



## SECTION 08 88 00

### THERMOCHROMIC GLASS

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#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Thermo-chromic glass for exterior windows, storefront, curtain wall and doors as scheduled.

##### 1.2 RELATED SECTIONS

- A. Section 08 41 23 - Steel-Framed Entrances and Storefronts.
- B. Section 08 42 29 - Automatic Entrances.
- C. Section 08 43 29 - Sliding Storefronts.
- D. Section 08 51 23 - Steel Windows.
- E. Section 08 51 13 - Aluminum Windows.
- F. Section 08 52 16 - Plastic-Clad Wood Windows.
- G. Section 08 53 13 - Vinyl Windows.
- H. Section 08 83 13 - Mirrored Glass Glazing
- I. Section 08 44 12 - Metal Framed Curtain Wall\*.

##### 1.3 REFERENCES

- A. American National Standards Institute (ANSI) Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- B. American Society of Civil Engineers (ASCE) 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM):
  - 1. ASTM C1036 - Standard Specification for Flat Glass.

2. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT, Coated and Uncoated Glass.
  3. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
  4. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
  5. ASTM E2141 - Standard Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units.
  6. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
  7. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
  8. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- D. Consumer Product Safety Commission (CPSC) 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- E. Glass Association of North America (GANA):
1. GANA Engineering Standards Manual.
  2. GANA Glazing Manual.
  3. GANA Laminated Glass Design Guide.
- F. Insulating Glass Manufacturers Alliance (IGMA):
1. IGMA TB-3001 - Sloped Glazing Guidelines.
  2. SIGMA TM-3000 - Glazing Guidelines for Sealed Insulating Glass Units.

#### 1.4 SYSTEM DESCRIPTION

- A. Glass Thicknesses:
1. Size glass to withstand positive and negative wind pressure acting normal to plane in accordance with ASCE 7 as measured in accordance with ASTM E330.
  2. Size glass to withstand positive and negative wind pressure acting normal to plane in accordance with Building Code as measured in accordance with ASTM E330.
  3. Provide glass in thicknesses and strengths to meet or exceed ASTM E1300.

#### 1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Descriptive data and performance attributes for thermochromic glass, including:
1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- C. Shop Drawings: Submit details of construction, including relationship with adjacent materials.
- D. Selection Samples: For each finish product specified, two 12 inches x 12 inches (305 mm x 305 mm) thermochromic glass samples.
- E. Verification Samples: For each finish product specified, two samples, 12 inches x 12 inches (305 mm x 305 mm) thermochromic glass samples.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar

products.

- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Regulatory Requirements:
  - 1. Provide safety glass for locations subject to human impact as required by Building Code.
  - 2. Safety glass: Tested and labeled to CPSC 16 CFR 1201.
- D. Perform Work in accordance with GANA Glazing Manual.
- E. Perform Work in accordance with GANA Laminated Glass Design Guide.
- F. Perform Work in accordance with SIGMA TM-3000.
- G. Perform Work in accordance with IGMA TB-3001.
- H. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship is approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

#### 1.7 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

#### 1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

#### 1.10 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### 1.11 WARRANTY

- A. Furnish manufacturer's 10 year warranty providing for replacement of glass units exhibiting filter delamination from glass, optical failures including bubbles, and heat seal failure, not including labor.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: RavenWindow, which is located at: 3950 Kearney St. Denver, CO 80207; Tel: 303-984-7490; Email: [request info: \(Del@ravenwindow.com\)](mailto:request info: (Del@ravenwindow.com)); Web: [www.ravenwindow.com](http://www.ravenwindow.com)

- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

## 2.2 MATERIALS - FILTER

- A. Manufacturer: RavenWindow thermochromic filter, applied to glass surface No. 2.
- B. Performance Characteristics:
  - 1. Heat and ultraviolet exposure: Pass 216 hour exposure under 700 watt UV curing lamp at sample temperature of 90 degrees C.
  - 2. Vibration and flexure: No defects, tested for 24 hours between two speakers set to 90 db and using tone generating software generating sounds from 20 to 20,000 Hz in 4 second cycles.
  - 3. Solar: No change to visual or functional conditions, tested to ASTM E2141.
  - 4. Fogging: No visual fogging, tested to ASTM E2189.
  - 5. Heat/humidity and thermal cycling: No damage to filter or visible change in appearance or function, tested to ASTM E2188.
  - 6. Long term cycling: No damage to filter or visible change in appearance or function, tested to ASTM E2190.

## 2.3 MATERIALS - GLASS

- A. Clear Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
- B. Clear Tempered Glass: ASTM C1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind FT fully tempered.
- C. Clear Heat Strengthened Glass: ASTM C1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind HS heat strengthened.
- D. Tinted Glass:
  - 1. Type: ASTM C1036, Type 1 transparent flat, Class 2 tinted heat absorbing and light reducing, Quality q3 glazing select.
  - 2. Color: Blue.
  - 3. Color: Green.
  - 4. Color: Bronze.
  - 5. Color: Gray.
- E. Tinted Tempered Glass:
  - 1. Type: ASTM C1048, Type 1 transparent flat, Class 2 tinted heat absorbing and light reducing, Quality q3 glazing select, Kind FT fully tempered.
  - 2. Color: Blue.
  - 3. Color: Green.
  - 4. Color: Bronze.
  - 5. Color: Gray.
- F. Tinted Heat Strengthened Glass:
  - 1. Type: ASTM C1048, Type 1 transparent flat, Class 2 tinted heat absorbing and light reducing, Quality q3 glazing select, Kind HS heat strengthened.
  - 2. Color: Blue.
  - 3. Color: Green.
  - 4. Color: Bronze.
  - 5. Color: Gray.

## 2.4 ACCESSORIES

- A. Glazing Accessories: Refer to Section 08 83 13 - Mirrored Glass Glazing.

## 2.5 FABRICATION

- A. Laminated Glass:
  - 1. Comply with ASTM C1172 and ANSI Z97.1.
  - 2. Laminate glass with laminating film by manufacturer's standard heat and pressure process.
  - 3. Cut glass to required size at factory.
  - 4. Discard glass with voids, delamination, or entrapped dirt or foreign matter.
- B. Sealed Insulating Glass:
  - 1. Comply with ASTM E2190.
  - 2. Fabricate spacer bar frame of tubular aluminum filled with desiccant.
  - 3. Bond spacer bar frame to glass panes with twin primary seals.
  - 4. Fill space outside frame to glass edge with elastomeric sealant.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Install glass in framing as specified in Section 08 83 13 - Mirrored Glass Glazing.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION