

REQUEST FOR PROPOSAL (RFP)
Langley AFB Multiple Award Construction Contract (MACC)
Amendment 09

Issued By: 633d Contracting Squadron/LGCB
74 Nealy Avenue
Langley AFB, VA 23665

21 May 2010

Point of Contact: Cody Hancock, (757) 764-4902; 1 Lt Brian Chin (757) 764-7681

PROJECT NUMBER: MUHJ 10-4093.

PROJECT TITLE: Repair Nor'Easter Damage, Floors/Walls/Ceiling/Roof, Facility 658

Subject RFP is amended as follows: Incorporate Updated Form 66, Updated Specification Table of Contents and Specification Section 08 81 00 Glazing; Remove Specification Section 08 51 23 Steel Windows and Replace with Section 08 51 13 Aluminum Windows.

SCHEDULE OF MATERIAL SUBMITTALS										Project No. MUHJ 10-4093	Project Title Repair Nor'easter Damages, Floors/Walls/Ceilings, F. 658	Solicitation/Contract Number								
TO BE COMPLETED BY PROJECT ENGINEER										TO BE COMPLETED BY CONTRACT ADMINISTRATOR										
LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	CERTIFICATION OF COMPLIANCE	NUMBER OF COPIES REQUIRED								REQUIRED SUBMISSION DATE	DATE RECEIVED IN CONTRACTING	DATE TO CIVIL ENGINEERING	RETURN SUSPENSE DATE	SUBMITTAL NUMBERS	DATE CONTRACTOR NOTIFIED		CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
			SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATION	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	TEST REPORTS						OTHER	APPROVED			
1	Asbestos Notification 01 11 00 1.10.2.1									3										
2	As-Built Drawing Submittal 01 11 00 1.24.10									3										
3	Warranty of Construction 01 11 00 1.25									3										
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SECTION 08 51 13

ALUMINUM WINDOWS
08/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 1302.5 (1976) Voluntary Specifications for Forced-Entry Resistant Aluminum Prime Windows

AAMA 1503 (2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

AAMA 2603 (2002) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

AAMA 2604 (2005) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

AAMA 2605 (2005) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

AAMA 611 (1998) Voluntary Specification for Anodized Architectural Aluminum

AAMA 701 (2004) Voluntary Specification for Pile Weather Strip

AAMA 902 (1999) Voluntary Specification for Sash Balances

AAMA WSG.1 (1995) Window Selection Guide

AAMA/WDMA/CSA 101/I.S.2/A440 (2008; Update 1 2008; Update 2 2008; Update 3 2009) North American Fenestration

Standard/Specification for Windows, Doors,
and Skylights

ASTM INTERNATIONAL (ASTM)

- ASTM A 276** (2008a) Standard Specification for Stainless Steel Bars and Shapes
- ASTM D 1972** (1997; R 2005) Standard Practice for Generic Marking of Plastic Products
- ASTM E 2129** (2005) Standard Practice for Data Collection for Sustainability Assessment of Building Products
- ASTM F 1642** (2004) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

GREEN SEAL (GS)

- GS-36** (2000) Commercial Adhesives

INTERNATIONAL WINDOW CLEANING ASSOCIATION (IWCA)

- IWCA I-14.1** (2001) Window Cleaning Safety Standard

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

- NFRC 100** (2004) Procedure for Determining Fenestration Product U-Factors
- NFRC 200** (2004) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 101** (2009; Amd 1 & 2 2009) Life Safety Code

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

- SCAQMD Rule 1168** (1989; R 2005) Adhesive and Sealant Applications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- Energy Star** (1992; R 2006) Energy Star Energy Efficiency Labeling System

1.2 CERTIFICATION

Each prime window unit must bear the AAMA Label warranting that the product complies with **AAMA/WDMA/CSA 101/I.S.2/A440**. Certified test reports attesting that the prime window units meet the requirements of **AAMA/WDMA/CSA 101/I.S.2/A440**, including test size, will be acceptable in lieu of product labeling.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows; G

Fabrication Drawings

SD-03 Product Data

Windows; G

Hardware; G

Fasteners; G;

Window performance; G

Thermal-Barrier Windows; G

Mullions; G

Window Cleaners' Bolts; G

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Screens; G

Weatherstripping; G

Accessories; G

Adhesives;

Submit manufacturer's product data, indicating VOC content.

