or removable locking operating handles, as specified to operate windows.
- B. A minimum of 20 custodial keys shall be provided to VA upon completion of window installation.

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