SECTION 080001

METAL WINDOWS

(PRE-QUALIFIED TRADE CONTRACTOR – BID REQUIRED)

Trade Contractors are required by law to provide Payment and Performance Bonds for the full value of their Trade Contracts, and Trade Contractors must include the full cost of the required Payment and Performance Bonds in the bid price they submit in response to this RFB.

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including, but not limited to, the following:

1. Work of Section 024100 – Selective Removal – as delineated.

2. All Work of Section 085113 – Aluminum Windows.

3. All Work of Section 088000 – Window Glazing.

4. Hoisting Equipment: Furnish, install, and maintain in safe and adequate condition all mechanical hoisting equipment, operating personnel, and rigging that is necessary for the proper execution of the Work of this Section.

5. Staging, Planking, and Scaffolding: Furnish, install, and maintain in safe and adequate condition all staging, planking, and scaffolding that is necessary for the proper execution of the Work in this Section.

B. Alternates: Not Applicable.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 085113

AULMINUM WINDOWS

(Part of Work of Section 080001 – METAL WINDOWS.
Prequalified Trade Contractor – Bid Required.)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work of this Section includes all labor, materials, equipment, and services necessary to complete the following:

1. Provide and install the window system with insulating glass as specified in configurations shown on the Drawings.

a. Provide heel sealant bead and weeps in glazing pocket as shown on the drawings; NOTE THIS WORK MAY BE ABOVE AND BEYOND WINDOW MANUFACTURER'S STANDARD FABRICATION PROCEDURE.

2. Provide interior trim covers at window perimeters as shown on the Drawings.

1.03 RELATED WORK:

A. The following items are not included in this Section and will be performed under the designated Sections:

1. 024100 – Selective Removal

2. 055000 – Metal Fabrications

3. 075400 – Membrane Roofing

4. 079000 – Joint Sealants

5. 088000 – Glazing

1.04 STANDARDS

A. Unless noted otherwise, comply with the current version of applicable standards noted in Section 014200 and the following, except where these specifications are more stringent:

1. Architectural Aluminum Manufacturers Association (AAMA):

a. 101/I.S.2-97 – Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

b. 502 – Voluntary Specification for Field Testing of Windows and Sliding Glass Doors.

c. 1503.1 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

2. Glass Association of America (GANA) Glazing Manual and Sealant Manual.

3. Flat Glass Marketing Association (FGMA), "Sealant Manual."

4. ASTM International (ASTM):

a. C920 – Specification for Elastomeric Sealant Joints.

b. E283 – Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.

c. E330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

d. E331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

e. E783 – Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

f. E1105 – Field Determination of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

1.05 PERFORMANCE REQUIREMENTS

A. General: Design wind pressures for windows and doors shall be as established by the International Building Code, 2009 edition with Massachusetts amendments. The design wind pressures for general wall areas and salient corners shall be verified by the Contractor's submitted engineering calculations.

B. Windows shall meet or exceed the strictest performance requirements of ANSI/AAMA 101/I.S.2-97 and shall meet the requirements listed below. Window

frames and receptor frames shall be thermally broken. Windows shall bear a label indicating their performance. AAMA Window and Door designations as follows:

1. Fixed Windows: AAMA F-HC40

2. Projected Windows: AAMA AP-HC40

C. Deflection: shall not exceed 1/175 of the unsupported spans when tested in accordance with ASTM E330 under a pressure equal to 1.5 times the design pressure sustained for ten seconds in each direction, and must be without permanent deformation of any component (limited to 0.2% of its span), glass breakage, or anchorage failure.

D. Thermal Resistance:

1. Maximum window U-value shall be 0.5.

E. Air Infiltration:

1. Tests shall be conducted in accordance with ASTM E283 (lab)/E783 (field).

2. Fixed and Projected Windows: Allowable air infiltration rates shall be 0.3 cfm/sq ft at a static air pressure difference of 6.24 psf.

F. Water Penetration Resistance:

1. The window and door system, including perimeter sealant joints and flashing, shall be sufficient to withstand, without leakage, a 15 min. static and cyclic (three cycles of 5 min. each) test at a pressure differential of 6.0 psf in accordance with ASTM E547(lab)/ASTM E1105(field).

