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Section 088800 – Switchable Smart Glass with PDLC

This guide specification has been prepared by Gauzy, USA, as an aid to specifiers in preparing written construction documents for electrically charged switchable translucent smart glass LCG[®], utilizing PDLC (Polymer-Dispersed Liquid Crystal) technology.

Common applications for instant privacy and projection, switchable smart glass include: Conference rooms, private offices, healthcare applications including clinics, patient room view windows and ICU/CCU sliding doors. Residential & commercial uses include bath/shower enclosures, security windows, skylights, and as the interior pane of insulated exterior glazing.

This guide specification is written around the Construction Specifications Institute (CSI), Section Format standards, and references to section names and numbers are based on MasterFormat 2012.

For specification assistance on specific product applications, please contact our offices above.

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Part 1 - General

1.1 DESCRIPTION

- A. Work Included: Provide specialty glazing and glazing accessories where indicated on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Documents: General Conditions, Supplementary Conditions, and Sections in Division 01 of these specifications apply to the work of this section.
- C. Related Sections:
 - 1. 079200 - Joint Sealants
 - 2. 081113 - Hollow Metal Doors & Frames
 - 3. 081216 - Interior Aluminum Door and Window Frames
 - 4. 081416 - Flush Wood Doors
 - 5. 084113 - Aluminum Entrances and Storefronts
 - 6. 084126 - All Glass Entrances and Storefronts

- 7. 084229 - Automatic Entrance Doors
- 8. 084243 - ICU/CCU Sliding Doors
- 9. 084413 - Glazed Aluminum Curtain walls
- 10. 085123 - Steel Windows and Storefront (Hollow Metal)
- 11. 086300 - Metal Framed Skylights
- 12. 088000 - Glazing
- 13. Electrical

1.2 QUALITY ASSURANCE

- A. Provide glazed units complying with the following as applicable to specific selections

PART 2:

- 1. Standards
 - a. GANA (Glass Association of North America)
 - b. IGMA (Insulated Glass Manufacturers Association)
- 2. Certification/Ratings
 - a. Safety Glazing
 - 1) CPSC (Consumer Products Safety Commission) 16 CFR 1201 Cat II
 - 2) ANSI (American National Standards Institute) Z91.1-2004 ANSI SAE Z26.1-1996 (safety glazing for motor vehicles)
 - b. Sound Control
 - 1) ASTM International (American Society for Testing and Materials) E90-83 (sound transmission class), E90-87 (analysis)
 - 2) E413-87 (certification)
 - 3) Sound Control Data

Overall Thickness	Construction	STC Value
5/16" (8mm)	1/8" x 0.060* x 1/8"	35
7/16" (11mm)	3/16" x 0.060* x 3/16"	37
9/16" (14mm)	1/4" x 0.060* x 1/4"	39
1" (25mm)	3/16" x 1/2" airspace x 5/16" laminate	39

* PVB inner layer is composed of two layers of 0.030 material to form the 0.060 thickness.

- 3. Others
 - a. IGCC (Insulated Glass Certification Council) #681 per ASTM guidelines set forth in E-773 and E-774 and certified to level CBA
 - b. ASTM C-920 (elastomeric joint sealants)
 - c. ASTM C-162 (standard terminology of glass and glass products)
 - d. ASTM C-1036 (flat glass)
 - e. ASTM C-1048 (heat-treated flat glass)
 - f. ASTM C-1172 (laminated architectural flat glass)
 - g. ASTM C-1422 (chemically-strengthened flat glass)

- h. ASTM C-1464 (bent glass)
- i. ASTM D1003 (haze and luminous transmittance of transparent plastics)
- j. ASTM E2190 (specification for insulating glass units)
- k. ASTM E2188 (accelerated weathering)
- l. ASTM E2189 (fog resistance)
- m. ASTM F-1637 (standard practice for safe walking surfaces)
- n. ASTM F-1646 (terminology relating to safety and traction for footwear)

