

**SECTION 08 8836.11 – ELECTRONICALLY CONTROLLED SWITCHABLE INSULATING GLASS UNITS****PART 1 - GENERAL****1.1 SUMMARY**

Halio® smart-tinting insulating glass units use electrochromic technology to change color between clear and dark when an electrical charge is briefly applied. The electrical charge is controlled by cloud-based hardware and software.

- A. Section includes:
  - 1. Halio® smart-tinting electrochromic insulating glazing units. There are two variants of Halio IGUs:
    - a. Halio: Single-device glazing units.
    - b. Halio Black: Dual-device glazing units.
- B. Related Sections:

[Edit this list to remove sections not in Project or add sections related to Halio glazing.](#)

- 1. Division 08 - Sections for doors and framing to receive electrochromic glazing.
- 2. Division 25 - Sections for integrated automation of electrochromic glazing.
- 3. Division 26 - Sections for electrical devices, wiring, and general requirements.
- 4. Section 26 0905 - "Electronically Controlled Switchable Glass Controls."

**1.2 REFERENCES**

- A. Definitions: Refer to Division 08 for standard glass and glazing definitions.
  - 1. Electrochromic Glazing (EC Glazing): Glazing material that changes its aesthetic and transmittance properties in response to an applied electrical voltage or current.
  - 2. Electrochromic Device: The device that enables the color change between clear and tinted, which dynamically changes the visible light transmission properties.
  - 3. Tinted: The state in which the electrochromic IGU is in a lower visible light transmission.
  - 4. Clear: The state in which the electrochromic IGU is in its highest visible light transmission.
  - 5. Intermediate Tint Level: Any tint level between fully tinted and clear.
  - 6. Inboard Lite: The IGU pane that faces the exterior of a building.
  - 7. Outboard Lite: The IGU pane that faces the interior of a building.
  - 8. Surface 1: Exterior surface of outer pane.
  - 9. Surface 2: Interior surface of outer pane.
  - 10. Surface 3: Exterior surface of inner pane.
  - 11. Surface 4: Room side surface of inner pane.

- B. Reference Standards:
1. ASTM International (ASTM):
    - a. ASTM C 1036 - Specification for Flat Glass.
    - b. ASTM C 1048 - Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
    - c. ASTM C 1172 - Specification for Laminated Architectural Flat Glass.
    - d. ASTM C 1376 - Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
    - e. ASTM E 2190 - Specification for Insulating Glass Unit Performance and Evaluation.
    - f. ASTM E 2953 - Standard Specification for Evaluating Accelerated Aging Performance of Electrochromic Devices in Sealed Insulating Glass Units.
    - g. ASTM E 2141 – Standard Test Method for Accelerated Aging of Electrochromic Devices in Sealed Insulating Glass Units.
  2. American National Standards Institute (ANSI):
    - a. ANSI Z97.1 – American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
  3. Code of Federal Regulations:
    - a. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
  4. National Fire Protection Association (NFPA): [www.nfpa.org](http://www.nfpa.org).
    - a. NFPA 70 - National Electrical Code.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of electrochromic glazing with work of related sections including, but not limited to, provisions for electrical wiring concealed within glazing framing, connection points for electrical wiring work, and shop drawing requirements of other Sections that include provisions for installation of electrochromic glazing system components.
- B. Pre-installation Kick-off Meetings: Owner/Owner's representative, architect, general contractor, EC glazing manufacturer's project management, glazier, low voltage contractor, BMS/BAS representative (as required) shall meet to discuss wiring schematics, installation, owner configurable tinting behavior, and strategies for achieving desired outcomes.
- C. Commissioning: [**See Section 08 8836.11 "Commissioning".**]

### 1.4 ACTION SUBMITTALS

- A. Product Data: For electrochromic glazing system components.
  1. Include makeup diagram and performance data for each specified IGU.
- B. Sustainable Design Requirements:
  1. Energy performance data for each specified IGU.