Thermal performance

Submit documentation for Energy Star qualifications.

SD-04 Samples

Finish Sample

Window Sample

SD-05 Design Data

Structural calculations for deflection; G

SD-06 Test Reports

Minimum condensation resistance factor

Standard Airblast Test; G

For Minimum Antiterrorism windows, in lieu of a Design Analysis, results of airblast testing, whether by arena test or shocktube, shall be included in a test report, providing information in accordance with ASTM F 1642, as prepared by the independent testing agency performing the test. The test results shall demonstrate the ability of each window proposed for use to withstand the airblast loading parameters and achieve the hazard level rating specified in paragraph "Standard Airblast Test Method".

SD-10 Operation and Maintenance Data

Windows, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Plastic Identification

When not labeled, identify types in Operation and Maintenance Manual.

1.4 QUALITY ASSURANCE

1.4.1 Shop Drawing Requirements

Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, method and materials for weatherstripping, material and method of attaching subframes, trim, installation details, and other related items.

1.4.2 Sample Requirements

1.4.2.1 Finish Sample Requirements

Submit color chart of standard factory color coatings when factory-finish color coating is to be provided.

1.4.2.2 Window Sample Requirements

Submit one full-size corner of each window type proposed for use. Where screens or weatherstripping is required, fit sample with such items that are to be used.]

1.4.3 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements. A registered Professional Engineer must provide calculations.

Submit **design analysis** with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the requirements of paragraph "Minimum Antiterrorism Performance Criteria". Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

1.4.4 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to **AAMA/WDMA/CSA 101/I.S.2/A440** including test size, and minimum condensation resistance factor (CRF), and resistance to forced entry, and, for Minimum Antiterrorism windows, in lieu of a Design Analysis, results of a Standard Airblast Test.

1.5 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows can not be repaired, provide a new unit.

1.6 PROTECTION

Protect finished surfaces during shipping and handling using the manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which calking and glazing compounds must adhere.

1.7 SUSTAINABLE DESIGN REQUIREMENTS

1.7.1 Local/Regional Materials

NOT USED

1.7.2 Environmental Data

NOT USED

1.7.3 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with **ASTM D 1972**. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual.

- a. Type 1: Polyethylene Terephthalate (PET, PETE).
- b. Type 2: High Density Polyethylene (HDPE).

- c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
- d. Type 4: Low Density Polyethylene (LDPE).
- e. Type 5: Polypropylene (PP).
- f. Type 6: Polystyrene (PS).
- g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.8 FIELD MEASUREMENTS

Take field measurements prior to preparation of the drawings and fabrication.

1.9 PERFORMANCE REQUIREMENTS

1.9.1 Minimum Antiterrorism Performance Criteria

Windows must meet the minimum antiterrorism performance criteria as specified in the paragraphs below.

1.9.1.1 Glazing

Glazing must have laminated glass as specified in Section [08 81 00](#) GLAZING.

1.9.1.2 Aluminum Window Frames

Restrict aluminum framing members deflections of edges of glazing they support to $L/160$ under an equivalent 3-second duration loading of 45 pounds per square foot (psf), where L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the window frames must be adequate to accept the width of structural silicone sealant or glazing tape as specified in paragraph "Provisions for Glazing" below.

1.9.1.3 Window Frame Anchors

Fasten window frames to the supporting structure with anchors designed to resist forces generated by a 3-second duration load of 45 pounds per square foot (psf) acting on the entire window unit.

1.9.2 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure of at least 28 pounds per square foot (psf) acting on the entire window unit.

1.9.3 Tests

Test windows proposed for use in accordance with [AAMA/WDMA/CSA 101/I.S.2/A440](#) for the particular type and quality window specified.

Perform tests by a nationally recognized independent testing laboratory equipped and capable of performing the required tests. Submit the results of the tests as certified laboratory reports required herein.

Minimum design load for a uniform-load structural test must be 50 psf.

Test projected windows in accordance with the applicable portions of the [AAMA WSG.1](#) for air infiltration, water resistance, uniform-load deflection, and uniform-load structural test.

1.10 DRAWINGS

Submit the [Fabrication Drawings](#) for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

1.11 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

1.11.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward). After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There must be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for the window types and classification specified in this section.

1.11.2 Minimum Antiterrorism Performance

Windows shall meet the minimum antiterrorism performance criteria of [UFC 4-010-01](#), as specified in the paragraphs below. Conformance to the performance requirements shall be validated by one of the following methods.

1.11.2.1 Computational Design Analysis Method

Window frames, mullions, and sashes shall be designed to the criteria listed herein. Computational design analysis shall include calculations verifying the structural performance of each window proposed for use, under the given static equivalent loads.

Aluminum window framing members shall restrict deflections of edges of glazing they support to $L/160$ under an equivalent 3-second duration loading of 45 pounds per square foot (psf), where L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the window frames shall be adequate to accept the width of structural silicone sealant or glazing tape as specified in paragraph "Provisions for Glazing" below.

Window frames shall be anchored to the supporting structure with anchors designed to resist forces generated by a 3-second duration load of 45 pounds per square foot (psf) acting on the entire window unit.

1.11.2.2 Alternate Dynamic Design Analysis Method

As an alternative to the static equivalent load design approach described above, window framing members, anchors, and glazing may be designed using a dynamic analysis to prove the window system will provide performance equivalent to or better than the hazard rating associated with the applicable level of protection for the project.

1.11.2.3 Standard Airblast Test Method

As an alternative to either of the Computational Design Analysis Methods, each Minimum Antiterrorism window type shall be tested for evaluation of hazards generated from airblast loading in accordance with [ASTM F 1642](#) by an independent testing agency regularly engaged in blast testing. For proposed window systems that are of the same type as the tested system but of different size, the test results may be accepted provided the proposed window size is within the range from 25 percent smaller to 10 percent larger in area, than the tested window. Proposed windows of a size outside this range shall require testing to evaluate their hazard rating. Testing may be by shock tube or arena test. The test shall be performed on the entire proposed window system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the window frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 5.8 psi (40 kPa) and positive phase impulse of 41.1 psi-msec (285 kPa-msec). The hazard rating for the proposed window systems, as determined by the rating criteria of [ASTM F 1642](#), shall not exceed the "Very Low Hazard" rating (i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" ratings are acceptable. "Low Hazard" and "High Hazard" ratings are unacceptable). Results of window systems previously tested by test protocols other than [ASTM F 1642](#) may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

1.11.3 Air Infiltration

Air infiltration must not exceed the amount established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for each window type.

1.11.4 Water Penetration

Water penetration must not exceed the amount established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for each window type.

1.11.5 Thermal Performance

Thermal transmittance for thermally broken aluminum windows with insulating glass must not exceed a U-factor of 0.75 Btu/hr-ft²-F determined according to [NFRC 100](#), and a solar heat gain coefficient (SHGC) of 0.40 Btu/hr-ft²-F determined according to [NFRC 200](#). Provide window units that comply with the U.S. Department of Energy, Energy Star Window Program for the Southern Climate Zone

1.11.6 Life Safety Criteria

NOT USED

1.11.7 Sound Attenuation

The window unit must have a minimum STC of 41 with the window glazed with two pieces of 1/4 inch thick laminated glass with the window glazed with 1/2 inch air space between two pieces of 1/4 inch thick glass when tested in accordance with [AAMA/WDMA/CSA 101/I.S.2/A440](#) acoustical performance.

1.12 QUALIFICATION

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 5 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.13 MOCK-UPS

NOT USED

1.14 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with [AAMA 101](#) and the requirements specified herein. In addition to compliance with [AAMA 101](#), window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide [Structural calculations for deflection](#) to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Windows must contain a minimum of 5 percent of post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Window materials may contain post-consumer or post-industrial recycled content. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) of 57 when tested in accordance with [AAMA 1503](#). Glazed systems (including frames and glass) will be [Energy Star](#) labeled products as appropriate to climate zone and as applicable to window type, with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of 0.40 determined according to [NFRC 200](#) procedures. Glazed systems must have a U-factor maximum of 0.75 Btu per square foot times hr times degree F in accordance with [NFRC 100](#).

2.1.1 Awning Windows (AP)

NOT USED

2.1.2 Casement Windows (C)

NOT USED

2.1.3 Hung Windows (H)

NOT USED

2.1.3.1 Window Materials

Window frames and sash members, mullions, mullion covers, screen frames, and glazing beads shall be fabricated in accordance with [AAMA 101](#).

