

ADDENDUM NO. 2**TERMINAL GLAZING REPLACEMENT****MJ PROJECT NO. 19228.13**

The attention of all bidders submitting proposals for the above project is called to the following changes to the Contract Documents. The items set forth herein, whether of clarification, omission, addition, or substitution are to be included in and shall form a part of the proposal submitted.

Bidders shall acknowledge receipt of the Addendum by writing the words, “**Addendum No. 2**” and inserting a date of **May 27, 2025**, on page BP-2 of the Proposal Documents.

TECHNICAL SPECIFICATIONS**Addendum Item No. 1.1**

REVISE SPECIAL FUNCTION GLAZING – DOUBLE IGUS - **delete** Pages 1 through 9 in their entirety and **replace** with pages 1 through 9 attached to this addendum.

Summary:

Revision of Glass Finish GI-1B in Paragraph 2.3A.3.f.2.

END OF ADDENDUM NO. 2

SECTION 08 88 00
SPECIAL FUNCTION GLAZING-DOUBLE IGUS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Electronically tintable insulating glass units for dynamic light and heat control.
- B. Related Sections:
 - 1. Section 08 80 00
 - 2. Division 26 - Electrical

1.2 DEFINITIONS

- A. Fenestration: Openings in building's envelope including windows, doors, and skylights.
- B. Framing System: Basic rigid supporting structure of window.
- C. Glazing System: Soft material used in framing system.
- D. Bite: Dimension by which edge of glass product is engaged into glazing channel.
- E. IGU: Insulating Glass Unit.
- F. IGU Pigtail: Cable that extends from individual insulating glass units.
- G. Frame Cable: Cable that runs through framing system and connects IGU Pigtail to the Window Controller.
- H. 2-ply Laminated Glass: 2-sheets of monolithic glass bonded together with plastic interlayer by heat and pressure.
- I. Inboard Lite: Pane of IGU that faces interior of building.
- J. Outboard Lite: Pane of IGU that faces exterior of building.
- K. Performance Characteristics:
 - 1. Center-of-Glass Characteristics: Performance values that take only center portion of IGU into account and not framing members.
 - 2. Fenestration Performance: Performance based on total fenestration (glass and framing members). Values that can be validated and certified by National Fenestration Rating Council (NFRC).
- L. Insulating Glass Unit Surfaces and Coating Orientation:

1. Surface 1: Exterior surface of outer laminated glass ply.
 2. Surface 2: Interior surface of outer laminated glass ply (surface facing the laminating material).
 3. Surface 3: Exterior surface of inner laminated glass ply (surface facing the laminating material).
 4. Surface 4: Interior surface of inner laminated glass ply which is coated with the electrochromic layers.
 5. Surface 5: Exterior surface of inner pane.
 6. Surface 6: Room side surface of inner pane.
- M. Full: On state, with lowest visible light transmission.
- N. Clear: Off state, with highest visible light transmission.
- O. Variable Tint: Intermediate tint levels between fully tinted and clear.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
Electrochromic glass units shall be operated by a control system approved by the electrochromic glass manufacturer and as specified in Section 26 09 00.
- B. Framing and Glazing Systems:
1. Designed to accommodate IGU components below:
- C. Edge clearance: 1/4 inch (6 mm).
1. Bite clearance: 5/8 inch (16 mm).
 2. Face clearance: 3/16 inch (5 mm).
 3. Controls wiring, per manufacturer
 4. Glazing materials: compatible with materials of electronically tintable glass manufacturer's components.
 5. Provide glazing systems capable of withstanding normal thermal movements, wind loads, and impact loads, without failure, including loss due to defective manufacture, fabrication, and installation, deterioration of glazing materials, and other defects in construction.
 - a. Normal Thermal Movement: Resulting from ambient temperature range of 120 degrees F (67 degrees C) and from consequent temperature range within glass and glass framing members of 180 degrees F (100 degrees C)
- D. Provide glass products in thicknesses and strengths (heat-treated) required to meet or exceed the following criteria based on Project loads and in-service conditions per the methodology described in ASTM E1300.
1. Select minimum thickness of heat-treated glass products to ensure probability of failure does not exceed the following:
 - a. 8 breaks per 1000 for glass installed vertically or not over 15 degrees or more from vertical plan and under wind action.