2. Weep System: Each window sash glazing pocket and the sill frame shall be weeped. All weeps shall be located at the lowest drainage point of the section to drain all water from the section. At the sill frame, all weeps shall have a minimum unobstructed cross-section dimension of 3/8 in. The configuration of the window shall allow water to pass unimpeded from weep holes to the exterior, but shall not allow for "blow through" of wind-driven rain from the exterior. Weep covers, if allowed by the Architect, shall consist of stamped or formed metal covers with continuous tops and sides; covers formed of brake metal, i.e., formed Zs, or PVC will not be allowed.

G. Uniform Structural Load:

1. Windows shall be sufficient to withstand a positive and negative differential pressure of 1.5 times design pressure (40 psf) in accordance with ASTM E330, Procedure B. Units shall have no glass breakage or permanent damage to fasteners, hardware parts, or activating mechanisms, nor shall there be any other damage that would cause the units to be inoperable.

H. Comply with system physical requirements as follows:

1. Perimeter Seals: The window shall accommodate the designed outer perimeter seal, as well as a through-sill flashing, that is capable of collecting water penetrating the adjacent walls or through the sill corners of the sash frame and drain it back to the exterior. Windows/doors shall incorporate the following features:

   a. Provide continuous, solid edge returns, at least 1 in. deep, mitered or coped and reinforced at all corners, to accept the outer perimeter sealant and support the backer rod (without excessive deflection). The edge return may be an integrally extruded part of the frame, or may be a continuous frame expander.

   b. Frame expander and frame shall be constructed such that any joints or overlaps in the system are not against the flow of water.

   c. There shall be no penetrations or interruptions in the continuity of the perimeter seals.

2. Frame and Sash Construction:

   a. All frames shall be fabricated, cut, and assembled in the factory.

   b. No frame component, including glazing stops, shall be offset from the plane of the adjacent section by more than 1/32 in. Metal-to-metal-joint separations shall be limited to less than 1/32 in., and all such exterior joints shall be positively and continuously sealed to prevent water penetration into the frame. Application of sealant to the face of joints (face-sealing) is prohibited. All metal-to-metal joints, glazing seals, and perimeter joints shall have secondary drainage capacity to collect any penetrating water and weep it back to the outside.

   c. All fasteners shall be concealed and not visible after installation.

   d. Frame corners shall be joined using screws and all corners shall be sealed watertight. Multiple layers of sealant are prohibited.

3. Accommodation of Interior Finishes: The interior window trim shall meet the following requirements:

   a. The edge of the trim along the interior finish shall fit tightly and continuously against the finish.

   b. The trim shall be attached with concealed clips or fasteners, as shown on Drawings. The fasteners for concealed clips shall not penetrate the window flashing.

   c. Exposed trim fasteners are not permitted.

I. Frame Perimeter Anchorage:

1. Acceptable concepts for perimeter anchorage are shown on the Drawings. Other methods require approval of the Architect and must meet the following requirements:

a. Sill anchors shall not penetrate the horizontal leg of the sill flashing. Penetrating the rear, upturned leg 1 in. or higher above the horizontal leg is permitted as long as the fasteners have a continuous "gasket" seal around the point of penetration.

b. Pneumatic or powder-driven shot-in anchors are prohibited.

c. Frames shall be attached to structural components of the exterior wall assembly through structural sections and shall not be anchored through or to interior finishes.

d. Working strength of anchors shall be based on the smaller of the following:

(1) Average of field test results (see below) divided by a factor of safety of five for static loads and three for dynamic loads, whichever is smaller.

(2) Calculations based on manufacturer's published ultimate tensile and shear loads in base material with a factor of safety of five.

e. Minimum allowable fastener edge distance is as required by the manufacturer. Fastener load capacity shall be reduced as required by the manufacturer when edge distance is less than the edge distance required to obtain the maximum load.

f. Anchorage to frame and to surrounding structure shall be arranged such that failure of any single anchor will not make the anchorage system unstable or cause working loads on the remaining fasteners to exceed 50% of their ultimate static anchorage capacity.

1.06 SUBMITTALS

A. Written certification (by the producers of the materials) that all materials supplied comply with all the requirements of the appropriate referenced standards, that all materials are compatible with adjacent materials, and that all materials are suitable for their intended purpose.

B. Documentation from the window manufacturer certifying that the window system meets all performance requirements listed in Para. 1.05. If the proposed window will not meet performance requirements for some window configurations, promptly send the Designer a written list of those windows and the reasons for noncompliance.