- C. Shop Drawings: Provided by subcontractor for electrochromic glazing, including:
  - 1. IGU Schedule: For each IGU, include size, makeup of glazing unit, orientation, and location as keyed to elevations.
  - 2. Elevations, with numbered location for each IGU coordinated with Glazing Schedule.
  - 3. Installation details.
- D. Samples for Verification: As required.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports: Summary test results of ASTM 2141 testing.
- B. Source Quality Assurance Submittals: Manufacturer's Quality Assurance Document.
- C. Field Quality Control Submittals: Field testing results.
- D. Qualification Statements: Fabricator's and Installer's certificates, issued by EC glazing manufacturer.
- E. Sample Service Contract: Sample of software-as-service contract and terms shall be provided, including applicable options for fully- managed services.
- F. Sample Warranty: Manufacturer's standard warranty as specified.

### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Documentation as specified in Division 01.
- B. Warranty Documentation: Manufacturer's executed warranty documents. Submit prior to acceptance of Work.

### 1.7 QUALITY ASSURANCE

- A. Qualifications of Installers: Installer shall have completed EC glazing manufacturer's training program and received certification prior to certification.
- B. Quality Standards: Provide products and perform work of this Section in accordance with the following:
  - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

Specifier: Retain publications below that correspond to scope of Project.

2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
3. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
4. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

C. Mock-ups: As required by other Division 08 fenestration Sections.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements: Protect electrochromic glazing during shipping, handling, and storage to prevent breakage, scratching, damage to seals, or other visible damage. Deliver, unload, store, and erect electrochromic glazing without exposing panels to damage from construction operations. Protect electrical components from damage during handling and installation.

### 1.9 FIELD CONDITIONS

- A. Existing Conditions: Perform careful measurement of existing openings to receive new electrochromic glazing and verify ability to route wires.

### 1.10 WARRANTY

[Contact the manufacturer for complete warranty and service terms.](#)

- A. Manufacturer's Warranty: Manufacturer agrees to replace failed electrochromic glazing units against the following failures and defects, developed under normal use, from date of Substantial Completion for durations indicated.
1. Coated Glass: Defects including peeling, cracking, and other indications of deterioration in coating.
  2. Laminated Glass: Defects including edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  3. Insulating Glass Units: Defects including failure of hermetic seal. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  4. Electrochromic Glass Performance: Defects including failure of units to uniformly change color and visible light transmittance as described in manufacturer's published performance data.
  5. Warranty Durations:
    - a. Glazing Units: 10 years for insulating glazing units.
    - b. Electrochromic Device: 10 years.
    - c. Electrical Components: 5 years for electronic components.

**PART 2 - PRODUCTS****2.1 SYSTEM DESCRIPTION**

- A. Manufacturer: Kinestral Technologies, Inc., distributed by:

Halio North America, LLC  
3955 Trust Way  
Hayward, CA 94545  
Email: [salesna@halioglass.com](mailto:salesna@halioglass.com)

- B. Substitution Limitations:  
1. Substitutions are not permitted.

Select substitution limitation requirement above or below. Because Halio is uniquely consistent in color and rigorously factory-tested, it has no known equal. If project requires substitutions to be considered, retain and edit requirement below, but carefully review any proposed substitutions.

2. Substitutions will be considered according to [**Instructions to Bidders**] [**Division 01 Section "Substitution Procedures"**] [**Division 01 Section "Product Requirements"**].

Halio and Halio Black glazing units are available from 1'-11 15/16" (608 mm) to 10'-0 3/8" (3058 mm) tall by 1'-11 15/16" (608 mm) to 4'-11 3/8" (1508 mm) wide. They can be glazed into four-side captive glazing systems, including doors, sloped glazing, and skylights.

Specify Halio for light-filtering applications blocking up to 98 percent of visible light. Specify Halio Black where privacy or near-blackout conditions are required.

Contact Halio North America ([www.halioglass.com](http://www.halioglass.com)) for customization options.

- C. Electrochromic Glazing System: Electrochromic insulating glazing units installed in<**Insert Project-specific description of door and window types to be glazed with Halio and Halio Black IGUs.**>
1. Halio: Single-device glazing units.
  2. Halio Black: Dual-device glazing units.
  3. Control System and Wiring: Provided by electrochromic glazing manufacturer. See Section 26 09 46 "Network Instrumentation and Controls for Electrochromic Glazing."
  4. Remote Connectivity: Required for manufacturer's system setup and continued operation.
- D. Framing and glazing for smart-tinting IGU shall comply with the following:
1. Framing system: Approved by manufacturer of smart-tinting device.
  2. IGU clearances:
    - a. Edge: 1/4 inch (6 mm).
    - b. Bite: 5/8 inch (16 mm).

- c. Face: Depends on the selected frame.
- E. Electronic Components:
  - 1. External Components: Drivers, power supplies, cabinets, wiring, and controls as specified in Section 26 0905 "Electronically Controlled Switchable Glass Controls."
  - 2. Electrified Door Hardware: Shall be compatible with electrochromic glazing cabling. See hardware groups specified in Section 08 71 00 "Door Hardware."
  - 3. Electrical Characteristics: See Section 26 09 46 "Network Instrumentation and Controls for Electrochromic Glazing."
- F. Glazing materials: As specified in Section 08 80 00 "Glazing."

## 2.2 PERFORMANCE REQUIREMENTS

- A. Electrochromic Glazing System Performance, General: Installed glazing systems shall withstand normal thermal movement and wind and applicable impact loads without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing Performance: Comply with size, glazing type, location, and testing requirements of 16 CFR 1201 for Category I and II glazing products, and requirements of authorities having jurisdiction.
- C. Structural Performance: Provide glass products in thicknesses and strengths as described in ASTM E1300 and as follows:
  - 1. Select minimum thickness and strength of glass products such that failure probability does not exceed the following:
    - a. 8 breaks per 1000 for glass installed vertically or not over 15 degrees from vertical and under wind action.
    - b. 1 break per 1000 for glass installed 15 degrees or more from vertical and under action of wind, snow, or both.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties scheduled herein, based on procedures indicated below:
  - 1. U-Factors: Center-of-glazing values, per NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  - 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, per NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  - 3. Visible Reflectance: Center-of-glazing values, per NFRC 300.
  - 4. Color appearance of transmitted light: The transmitted spectrum of light shall be measured in accordance with NFRC301; color coordinates shall be calculated in accordance with WINDOW 6 authorized for NFRC Certification. The a\*b\* color coordinates for both the fully clear and fully tinted end states shall fall within the following range:

- a.  $a^*$  between -7 and 0.
  - b.  $b^*$  between -4.5 and +7.5.
  5. Color Rendering Index (CRI): Color Rendering Index of Transmitted light, measured in accordance with NFRC 301 and calculated according to EN410, shall be greater than 96 in the fully clear state.
- E. Sound Transmission Performance: As specified in Division 08 for fenestration systems to receive electrochromic glazing. Minimum performance of electrochromic glazing:
1. Sound Transmission Class (STC): 42.
  2. Outside Inside Transmission Class (OITC): 33.
- F. Tinting Performance:
1. Switching Response Time: Less than 20 seconds.
    - a. Measured as the amount of time for electrochromic IGU to visually indicate that it has received a command to tint.
  2. Switching Speed using PTR 5 from ASTM 2141:  $\leq 3$  minutes measured at STP (Standard Temperature & Pressure).
  3. Uniform Transitioning: Uniformity of color change over glazing unit. Gross non-uniformities resulting in an "iris effect," or edge-to-center tint progression shall not be acceptable.
    - a. Visible honeycomb pattern during tinting process indicates the window is in transition.
  4. Minimum 9 reconfigurable tint levels.
- G. Electronic Performance: See Section 26 0905 "Electronically Controlled Switchable Glass Controls."
- H. Network Security Performance: See Section 26 09 46 "Network Instrumentation and Controls for Electrochromic Glazing."

### 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and the following:
1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Permanently label with SGCC certification label.
- C. Insulating-Glass Certification Program: Permanently label with IGCC certification label.
- D. Thickness: Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Glass Components:

1. Float Glass, General: ASTM C 1036, Type I, Class I (clear), Quality-Q3.
  2. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.
  3. Heat-Treated Float Glass, Heat-Strengthened: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind HS.
  4. Heat-Treated Float Glass, Fully Tempered: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT, CPSC 16 CFR 1201 for Category II materials, where safety glass is indicated.
- F. Heat Treatment Fabrication Process:
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  2. Roll Wave Maximum Distortion: < 0.080 mm over 300 mm length.
  3. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048.
- G. Low-e Sputter-Coated Float Glass: ASTM C 1376.
- H. Laminated Glass: ASTM C 1172 and CPSC 16 CFR 1201 for Category II materials, with manufacturer's standard interlayer.
- I. Insulating-Glass Units: ASTM E 2190 factory-assembled units consisting of dual-sealed lites of glass separated by a dehydrated interspace, with selected spacer material and manufacturer's standard construction. Provide insulating glass units free of skips or voids in the primary or secondary seals.
1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
  2. Metallic Spacer: Aluminum.
  3. Edge Deletion: Delete low-E coating prior to fabrication of insulating units according to coated glass manufacturer's instructions.

## 2.4 GLAZING MATERIALS

- A. Glazing Materials: Spacers, edge blocking, gaskets, and sealants specified in Section 08 80 00 "Glazing."

## 2.5 FABRICATION

- A. Fabricate electrochromic glazing in dimensions required, with edge and face clearances, edge and surface conditions, and bite in accordance with referenced glazing publications.
- B. Edge Finishing: Fabricate electrochromic glazing finished edges to produce smooth edges without chips or scratches, polished, and warp-free.
- C. Factory-assemble electrochromic insulating glazing units with sealed lites of specified glass separated by a dehydrated interspace meeting ASTM E 2190, utilizing manufacturer's standard dual seal system, spacer, and desiccant.



- D. Label each unit clearly with its unique designation per glazing schedule and to indicate upward edge and exterior face.

## 2.6 SOURCE QUALITY CONTROL

- A. Factory Quality Control Procedures: Electrochromic glazing shall be manufactured under a factory Quality Management System which includes component specifications, outgoing quality procedures and workmanship standards. Electrochromic glazing manufacturing and IGU construction quality processes shall include optical quality, performance, final test quality and workmanship standards.
- B. Factory Tests and Inspections: Manual and automatic test & inspection shall be used throughout the manufacturing process. Electrochromic glazing manufacturer's Quality System shall provide detailed tracking by serial number which allows manufacturer to track all construction details, including components, processes, date of manufacturing, and performance and quality test data from the final IGU serial number.

## 2.7 ELECTROCHROMIC IGU SCHEDULE

The following example description is based on Halio with Vitro Sungate 400.

- A. IGU with EC Device, Type 1: Halio electrochromic laminated insulating glazing unit, low-e, clear.
1. Unit Overall Thickness: 1 1/8 inch (28 mm).
  2. Composition:
    - a. Outboard Light: nominally 1/2 inch (12 mm) thick electrochromic laminated unit.
      - 1) Class 1 ultraclear heat strengthened float glass, 4 mm thick, with black masking frit nominally 26 mm wide from edge of IGU.
      - 2) PVB Interlayer: 1.14 mm thick, clear.
      - 3) Electrochromic Device: 1.2 mm thick.
      - 4) PVB Interlayer: 1.14 mm thick, clear.
      - 5) Class 1 ultraclear heat strengthened float glass, 4 mm thick, with black masking frit nominally 26 mm wide from edge of IGU.
    - b. Interspace: 10 mm, 90 percent argon-filled.
    - c. Inboard Lite: Class 1 clear float glass, Kind HS (heat strengthened), 6 mm nominal.
      - 1) Low-E Coating: Sputtered on inboard lite facing the gap (third surface.)
      - 2) Product: Vitro Sungate 400.
    - d. Cable Pigtail with Connector: Standard location as viewed from exterior of IGU is top left corner.
  3. Safety Glazing: Provide Kind FT (fully tempered) float glass or heat strengthened float glass, complying with safety glazing labeling as required.
  4. Visible Light Transmittance, fully clear: 61 percent.
  5. Visible Light Transmittance, fully tinted: 2 percent.
  6. Visible Light Reflectance, Exterior, fully clear: 15 percent.
  7. Visible Light Reflectance, Exterior, fully tinted: 6 percent.

8. Visible Light Reflectance, Interior, fully clear: 17 percent.
9. Visible Light Reflectance, Interior, fully tinted: 13 percent.
10. Solar Heat Gain Coefficient, fully clear: 0.48.
11. Solar Heat Gain Coefficient, fully tinted: 0.10.
12. UV Transmittance, all states: Less than 1 percent.
13. Winter Nighttime U-Factor: 0.28 maximum.
14. Summer Daytime U-Factor: 0.29 maximum.

The following example description is based on Halio Black with Vitro Sungate 400.

- B. IGU with EC Device, Type 2: Halio Black electrochromic laminated insulating glazing unit, low-e, clear.
1. Unit Overall Thickness: 1 1/4 inch (30 mm), depending on window size.
  2. Composition:
    - a. Outboard Light: 9/16 inch (14 mm) thick electrochromic laminated unit.
      - 1) Class 1 ultraclear heat strengthened float glass, 4 mm thick, with black masking frit nominally 26 mm wide from edge of IGU.
      - 2) PVB Interlayer: 1.14 mm thick, clear.
      - 3) Electrochromic Device: 1.2 mm thick.
      - 4) PVB Interlayer: 1.14 mm thick, clear.
      - 5) Electrochromic Device: 1.2 mm thick.
      - 6) PVB Interlayer: 1.14 mm thick, clear.
      - 7) Class 1 ultraclear heat strengthened float glass, 4 mm thick, with black masking frit nominally 26 mm wide from edge of IGU.
    - b. Interspace: 10 mm, 90 percent argon-filled.
    - c. Inboard Lite: Class 1 clear float glass, Kind HS (heat strengthened), 6 mm minimum thickness.
      - 1) Low-E Coating: Sputtered on inboard lite facing the gap (third surface.)
      - 2) Product: Vitro Sungate 400.
    - d. Cable Pigtail with Connectors: Two pigtails, standard locations as viewed from exterior of glazing unit at the top left and top right corners.
  3. Safety Glazing: Provide Kind FT (fully tempered) float glass or heat strengthened float glass, complying with safety glazing labeling as required.
  4. Visible Light Transmittance, fully clear: 50 percent.
  5. Visible Light Transmittance, fully tinted: 0.1 percent.
  6. Visible Light Reflectance, Exterior, fully clear: 18 percent.
  7. Visible Light Reflectance, Exterior, fully tinted: 6 percent.
  8. Visible Light Reflectance, Interior, fully clear: 19 percent.
  9. Visible Light Reflectance, Interior, fully tinted: 12 percent.
  10. Solar Heat Gain Coefficient, fully clear: 0.39.
  11. Solar Heat Gain Coefficient, full tinted: 0.08.
  12. UV Transmittance, all states: Less than 1 percent.
  13. Winter Nighttime U-Factor: 0.27 maximum.
  14. Summer Daytime U-Factor: 0.28 maximum.

Contact manufacturer for performance data for customized IGU.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION AND PREPARATION**

- A. Verification of Conditions: Examine framing and glazing channels and EC glazing units, including preparations for wiring and wiring connections, for compliance with manufacturer's recommended installation tolerances, weep system functioning, face and edge clearances, and effective sealing between joints of glass-framing members.
  - 1. Verify that wiring pathways are available and free of obstruction.
- B. Preparation: As specified in Section 08 80 00 "Glazing" and as follows.
  - 1. Clean framing members in contact with glazing and glazing channels prior to installing glazing.
  - 2. Remove rough edges that may have resulted from cuts made in framing to accommodate cable or cable connectors.
  - 3. Temporarily label or mark glazing units to establish exterior and interior surfaces prior to installing glazing.
  - 4. Ensure that each lite and connected cable is individually labeled with its glazing schedule designation and orientation.
  - 5. See Section 26 09 46 "Network Instrumentation and Controls for Electrochromic Glazing" for preparation for connecting electrochromic glazing to power and data.

### **3.2 INSTALLATION**

- A. Glazing Installation, General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
  - 1. Comply with Section 08 80 00 "Glazing."
- B. Electrochromic Glazing Installation:
  - 1. Locate each IGU according to numbered location in Shop Drawings.
  - 2. Orient IGU as labeled and as indicated in Shop Drawings.
  - 3. Connections: See Section 26 0905 "Electronically Controlled Switchable Glass Controls."
- C. Tolerances: As specified in Section 08 80 00 "Glazing."

### **3.3 SYSTEM STARTUP**

- A. System Startup: See 26 09 46 "Network Instrumentation and Controls for Electrochromic Glazing."

### **3.4 FIELD QUALITY CONTROL**

- A. Tests and Inspections: Field inspections shall be performed by EC glazing manufacturer's Field Support or manufacturer-trained Glazing/low voltage integrator.
  - 1. EC glazing manufacturer shall provide detailed test procedures and testing tools for pre-installation and post installation.

2. Non-conforming product shall be isolated and be subject to further field testing before disposition.
3. Manufacturer field engineers shall inspect all jobs performed by first time installers of manufacturer's products.
4. Non-conforming work is defined as any work completed or installed outside manufacturer-recommended specs that is not previously approved by manufacturer's project manager.

All projects will receive Halio Design Services, Halio Field Support, and Halio Project Management support. Additional on-site services are determined on an as-needed basis.

- B. Manufacturer's Field Services: EC glazing manufacturer shall provide field support upon request by Contractor, installer, Architect, or Owner.
- C. Manufacturer's Remote Support Services: Provide factory real-time support for installers via telephone, email or in-app support.
  1. EC glazing manufacturer's Field Support personnel shall be supported by a regional Technical Support Team. This Technical Support team shall provide advanced support knowledge, tools and have direct access to product design, process engineers and quality managers as needed.
- D. **[Coordination of Other Tests and Inspections: Cooperate with Commissioning Agent as specified in See Section 08 8836.11 "Commissioning".]**

### 3.5 ADJUSTING AND CLEANING

1. Adjusting: See Section 26 0905 "Electronically Controlled Switchable Glass Controls" for adjusting of tinting performance and programming.
- B. Cleaning: As specified in Section 08 80 00 "Glazing" and in conformance with the following:
  1. GANA Glass Information Bulletin GANA 01-0300 - Proper Procedures for Cleaning Architectural Glass Products.
  2. GANA Glass Information Bulletin GANA TD-02-0402 - Heat-Treated Glass Surfaces Are Different.

### 3.6 COMMISSIONING

- A. As part of the work of this section, perform the following:
  1. Conduct visual inspection of the insulating glass unit and confirm pigtail placement.
  2. Verify electrochromic glass functionality by using the Mobile Testing Tool provided by the Manufacturer.
  3. Verify that all IGU pigtails are accessible for connection to the appropriate driver cable.

4. Using the Manufacturer-provided mobile installation app, locate the correct window in the app and scan the window QR code when prompted.
5. From cabinet location, use the Halio Install app to provision gateway and commission drivers by following the onscreen prompts.
7. Connect appropriate driver cable to driver and test using the Tint/Clear buttons. Visually observe and confirm the proper operation of the Halio system.

### 3.7 CLOSEOUT ACTIVITIES

- A. Demonstration and Training:
  1. Introduce system to Owner as part of fully-managed services specified herein.
  2. Review commissioning checklist with Owner to verify functions work as designed.
  3. Provide end user training, manuals, documentation and as-built drawings to parties designated by Owner.

### 3.8 PROTECTION

- A. Protection: Protect glazing as specified in Section 08 80 00 "Glazing."

### 3.9 MAINTENANCE

- A. Maintenance Service: Fully-managed service contract between Owner and electrochromic glazing manufacturer.

### END OF SECTION

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