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 013300.
- B. Product data:
 - 1. Materials list of items proposed to be provided.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturers' recommended installation procedures.
- C. Samples: Accompanying the above product data, submit:
 - 1. Samples of each type of gasket proposed to be used.
 - 2. Samples of each type of sealant proposed to be used, tested for each substrate involved, (including certification by sealant supplier if organic coating involved) proving compliance with manufacturer's recommended sealants for use with specialty glass.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 016000 and manufacturer's recommendations.
- B. Follow strict glass handling and storage recommendations of referenced standards, including
 - 1. Deliver and store glass in manufacturers crate. Lift glass out of crate (do not slide).
 - 2. Do not rest glass on un-cushioned surface.
 - 3. Do not lift or handle glass by electrical connectors or wires.
 - 4. Do not allow glass edges to come in contact with the frame or other conductive surfaces

While manufacturer warrants products against defects in materials, expected life of installation, with proper maintenance, is in excess of 10 years.

1.5 WARRANTIES

- A. Provide 2-year limited manufacturer's warranty against electrical failure and delamination of Materials, including failure in workmanship.

Part 2 - Products

2.1 SWITCHABLE PRIVACY GLASS

- A. Acceptable Manufacturer:
 - 1. LCG[®] by Gauzy, USA, Plano, TX www.gauzy.com
 - 2. Substitutions: Submit in accordance with Section 012500.
- B. General
 - 1. All glass complies with ASTM C-1036-06
 - 2. Provide the type and thickness shown on the Drawings or specified herein.
 - 3. Panels will not be given a permanently etched safety certification label unless specifically directed by the architect.
- C. Materials:
 - 1. Float glass-clear: Type 1, Class 1, Quality q3, ultraclear glass equal to
 - a. Pilkington North America; Optiwhite.
 - b. PPG Industries, Inc.; Starphire.

Annealed glass with manufacturer's standard PVB inner layers normally qualify as safety glass, but heat strengthening or fully tempering is also available if code requires or is desirable for specific applications.

- 2. Tempered glass: Comply with ASTM C-104 and Z976.1-84 for [heat strengthened] [fully tempered] glass.
- 3. Lamination Layers: Two layers of 0.030 PVB (polyvinyl butyral).
- 4. Switchable Film: Manufacturer's patented PDLC sheet, composed of a polymer matrix and liquid crystals, with electrical wiring connected to a CE&UL Listed Controller.
- D. Laminated Glass Fabrication:
 - 1. Provide [clear] [bronzel] [gray] tinted glass consisting of an outer face and an inner face of [float] [heat-strengthened] [fully tempered] glass laminated under heat and pressure to a proprietary liquid crystal film.
 - 2. Panels with widths exceeding maximum width of 70" will be manufactured with two butt-jointed liquid crystal films laminated into a single panel.
 - 3. Glass Optical Performance:
 - a. Transmission (visible): Approximately 78%
 - b. View Angle: Approximately 170 degrees.
 - c. Scattering Effectiveness: Approximately 1 inch.
 - d. Documented testing of each panel, showing less than 4% haze, is required.
 - 4. Fabricated Glass Thickness: Maximum Glass Sizes (for both 2 and 4 sided

framing):

- a. 5/16" in thickness:
- b. 7/16" in thickness
- c. 9/16" in thickness

5. [Exterior insulated glass units will be composed of 3/16 inch fully tempered outer light + 3/8" inch air space + 7/16 inch laminated switchable smart glass.]

- F. Provide other material, not specifically described but required for a complete and proper installation, as specified or selected by the Contractor subject to the approval of the Architect.