C. Product Data: For each product to be used, submit manufacturer's technical literature, MSDS sheets, and test data substantiating that products comply with the stated requirements.

D. Samples: Samples of all materials specified, each properly labeled, including a typical window frame and sash corner, and all hardware.

E. Shop drawings of each window type, including window perimeter conditions and adjacent components coordinated with all involved trades. Drawings shall show the following:

1. Typical dimensioned elevations showing window openings and sash sizes.

2. Full-scale head, jamb, rail and stile, and sill sections.

3. Weep-drainage capabilities.

4. Hardware details and installation.

5. Anchorage details.

6. Installation sequence showing relation to adjoining construction, in particular position of window in relation to existing curb; wood blocking; membrane and metal flashing and cladding; and interior trim.

7. Drawings shall note and describe all materials and dimensional tolerance limits.

F. Window schedule showing window opening size, window operability, and glazing finishes at each replacement window location.

G. Sealant compatibility reports including frame corner seals/adhesives, and glazing components to frame and to paints, sealers, and other finishes. Reports shall address both chemical and adhesion compatibility issues. Coordinate with requirements of Section 079200 – Joint Sealants.

H. Manufacturer and installation contractor qualifications as described in Para. 1.07 – Quality Requirements.

I. Quality control documentation: Provide documentation showing that the items below meet the requirements for fabrication or installation as listed.

1. Calculations, sealed by a Massachusetts-licensed Professional Engineer, showing the adequacy of window perimeter anchors and attachments, stiffness of the mullions, and adequacy of components that are not verified by testing. Design of anchors shall meet manufacturer's recommendations, accepted engineering practices and the requirements of Par. 1.05.

2. Provide factory fabrication and assembly schedule for the windows for this project. Also, provide a letter stating that the Architect may visit the manufacturing plant at any time throughout the work to observe the

fabrication of products under this specification, including mock-up and production materials.

J. Closeout Documentation: Provide the following documentation upon substantial completion.

1. Provide the Owner with two copies of the maintenance manual produced by the replacement window manufacturer listing procedures and recommended frequency for inspecting, adjusting, and maintaining the windows specific to this project. The maintenance manual shall address all hardware, gaskets, sealants, and cleaning procedures.

1.07 QUALITY REQUIREMENTS

A. Manufacturer Qualifications: A firm regularly engaged in producing windows for not less than ten years that can successfully demonstrate the following:

1. A history of furnishing windows, sashes, and replacement parts for similar applications to this project with successful results.

2. Capability of producing the materials for this project as a sole source supplier, within the time parameters established by the project schedule.

3. Capability of furnishing window components in accordance with the Specifications.

4. Capability of engineering window components and demonstrating with calculations the structural adequacy of the window design.

5. Employ full-time factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

6. Provide the warranty requirements outlined in Para. 1.11.

B. Contractor Qualifications: The work of this Section shall be performed by a contractor acceptable to the Owner and approved by the window manufacturer.

1. The Contractor, the Contractor's superintendent, and foreman will have at least five years' experience successfully installing window systems similar in material, design, and extent to that indicated for this Project.

2. All work shall be performed by trained and authorized personnel.

3. Installation of the metal and membrane flashing shall be the responsibility of the window installer to ensure undivided responsibility.

4. All mechanics on this project shall be completely familiar with these Contract Documents and the procedures shown on the installation sequence shop drawings before installing any windows.

C. Source limitations: Obtain all windows through one source from a single manufacturer.

D. Regulatory Requirements:

1. Comply with all applicable local, city, state, and federal government environmental requirements regarding use and installation of the window system materials

1.08 MOCKUPS:

A. Construct mockups as indicated on the drawings and as follows. The mockups will be used to establish both technical and aesthetic standards for the remainder of the project. Notify Architect at least 48 hrs before starting work on each mockup.

B. Provide a full-scale mockup of the conditions listed below. Mockups must be prepared by scheduled installers. Include all required flashing, membranes, fasteners, and other components as required.

1. Replacement window system, including jamb, head, sill, and ganged-mullion conditions.

C. If Architect determines that mockups do not comply with requirements, reconstruct at no additional cost to the Owner until the Architect approves mockups.