- b. 1 break per 1000 for glass installed 15 degrees or more from vertical plane and under action of wind, snow, or both.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's IGU Product and Performance datasheet.
- B. Documentation indicating compliance with ASTM E2141-14 and E2953-14, Standard Specification for Evaluating Accelerated Aging Performance of Electrochromic Devices in Sealed Insulating Glass Units as verified by third party test laboratory such as National Renewable Energy Laboratory (NREL).
- C. Test Report: ASTM E2190 Specification for IGU Seal Durability. Provide certificate or test report stating that IGUs that passed the testing requirement contained the electrochromic system (EC coatings, bus bars, wires etc.) as in the product specified herein.
- D. IG Certification: IGCC/IGMA certification for insulating glass units containing electrochromic system. Provide certificate stating that IGUs that passed the testing requirement contained the electrochromic system (EC coatings, bus bars, wires etc.) as in the product specified herein. If capillary tubes are required for altitude applications, certification covering units with capillary tubes is also required.
- E. Shop Drawings: Indicate framing system and accommodations for wiring paths, connectors, routing, and exit from framing system.
- F. Structural Calculations: Provide structural calculations for framing system certified by structural engineer licensed in the state in which Project is located.

1.5 QUALITY ASSURANCE

- A. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or referenced standards.
 - 1. NGA/GANA Publications.
 - 2. FGIA/AAMA/IGMA Publications.
- B. Safety glass products in the US are to comply with CPSC 16 CFR Part 1201 for Category II materials and ANSI Z97.1 2015.
- C. Glass center of glass thermal and optical performance properties shall be based on calculations from the current LBNL WINDOW computer program.
- D. Provide glass that is heat-treated by horizontal (roller hearth) process with inherent roller wave distortion parallel to the base dimension, unless otherwise specified.
- E. Pre-Installation Meetings: Conduct pre-installation meeting/teleconference with the following parties in attendance:
 - 1. Architect, contractor, glazing contractor, frame manufacturer, Electrochromic IGU and controls manufacturer, electrical contractor, and other parties related

to work of this section, to review procedures, schedules, safety, and coordination with other elements of Project.

- F. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Material Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer. Do not remove IGU Pigtail connector cover until making connection to Frame Cable.
- D. Exercise care to prevent edge damage to glass, wire, and coatings on glass.
- E. Where insulating glass units will be exposed to substantial altitude changes, avoid seal ruptures by complying with manufacturer's recommendations for venting and sealing.

1.7 PROJECT / SITE CONDITIONS

- A. Verify frame channel dimensions are adequate for wire runs as designed.
- B. Environmental Requirements:
 - 1. Ensure that substrate surface and ambient air temperature are minimum of 40 degrees F (5 degrees C) and rising at application time and remain above 40 degrees F (5 degrees C) for at least 24 hours after application of sealants.

1.8 WARRANTY

- A. Warrant IGUs against defects in material or workmanship causing material obstruction of vision as a result of fogging or film formation of the internal glass as a result of failure of the seal for a period of ten (10) years from the date of manufacture of the IGUs from the Manufacturer.
- B. Warrant electrochromic glass against defects in material or workmanship, resulting in failure to tint, for a period of five (5) years from the date of manufacture of the electrochromic glass from the Manufacturer.
- C. Warrant laminated products against lamination defects, such as edge separation or delamination that materially obstruct vision through the glass for a period of five (5) years from the date of manufacture of the electrochromic glass from the Manufacturer.

- D. Manufacturer is not responsible for any special punitive, indirect, incidental or consequential damages (including, without limitation, the cost to remove non-conforming product or install replacement product.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The Basis of Design is SageGlass manufactured by SAGE Electrochromics, Inc.
2 Sage Way
Faribault, MN 55021
Telephone: 1-877-724-3321
E-mail: commercialsales@sageglass.com.
Internet: <http://www.sageglass.com>
Manufacture's Representative: Chase Cutts; chase.cutts@saint-gobain.com; 704-254-0912

Alternate products and Substitutions: Alternate products may be considered if they comply with all of the performance requirements of this specification and evidence is submitted thereof. Samples and data sheets of alternate products must be submitted at least 14 days prior to bid date for review. Alternate product to be approved by Architect. By using products other than Basis of Design the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.2 DEPARTMENT OF TRANSPORTATION FAA AIRPORT TERMINAL PROGRAM GRANT REQUIREMENT

1. Products and services must comply with Department of Transportation FAA Airport Terminal Program FY 2024 Funding Opportunity Grant Requirements (Section F.2.i)

2.3 MATERIALS

- A. 1 INCH Electrochromic Laminated Sealed Insulating Glass Units (IGUs), Argon Filled:
1. Laminated Outboard Lite:
 - a. Outer Ply (Surface 1 & 2):
 - 1) Glass Type: Coated float glass.
 - 2) Glass Tint: PACIFICA.
 - 3) Nominal Thickness: 0.250 inch (6 mm).
 - 4) Heat Treatment: Heat Strengthened
 - 5) Coating orientation: Surface No. 2.
 - 6) Obscuration: ≤26.0mm from IGU edge black ink obscuration band on surface # 2 around the perimeter.
 - 7) Add-Alternate finish: Bird friendly etch
 - b. Interlayer (between surface 2 & 3):
 - 1) Interlayer Type: PVB interlayer.
 - 2) Interlayer Tint: Clear.