Weatherstripping will be woven wool pile weatherstripping 0.210 inch thick, conforming to [AAMA 701](#), or polypropylene multifilament fiber weatherstripping installed in an integral weatherstripping groove in the sash or frame, and flexible polyvinylchloride weatherstripping installed in the sill member.

2.1.4 Horizontal Sliding Windows (HS)

NOT USED

2.1.5 Projected Windows (AP)

NOT USED

2.1.6 Top-Hinged Windows (TH)

NOT USED

2.1.7 Vertically Pivoted Windows (VP)

NOT USED

2.1.8 Fixed Windows (F)

Type F-R15

2.1.9 Forced Entry Resistant Windows

In addition to meeting the requirements of [AAMA 101](#), windows designated for resistance to forced entry must conform to the requirements of [AAMA 1302.5](#).

2.1.10 Glass and Glazing

Materials are specified in Section [08 81 00](#) GLAZING.

2.1.11 Calking and Sealing

Are specified in Section [07 92 00](#) JOINT SEALANTS.

2.1.12 Weatherstripping

[AAMA/WDMA/CSA 101/I.S.2/A440](#).

2.1.13 Sash Poles

NOT USED

2.2 FABRICATION

Fabrication of window units must comply with [AAMA 101](#).

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thickness shown or specified.

2.2.2 Weatherstripping

Provide for ventilating sections of all windows to ensure a weather-tight seal meeting the infiltration requirements specified in [AAMA 101](#). Provide easily replaceable factory-applied weatherstripping. Use molded vinyl, molded or molded-expanded neoprene or molded or expanded Ethylene Propylene Diene Terpolymer (EPDM) compression-type weatherstripping for compression contact surfaces. Use treated woven pile or wool, or polypropylene or nylon pile bonded to nylon fabric and metal or plastic backing strip weatherstripping for sliding surfaces. Do not use neoprene or polyvinylchloride weatherstripping where they will be exposed to direct sunlight.

2.2.3 Fasteners

Fabricated from 100 percent re-melted steel. Use fasteners as standard with the window manufacturer for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than 1/16 inch thick.

2.2.4 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials, [GS-36](#), [SCAQMD Rule 1168](#), and as specified in Section [07 92 00](#) JOINT SEALANTS.

2.2.5 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

2.2.6 Combination Windows

Windows used in combination must be the same class and grade and will be factory assembled. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

2.2.7 Mullions and Transom Bars

Provide mullions between multiple window units where indicated. Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

2.2.8 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation. Furnish extruded aluminum subframe receptors and subsill with each window unit.

2.2.8.1 Hardware

AAMA 101. The item, type, and functional characteristics must be the manufacturer's standard for the particular window type. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

2.2.8.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.8.3 Window-Cleaner Anchors

NOT USED

2.2.8.4 Window Anchors

Anchoring devices for installing windows must be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to **AAMA 101**.

2.2.9 Finishes

Exposed aluminum surfaces must be factory finished with an anodic coating. Color must match existing. All windows will have the same finish.

2.2.9.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to **AA DAF-45** and **AAMA 611**. Finish must be:

- a. Architectural Class I (0.7 mil or thicker), designation AA-M10-C22-A42, integral color anodized.

2.2.9.2 Organic Coating

NOT USED

2.2.10 Screens

AAMA 101. Provide one insect screen for each operable exterior sash or ventilator. Design screens to be rewirable, easily removable from inside the building, and to permit easy access to operating hardware.

2.3 SPECIAL OPERATORS

NOT USED

2.3.1 Pole Operators

NOT USED

2.3.2 Extension Crank Operators

NOT USED

2.3.3 Mechanical Operators

NOT USED

2.4 THERMAL-BARRIER WINDOWS

Provide thermal-barrier windows, complete with accessories and fittings, where indicated.

Specify material and construction except as follows:

- a. Aluminum alloy must be 6063-T6.
- b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors will not bridge the connection between the inner and outer frame.
- c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.
- d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.
- e. Operating and storm sash will be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

2.5 MULLIONS

Provide mullions between multiple-window units where indicated.

Mullions and mullion covers must be the profile indicated, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members shall be fabricated of the materials specified in [AAMA/WDMA/CSA 101/I.S.2/A440](#) and meet the specified design loading.