D. Assist Architect with air and water penetration resistance tests. Test initial installation of each window type, in locations selected by the Architect. The tests will be conducted on fully installed windows, including all flashing (head, sill, and jamb) and perimeter sealant assembly.

E. Mock-ups approved by the Architect may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Conform to the handling standards of the American Architectural Manufacturers Association (AAMA) Aluminum Curtain Wall Manual #10, "Care and Handling of Architectural Aluminum from Shop to Site."

1.10 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not glaze units when ambient air temperature is below 40°F or in the presence of any moisture.

B. Existing Conditions:

1. Remove and dispose of existing windows where shown on the Drawings per Section 024100 – Selective Removal.

2. If installation cannot be completed before the end of a work day, cover opening with specified plywood and make watertight.

C. Field Measurements: Verify all dimensions by field measurement prior to shop drawings submittal and fabrication.

1.11 WARRANTY/GUARANTEE

A. General: Refer to the Agreement and Division 1 – General Requirements – for warranty and guarantee requirements.

B. Manufacturer Warranty: Submit a written warranty, executed by the window manufacturer, for a period of ten years from the date of manufacture, against defective materials or workmanship, including substantial noncompliance with applicable specification requirements and industry standards resulting in premature failure of the windows, finish, factory-glazed glass, or parts outside of normal wear.

1. In the event that windows or components are found defective, manufacturer will repair or provide replacements without charge at manufacturer's option.

C. Contractor Guarantee: Guarantee all work under this Section in a document stating that

1. If, within two years after the Date of Substantial Completion of the Work, any of the work of this Section is found to be defective or not in accordance with the Contract Documents, the Contractor shall, at its sole cost and expense, correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition.

2. Also, state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney's fees, court costs, and expert witness and consultant fees, to enforce Contractor's compliance with the obligations of this Guarantee.

3. The obligations of this Guarantee shall run directly to the Owner and its successors and assigns and may be enforced by the Owner and its successors and assigns against the Contractor, shall survive the termination of the Contract, and shall not be limited by conditions other than this Contract.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Replacement Window System: Provide an aluminum window system meeting the material requirements below and performance requirements in Para. 1.05:

1. Graham Architectural Products Corporation, Series 6100, or approved equal.

2.02 MATERIALS

A. Frame Construction:

1. Aluminum Components:

a. Extruded aluminum prime billet 6063-T5 or T6 alloy for primary components; 6063-T5 or T6, 6005-T5, 6105-T5 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).

c. Principal window frame members will be a minimum 0.060 in. in thickness except at frame sills, which will be 0.080 in. minimum thickness.

d. Extruded or formed trim components will be a minimum 0.060 in. in thickness.

2. Maximum Frame Depth Front to Back: 2 in.

3. Sill must allow for drainage to the exterior and function under both negative and positive pressure.

B. Compression Glazing Strips And Weatherstripping: Neoprene gaskets complying with ASTM D2000 Designation 2BC415 to 3BC415, PVC gaskets complying with ASTM D2287, or expanded neoprene gaskets complying with ASTM C509, Grade 4.

C. Hardware for Project Windows:

1. Material: Aluminum, stainless steel, or other noncorrosive materials compatible with aluminum for hardware having component parts that are exposed. Cadmium or zinc-plated steel where used must be in accordance with ASTM Specification B766 or B633.

2. Primary Locking Devices: Cast in white bronze cam action locks. When vent width exceeds 24 in., two such locking devices will be required. "Hand" cam lock handles on projected units to facilitate operations.

3. Limit Hardware: Stainless steel limit operating stay arms (Anderburg 88SS or equal).

4. Butt Hinges: Two butt hinges with stainless steel pins. Hinges to match the color of windows or of nonrusting and nonmagnetic materials.

D. Glazing: Comply with Specification Section 088000 – Window Glazing.

E. Metal Attachment Angle at Window Perimeter: Extruded 6063 or 6061-T5 or T6 alloy, continuous length; size angle to provide trim as shown on the Drawings and as required by attachment calculations provided by window manufacturer.

F. Fasteners for Metal Angle:

1. For fastening aluminum angle to window frame: DrilFlex 12 14 x 1 in. long Hex washer head self-drilling/self-tapping screws, by DrilFlex/Textron, or approved equal.