- 3) Nominal Thickness: 0.030 inch (0.76mm).
 - c. Inner Ply (Surface 3 & 4):
 1. Glass Type: EC 2.0 coated clear float glass.
 2. Glass Tint: Electronically variable tintable.
 3. Nominal Thickness: 0.087 inch (2.2 mm).
 4. Heat treatment: Annealed
 5. Coating Orientation: Surface No. 4
2. Cavity:
 - a. Spacer Material: Austenitic standard stainless steel.
 - b. Nominal Thickness: 0.45" +/- 0.02 in (11.5 mm +/- 0.5mm).
 - c. Cavity: 0.5" (12.mm).
 - d. Wall Thickness: >= 0.007 inch (.178 mm).
 - e. Gas Fill: 90% Argon / 10% Air.
 - f. Desiccant: Four legs filled with blend of 3A molecular sieve and silica gel desiccant.
3. Inboard Lite:
 - d. Glass Type: Float glass.
 - e. Glass Tint: Clear
 - f. Glass Finish:
 1. GL-1A: None
 2. GI-1B: 3M FASARA Decorative Film. Pattern to be approved by architect/owner.
 - g. Nominal Thickness: 0.250 inch (6 mm).
 - h. Heat Treatment: Tempered
4. Pigtail:
 - a. Multi-conductor sheathed cable.
 - b. 2, 3 or 4 pin weather tight connector.
5. Clear Performance Characteristics (Center of Glass):
 - a. Visible Transmittance: 31 percent.
 - b. Exterior Reflectance: No greater than 6 percent.
 - c. Interior Reflectance: No greater than 10 percent.
 - d. Summer U-factor (U-value): 0.60 with 90% argon fill.
 - e. Winter U-factor (U-value): 0.60 with 90% argon fill.
 - f. Solar Heat Gain Coefficient (SHGC): 0.25.
 - g. Exterior reflected color using the l*a*b* color system shall have a negative value of b* (blue). The b* coordinate of the reflected exterior color shall not be positive (yellow) according to Window 6 calculations using appropriate NFRC approved International Glazing Database data file.
6. Full Performance Characteristics (Center of Glass):
 - a. Visible Transmittance: 1 percent.
 - b. Exterior Reflectance: No greater than 5 percent.
 - c. Interior Reflectance: No greater than 9 percent.
 - d. Summer U-factor (U-value): 0.29 with 90% argon fill.
 - e. Winter U-factor (U-value): 0.29 with 90% argon fill.
 - f. Solar Heat Gain Coefficient (SHGC): 0.10.

- g. Exterior reflected color in the blue-green (-a*, -b*) quadrant of the a*b* color space according to Window calculations using appropriate NFRC approved International Glazing Database data file.

B. Frame Cable (one per IGU):

- 1. Multi-conductor plenum rated sheathed cable type CMP/CL2P.
- 2. 2 or 4 pin weather resistant connector.
- 3. Connector shall be thin at <0.2" in height and installed in the glazing pocket or other easy to access space in the framing system for ease of maintenance.
- 4. Off state: Clear.
- 5. Operating Voltage: 5 volts DC or less applied to the EC insulating glass. Class 2 (low voltage, low current) electrical system.

C. Requirements:

- 1. Control functionality: Automated control for daylight and glare shall be provided (reference Division 26 section 09 00).
- 2. Heat-Strengthened Float Glass: Comply with ASTM C1048, Type I, Class 1 (clear), Quality Q3, Kind HS.
- 3. Tempered Float Glass: Comply with ASTM C1048, Type I, Class 1 (clear), Quality Q3, Kind FT.
- 4. Safety Tempered Float Glass: Comply with ANSI Z97.1 and CPSC 16 CFR 1201.
- 5. Laminated Glass: Comply with ASTM C1172 and other requirements as specified.
- 6. Fabricate laminated glass products in autoclave with heat, plus pressure, free of foreign substances and air pockets.
- 7. Coated glass: For point defects, comply with ASTM C1376-15 section 6.1 (vision glass) or 6.2 (overhead glass) as appropriate for the glazing application. For vision glass the ASTM C1376-15 standard requires that the glass be inspected at a distance of 10 ft (3m) at a 90° viewing angle against a bright uniform background. It allows for no more than 2 readily apparent blemishes in a 3" (75mm) diameter circle and no more than 5 readily apparent blemishes in a 12" (300mm) diameter circle. In addition, the maximum allowable pinhole and spot size is 1.6mm or 2.4mm in the central area and outer area respectively. The maximum length of a coating scratch or mark is 2" (50mm) and 3" (75mm) in the central and outer areas respectively. For more detail and definitions of central and outer area see ASTM C1376-15.
- 8. Provide sealed IGU with dehydrated airspace, primary seal of polyisobutylene (PIB); color black and secondary seal of two-part silicone; color- black, and >0.007 inch (.15mm) wall thickness stainless steel spacer as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification and Conditions

- 1. Verify that site conditions are acceptable for glass installation.
- 2. Verify openings for glazing are correctly sized and within tolerance.