2.6 WINDOW CLEANERS' BOLTS

NOT USED

PART 3 EXECUTION

3.1 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements are as follows:

<u>PRODUCTS</u>	<u>INCH-POUND</u>	<u>METRIC</u>
Metal Casing	0.0625 inch	1.59 mm
Aluminum Tube (Diameter)	0.0625 inch 1 inch	1.59 mm 25 mm

3.2 INSTALLATION

3.2.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

3.2.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to [AAMA 101](#). Do not coat surfaces in contact with sealants after installation with any type of protective material.

3.2.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 7/16 inch.

3.2.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify that products are properly installed, connected, and adjusted.

3.3 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

3.4 WASTE MANAGEMENT

Separate corrugated cardboard and protective materials in accordance with the Waste Management Plan and place in designated areas for reuse or recycling. Place materials defined as hazardous or toxic waste in designated containers. Close and seal tightly all partly used sealant containers and store protected in well ventilated fire-safe area at moderate temperature. Place used sealant tubes and containers in areas designated for hazardous materials.

-- End of Section --

SECTION 08 81 00

GLAZING
02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2004) Safety Glazing Materials Used in Buildings

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-05 (2006; Errata 2007) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2006) Standard Specification for Flat Glass

ASTM C 1048 (2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass

ASTM C 1172 (2009) Standard Specification for Laminated Architectural Flat Glass

ASTM C 1184 (2005) Standard Specification for Structural Silicone Sealants

ASTM C 509 (2006) Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM C 669 (2000) Glazing Compounds for Back Bedding and Face Glazing of Metal Sash

ASTM C 864 (2005) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

ASTM C 920 (2008) Standard Specification for Elastomeric Joint Sealants

ASTM D 2287 (1996; R 2001) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

ASTM D 395 (2003; R 2008) Standard Test Methods for Rubber Property - Compression Set

ASTM D 4802	(2002) Poly(Methyl Methacrylate) Acrylic Plastic Sheet
ASTM D 673	(1993ae1) Mar Resistance of Plastics
ASTM E 119	(2009c) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E 1300	(2009a) Determining Load Resistance of Glass in Buildings
ASTM E 2010	(2001) Positive Pressure Fire Tests of Window Assemblies
ASTM E 773	(2001) Accelerated Weathering of Sealed Insulating Glass Units
ASTM E 774	(1997) Classification of the Durability of Sealed Insulating Glass Units

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual
GANA Sealant Manual	(1990) Sealant Manual
GANA Standards Manual	(2001) Tempering Division's Engineering Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(1990) Guidelines for Sloped Glazing
IGMA TM-3000	(1997) Glazing Guidelines for Sealed Insulating Glass Units

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2007) Standard Methods of Fire Tests of Door Assemblies
NFPA 257	(2006) Fire Test for Window and Glass Block Assemblies
NFPA 80	(2010) Standard for Fire Doors and Other Opening Protectives

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-378	(Basic; Notice 1) Putty Linseed Oil Type, (for Wood-Sash-Glazing
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201 Safety Standard for Architectural Glazing
Materials

UNDERWRITERS LABORATORIES (UL)

UL 752 (2005; Rev thru Dec 2006) Bullet-Resisting
Equipment

UL MEAPD (2003) Mechanical Equipment and Associated
Products Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass

Documentation for Energy Star qualifications.

Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Samples

Insulating Glass

Glazing Compound

Glazing Tape

Sealant

Two 8 x 10 inch samples of each of the following: tinted glass, heat-absorbing glass, and insulating glass units.

Three samples of each indicated material.

SD-07 Certificates

Insulating Glass

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

SD-08 Manufacturer's Instructions

Setting and sealing materials

Glass setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified

SD-11 Closeout Submittals

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of **glazing accessories**, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with **ANSI Z97.1**. Glazed panels shall comply with indicated wind/snow loading in accordance with **ASTM E 1300**.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

NOT USED

1.7 WARRANTY

1.7.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.7.2 Warranty for Polycarbonate Sheet