2. Pre-drill fastener holes in angle. Provide fasteners for each window type as shown on the Drawings.

3. Provide minimum 1/2 in. edge distance and minimum 3/4 in. spacing between fasteners.

G. Perimeter Shims: Rigid plastic approved by Architect, uniform thickness, except wedge-type at sill, with hole or slot to surround anchors and prevent displacement. At sill, use a dab of window perimeter sealant to retain shims and prevent displacement. Materials that are prone to erosion are not permitted for shims. Set shims in Dow 795 silicone sealant (specified in Section 07900) where called for.

1. Plastic components, such as setting shims, in the window construction shall be shielded from direct exterior exposure. All plastic components shall be recommended for exterior use by the plastic manufacturer and shall resist QUV exposure with UV-B 313 bulbs, 4 hr CON at 50°C/4 hr UV at 40°C, in accordance with ASTM G53, for 2,000 hrs without embrittlement, cracking, or fading, with a verifiable five-year successful field track record.

H. Temporary Protection: Contractor to begin installation only on as many windows as can be fully installed and anchored before work ends for the day. The Contractor is to design temporary protection for windows area that is watertight and can resist wind loads up to 15 mph in the event that windows that are removed are not replaced in the same day. The Contractor may only use temporary protection in the following conditions: there is no rain forecasted until the next working day, there are no wind speeds greater than 15 mph forecasted until the next working day. If rain or wind speed greater than 15 mph is forecasted until the next working day, the Contractor may not use temporary protection for windows and doors and must reinstall the existing window or door in the opening.

2.03 WINDOW FINISHES

A. General: All aluminum, including interior trim, shall match that of the existing windows.

B. All aluminum, including trim covers, sash, and frames shall be painted to match the appearance of the existing bronze-colored frames; color to be selected by Architect from window manufacturer's standard color chart. Finish shall be Kynar 500 (no substitutions) based on 70% polyvinyldene fluoride (PVDF) resin in conformance to the requirements of AAMA 605.2 and the following:

1. Coating system and thicknesses shall consist of the following:

a. Primer: 0.8 mil

b. Color Coat: 0.8 mil

2. Hardness: ASTM D-3363; F minimum using Eagle Turquoise Pencil.

3. Impact Resistance:

a. Test Method: ASTM D-2794; Gardner Variable Impact Tester with 5/8 in. mandrel.

b. Coating shall withstand reverse impact of 1-1/2 in./lbs per mil substrate thickness.

c. Coating shall adhere tightly to metal when subjected to #600 Scotch tape pick-off test. Paint film shall not pull off of substrate.

4. Adhesion:

a. Test Method: ASTM D-3359.

b. Coating shall not pick off when subjected to an 11 x 11 knife cut grid spaced 1/16 in. apart and taped with #600 Scotch tape.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine all surfaces scheduled to receive window assemblies for roughness, contaminants, unsound structural substrates, or other conditions that may impair the system installation. Notify the Architect in writing of any such conditions; do not commence work until all defects are remedied.

B. Verify all site conditions and dimensions by field measurement in consideration of the special conditions associated with repairs to existing construction. Notify the Architect immediately of any inconsistency between the conditions found and those shown in the contract drawings.

3.02 WINDOW INSTALLATION

A. General: Install windows per approved Shop Drawings in proper relation to adjoining construction. Do not twist frames or force-fit them into poorly prepared openings. Anchor windows and louvers as required to satisfy design requirements. See the manufacturer's installation instructions and Shop Drawings.

B. Center windows in wall openings leaving a uniform interface perimeter sealant recess on all four sides.

C. Level Units: Install shims at bearing locations, anchors, and latch point so that they are not dislodged by subsequent operations. Test sash operation and sash alignment before permanently anchoring units.

D. Anchorage: Anchor windows as shown on the drawings with clips. Size and spacing of anchors shall be as determined by structural calculations.

3.03 INTERIOR TRIM INSTALLATION

A. Install interior aluminum trim covers as shown on the Drawings. Cope ends of trim neatly to fit intersecting trim pieces with tight joints. Seal intersecting joints with a fine fillet bead of sealant to match the color of the frame.

B. There shall be no transverse joints in the trim.

3.04 CLEANING

A. After installation is complete and surrounding work is substantially complete, the installation contractor is to clean window glass.

3.05 PROTECTION

A. Institute protective measures required throughout the construction period to ensure that both interior and exterior of windows will be without damage or deterioration, other than normal weathering.