2.2 ELECTRICAL DEVICES AND CONNECTIONS

A. CE & UL Certified Controller:

1. For each fixed panel installation, provide a separate CE & UL Certified [Dimmable] [On/Off] Controller for each 100 square feet or fraction thereof or panel surface. Power source of 110-240 VAC, 60 Hz electricity must be supplied from a minimum 15A GFI circuit (20 A dedicated circuit recommended).
2. Do not connect more than 18 panels to each 20A circuit.
3. Controller must ramp up voltage to switchable smart glass, and regulate voltage to ensure glass transparency is unaffected and have an overvoltage protection circuit.
4. Controller must employ a 70VAC true square wave output, to reduce power consumption and provide best transparency.
5. Controller must have a DMX smart home/office interface.
6. Controller must have a DRY contact for wet applications.
7. Controller must have adjustable frequency control for on-site adjustments.
8. Controller must have a DIMM function.
9. Controller must have 0-10v option available.

B. Wall Switch: [Standard single pole switch] or [LCG[®] Dimmable Touch Panel]

Part 3 - Execution

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions are critical to the timely and proper completion of this work. Do not proceed until unsatisfactory conditions are corrected.
- B. After preparation of the glazing system, clean glazing channels, stops and rabbets to receive glazing materials, making free from obstructions and deleterious substances which might impair the work.
1. Remove protective coating which might fall in adhesion or interfere with bond of

sealants.

2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to applications of primer and glazing compounds or tapes.

3.2 INSTALLATION

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of these sections.
- B. Inspect each piece of glass immediately prior to start of installation.
 1. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or deficient in any other manner.
 2. Do not remove labels that were provided by the manufacturer, until so directed.
 3. Adhere to all manufacturers' installation instructions.
- C. Locate sill setting blocks of standard width and thickness at quarter points of all glass lights unless otherwise recommended by manufacturer or supplier.
 1. Use blocks of proper durometer, size and thickness to support the glass in accordance with the manufacturers' recommendations. Do NOT use wood blocks.
 2. Glass lap and edge clearances must be provided according to pertinent codes and standards of manufacturers.
- D. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.
 1. Installations of the glass in dynamic frames such as operable windows and sliding doors must meet architectural specifications in section 088000.
 2. Glazing to the exterior and wet interior conditions must be wet-sealed and impervious to moisture with provisions to allow for weeping of condensation that may infiltrate the system.
 3. Pressure glazing systems without positive positioning stops are not to be used with this glass.
 4. Place electrical connections properly to allow access by electrician. And test each glass prior to installation.
 5. Electrical connections must exit at the head conditions of any framing system in wet environment applications.
- E. Cut and seal the joints of glazing gaskets in accordance with the manufacturers recommendations, provide watertight and airtight seal at corners and other locations where joints are required.
- F. Special Glazing Requirements
 1. Interior Butt Glazing
 - a. Panels can be butt glazed using a minimum 7/16" thickness panel. USE ONLY NEUTRAL CURE SILICONES. DOW 791, 795 & 995. For Butt joint glazing use DOW 1199 - DO NOT USE ACETIC SILICONES.

- b. A minimum of a 1/4" separation between panels is recommended. DOW 1199 neutral cure structural silicone sealant may be used to close the joint.
 2. Swinging and Sliding Doors:
 - a. Door package will be supplied complete with door header, door leaf, power transfer device, and all other hardware.
- 3.3 PROTECTION
- A. Protect glass from breakage after installation by promptly installing streamers of ribbons, suitably attached to the framing and held free from the glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically allowed by the manufacturer.
 - B. Note: Windblown objects, welding sparks, or other material applied to the glass surface during construction may cause irreversible damage.
- 3.4 CLEANING
- A. Inspect installation to ensure glazing is sealed and that the glass edges and electrical components are not exposed to moisture.
 - B. Test each electrified LCG[®] glass unit. Verify performance and control switching. Correct deficiencies.
 - C. Abrasive cleaners should never be used, particularly when the surface to be cleaned has a reflective coating. Clean with a mild soap or very weak acid (vinegar) applied with a soft, clean, grit-free cloth. Rinse glass and framing immediately with water and the excess should be squeezed away from the glass, taking care not to contact the glass with any metal parts. Wipe framing dry.