3. Verify that functioning weep system is present.
4. Verify that minimum required face and edge clearances are being met.
5. Verify that glazing channels and recesses are clear and free of obstructions, weeps are clear, and channels and recesses are ready for glazing.
6. Verify that framing system is appropriately sized for IGU thickness and that precautions are taken to not over compress the edge seals of the IGU when the glass is installed.
7. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation:
1. Clean and prepare glazing channels and other framing members to receive glass and wire.
 2. Remove coatings and other harmful materials that will prevent glass and glazing installation required to comply with performance criteria specified.
 3. Install grommets at all locations where Frame Cable will penetrate metal framing or structure.

3.3 INSTALLATION

- A. Install products using recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".
- B. Verify that IGU secondary seal is compatible with glazing sealants.
- C. Install glass in prepared glazing channels and other framing members.
- D. Install glass per manufacturer's drawings showing IGU orientation and wire exit point into building. Comply with glass manufacturer's labels and instructions for glass orientation. Protect IGU pigtail and Frame Cable from any damage during installation. Use grommets during installation to protect wire when routing through frame. If Frame Cable or the connector is damaged during installation, manufacturer must be notified and the cable or the connector must be replaced or repaired with manufacturer's approved method. Refer to manufacturer's Wired Control System requirements.
- E. PVC jacketed plenum cables (IGU Pigtails, 8 Conductor Cable, Frame Cables) should be conditioned for 24 hours at room temperature prior to installation and never installed below 0°C (32° F) ambient temperature. Once installed these wires must not be exposed to sunlight even through glass. If they are installed in an exposed location, they must be covered or painted (latex / water based paint only).
- F. Verify glazing pocket where IGU Pigtail and Frame Cable connection is made is a dry location.
- G. Install silicone setting blocks in rabbets as recommended by referenced glazing standards in GANA Glazing Manual and IGMA Glazing Guidelines and manufacturer's Glazing Guidelines.
- H. Use silicone edge blocks for all installed panes to prevent glass from walking post installation.
- I. Provide bite on glass, minimum edge and face clearances, and glazing material tolerances recommended by GANA Glazing Manual and as approved by glass manufacturer.

- J. Provide weep system as recommended by GANA Glazing Manual.
- K. Distribute weight of glass unit along edge rather than at corners.
- L. Comply with framing manufacturer's and referenced industry recommendations on expansion joints and anchors, accommodating thermal movement, glass openings, use of setting and edge blocks, use of glass spacers, edge blocks, and installation of weep systems. Setting and edge blocks must be made from silicone. It is not recommended to use setting blocks made from other materials, as they have been known to alter the chemical makeup of plastics and rubbers they come in contact with, resulting in seal failure.
- M. Protect glass from edge damage during handling and installation.
- N. Install per IGMA North American Glazing Guidelines for Sealed Insulated Glass Units, for Commercial and Residential Use TM-3000-90(04) states "For dry glazed systems, an adequate seal should consist of a minimum of 0.70 N/mm (4 lb/in) and not exceeding 1.75 N/mm (10 lb/in) applied to the edges of the insulated glass unit by gaskets or other fastening systems."
- O. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing, or plaster.
- P. Once electronically tintable IGUs have been removed from packaging, remove labels within 10 days of exposure to sunlight or other UV light sources.

3.4 ADJUSTING

- A. Remove glass that is broken, chipped, cracked, or damaged in any way, and replace with new materials. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

3.5 CLEANING

- A. Clean glass inside and outside, immediately after installation and sealants have cured, per manufacturer's written recommendations.
- B. Remove labels and markings from glass.
- C. Clean glass per:
 - 1. NGA Glass Technical Paper FB01-00 (2020) - Proper Procedures for Cleaning Architectural Glass Products.
 - 2. NGA Glass Technical Paper FB02-02 (2018) – Heat-Treated Glass Surfaces Are Different.
- D. Do not use scrapers or other metal tools to clean glass.

3.6 TESTING

- A. Do not use 'high voltage spark' gas analyzers such as Sparklike's Gasglass on this product. Film and controls damage may occur and potentially void the warranty.

END OF SECTION 088800