END OF SECTION

SECTION 088000

GLAZING

(Part of Work of Section 080001 – METAL WINDOWS,
Prequalified Trade Contractor – Bid Required.)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide labor, materials, and equipment necessary to complete the work of this Section, including, but not limited to, the following:

1. Provide glazing for all window systems.

1.03 RELATED WORK:

A. The following items are not included in this Section and will be performed under the designated Sections:

1. 085113 – Aluminum Windows

1.04 SUBMITTALS

A. Certifications that all materials supplied comply with all the requirements of the referenced standards and that all materials are suitable for the use specified herein.

B. Material Safety Data Sheets (MSDS) for all materials to be used.

C. Samples of all materials specified, each properly labeled, including two 12 in. by 12 in. samples of the specified insulated glass unit for testing and disassembly by the Architect.

D. Schedule: Provide a schedule of what type of glass will be used in each location. Coordinate with schedule required under Section 085113 – Aluminum Windows.

E. Shop Drawings: Drawings shall note and describe all materials and note limits of all tolerances.

F. Calculations: Provide glass manufacturer's wind-load charts, calculations, and certification of the performance of this work showing how design-load requirements and other performance criteria have been satisfied.

1.05 QUALIFICATIONS

A. Installer Qualifications: Engage an experienced installer who has a minimum of five years of experience with successfully completed work described in this Section.

1.06 WARRANTY/GUARANTEE

A. General: Refer to the Agreement and Division 1 – General Requirements – for warranty and guarantee requirements.

B. In addition to the requirements of the General Conditions, provide a guarantee stating that if any part of the work installed under this Section is found to be defective during a period of two years from the date of Substantial Completion (as defined in General Conditions). The Contractor shall promptly replace the defective components at no cost to the Owner. The guarantee shall cover labor and materials and shall not be prorated.

C. Provide the manufacturer's warranty on insulating glass units. Units shall be warranted against insulating unit seal failure, material obstruction of vision, and spacer migration for a period of ten years from the date of installation. A dew/frost point above –20°F shall constitute seal failure. This warranty shall cover labor and materials and shall not be prorated.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Glazing shall meet the following requirements:

1. Glass shall conform to ASTM C1048 (as applicable) and ASTM C1036-85, Type I, Class I, q3 – glazing select, and the following:

a. Glass edges shall be clean scored and cut.

b. Provide heat strengthened or tempered (heat soaked) glass as required for structural performance.

2. Insulating Glass Units (IGU): 1 in. overall thickness, comprised of two lites of 1/4 in. thick glass and 1/2 in. air space. IGUs shall conform to the following:

a. IGU hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be stainless steel tubes. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8 to 3/16 in. Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal

shall not be less than 1/16 in., and the total cumulative length of the primary seal between 1/16 in. and 1/8 in. shall be less than 12 in. in any one IGU. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable. Provide secondary seal of uniform depth with a nominal width of 1/4 in. Provide a total width of the primary and secondary seal of 1/2 in. Units shall carry CBA rating as established by ASTM E774-81 and shall meet SIGMA 65-7-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

b. Deflection of the IGU surface shall not exceed 0.01 in. when measured at the center of the insulating glass unit with a 2 ft long straight edge with temperatures on both sides of the IGU at 75°F and an ambient barometric pressure of 30.00 in. Hg.

c. The inner lite of the IGU shall have no tint (i.e., clear) glass.

d. The No. 3 surface of the IGU shall have a low emissivity ("low-e") coating. Performance characteristics of the IGU with low-e coating on the No. 3 surface: Shading coefficient of 0.40 or better (lower) and summertime ASHRAE U-value of 0.65 BTU/°F·sq ft·hr or better (lower).

B. Acceptable Manufacturers: Viracon, Oldcastle, Cardinal

2.02 GLAZING COMPONENTS

A. General Glazing Requirements: Provide sealants and gaskets that have performance and characteristics suitable for applications intended. Make sure that glazing sealants are compatible with sealants used in insulated glass fabrication, with laminated glass interlayer, and with surfaces to be in contact.