NOT USED

1.7.3 Monolithic Reflective Glass

NOT USED

1.7.4 Monolithic Opacified Spandrel

NOT USED

PART 2 PRODUCTS

2.1 GLASS

ASTM C 1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

NOT USED

2.1.2 Annealed Glass

NOT USED

2.1.3 Heat-Absorbing Glass

NOT USED

2.1.4 Wired Glass

NOT USED

2.1.5 Patterned Glass

NOT USED

2.1.6 Laminated Glass

ASTM C 1172, Kind LA fabricated from two nominal 1/8 inch pieces of Type I, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C 1036. Flat glass shall be laminated together with a minimum of 0.030 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Color shall be PPG Solarbronze with Sun-Guard Coating SN-68 or equal, meeting the following performance criteria:

VISIBLE LIGHT

% Transmittance: 51

% Reflectance: Indoors 10 Outdoor 9

SOLAR ENERGY (DIRECT)

% Transmittance: 24 Reflect % Out 19

WINTERU-Factor Nighttime: .29

SUMMER

U-Factor Daytime: .27

Shading Coef.: .42

SHGC: .358

Relative Heat Gain: 87

2.1.7 Bullet-Resisting Glass

NOT USED

2.1.8 Mirrors

NOT USED

2.1.9 One-Way Vision Glass (Transparent Mirrors)

NOT USED

2.1.10 Tempered Glass

NOT USED

2.1.11 Heat-Strengthened Glass

NOT USED

2.1.12 Spandrel Glass

NOT USED

2.1.13 Fire/Safety Rated Glass

Fire/safety rated glass shall be laminated Type I transparent flat type, Class 1-clear. Glass shall have a 45 minute rating when tested in accordance with [ASTM E 119](#). Glass shall be permanently labeled with appropriate markings.

2.1.14 Tinted (Light-Reducing) Glass

NOT USED

2.2 INSULATING GLASS UNITS

2.2.1 Buildings

NOT USED

2.2.2 Control Towers

NOT USED

2.2.3 Low Emissivity Insulating Glass

NOT USED

2.3 PLASTIC GLAZING

NOT USED

2.4 SETTING AND SEALING MATERIALS

Provide as specified in the [GANA Glazing Manual](#), [IGMA TM-3000](#), [IGMA TB-3001](#), and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted shall be gray or neutral color.

2.4.1 Putty and Glazing Compound

Glazing compound shall conform to [ASTM C 669](#) for face-glazing metal sash. Putty shall be linseed oil type conforming to [CID A-A-378](#) for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.4.2 Glazing Compound

[ASTM C 669](#). Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.4.3 Sealants

Provide elastomeric [and structural] sealants.

2.4.3.1 Elastomeric Sealant

[ASTM C 920](#), Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant shall match adjacent materials.

2.4.3.2 Structural Sealant

[ASTM C 1184](#), Type S.

2.4.4 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

2.4.5 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with [ASTM D 2287](#). Use only where glazing rabbet is designed for tape and tape is recommended by the glass or

sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes shall be chemically compatible with the product being set.

2.4.6 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to [ASTM C 509](#) and [ASTM D 395](#), Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer. Block color shall be black.

2.4.7 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

2.4.7.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to [ASTM C 509](#), Type 2, Option 1.

2.4.7.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to [ASTM C 864](#), Option 1, Shore A durometer between 65 and 75.

2.4.7.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.4.8 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

2.5 MIRROR ACCESSORIES

NOT USED

PART 3 EXECUTION

3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the [GANA Glazing Manual](#), [GANA Sealant Manual](#),

IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

NOT USED

3.2.2 Patterned Glass

NOT USED

3.2.3 Insulating Glass Units

NOT USED

3.2.4 Installation of Wire Glass

NOT USED

3.2.5 Installation of Heat-Absorbing Glass

NOT USED

3.2.6 Installation of Laminated Glass

Sashes which are to receive laminated glass shall be weeped to the outside to allow water drainage into the channel.

3.2.7 Plastic Sheet

NOT USED

3.3 ADDITIONAL REQUIREMENTS FOR GLAZING CONTROL TOWER WINDOWS

NOT USED

3.4 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass shall be clean at the time the work is accepted.

3.5 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.6 WASTE MANAGEMENT

Disposal and recycling of waste materials, including corrugated cardboard recycling, shall be in accordance with the Waste Management Plan. Separate float glass and reuse or recycle. Upon removal, separate protective materials and reuse or recycle. Separate tempered glass for use as aggregate or nonstructural fill. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

-- End of Section --