1. Colors: Provide colors of sealants and gaskets as selected by Architect from manufacturer's standards.

B. General Glazing: Provide sealant compatible with all substrates and materials and having maximum Shore A hardness of 50. Provide one of the following products if they meet or exceed the requirements of these Specifications:

1. Dow Corning 795

2. General Electric Silglaze N 2500, Gesil N, or Contractors SCS-1000

3. Tremco Tremsil 200 or Spectrum 2

C. Preformed Glazing Tape: Provide butyl-polyisobutylene rubber with 100% solids content in extruded tape roll form and complying with AAMA 804.1. Provide one of the following products if they meet or exceed the requirements of these Specifications:

1. Protective Treatments 303 or 606

2. Tremco Polyshim II

3. Woodmont Chem-Tape 40

D. Setting Blocks: Provide dense extruded neoprene or silicone with a hardness of 85 ±5 Shore A Durometer hardness, a minimum length of 4 in. and a minimum width equal to the glass thickness. Provide materials as recommended and approved by glass and sealant manufacturers. Provide products certified by their manufacturers to be "silicone compatible."

1. Shims: Used with setting blocks shall be the same material, hardness, length, and width as setting blocks.

E. Side Blocks: Provide dense extruded neoprene or silicone with a hardness of 55 ±5 Shore A Durometer hardness. Provide block with sufficient length to prevent point loading on the glass. Provide materials as recommended and approved by glass and sealant manufacturers. Provide products certified by their manufacturers to be "silicone compatible." Provide silicone side blocks for insulating units with silicone edge seals. Neoprene side blocks are acceptable only if permitted by the insulating glass fabricator.

F. Sealant Backer Rods: Provide flexible, resilient polyethylene foam, urethane foam, or extruded silicone as recommended and approved by sealant and glass manufacturers.

G. Primers: Provide cleaners, primers, and sealers as recommended by glass and sealant manufacturers.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify all site conditions and dimensions by field measurement in consideration of the special conditions associated with repairs to existing construction. Notify the Architect immediately of any inconsistency between the conditions found and those shown in the Contract Drawings.

3.02 GENERAL GLAZING WORKMANSHIP AND PROCEDURES

A. In general, follow the recommendations and procedures of the following standards and publications, except where these Contract Documents (project Specifications and Drawings) are more stringent:

1. Glazing Association of North America (GANA) "Glazing Manual," latest edition.

2. GANA "Sealant Manual," latest edition.

B. Preparation and Glazing: Do not glaze when ambient temperature is below 40°F or when in the presence of any moisture.

1. Inspect all glass before installation. Do not install defective glass.

2. Check glass for correct size and squareness. Adjust frame or glass size to correct as necessary.

3. Protect glass from edge damage. Use roller blocks. Replace all damaged or weakened glass.

4. Thoroughly clean glazing channels and pockets immediately before glazing and keep them dry.

5. Remove coatings which are not firmly bonded to substrates. Remove lacquer, if any.

6. Center glass in opening and provide minimum 1/2 in. glass bite and 1/8 in. minimum edge clearances.

7. Place setting blocks at quarter points and side blocks at upper half each side.

8. Securely set setting blocks and side blocks in position to prevent displacement.

9. Keep weeps clear.

10. Remove stops and provide sealants to create a watertight and airtight installation.

11. Glaze in a manner to permit simple replacement of glass without dismantling frames.

12. Place glass with uniform pattern, draw, bow, and similar visual characteristics.

13. Install tapes and gaskets to eliminate dirt and moisture pockets. Prepare for exterior cap seal.

14. Miter and seal tapes and gaskets at corners and seal at joints. Do not overlap at corners.

15. Install tapes and gaskets to prevent pulling away from corners.

16. Prevent metal-to-glass contact. Protect edges of insulating units from solvents and damage.

17. Replace stops and clean and prime stops, framing, and glass on both sides.

18. Clean, prime, and mask for liquid sealants immediately before sealant application.

19. Apply wet sealant in continuous motion and tool thoroughly to "wet" contact surfaces uniformly.

20. Slope sealant to promote drainage away from glass and sealant.

21. Defer glazing of openings needed for construction operations until directed.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned. Clean frequently, if necessary, to remove build-up of potentially harmful construction contaminants. Reclean all glass within one week of final acceptance of the project.

B. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Do not apply markers to surfaces of glass. Remove protections and reclean as necessary immediately before final acceptance.

C. Remove and replace all broken, chipped, cracked, scratched, or otherwise damaged glass from whatever cause.

END OF SECTION