

This section specifies Communication and Control for **View® Smart Windows** in CSI format for use by design professionals for use in Project Manuals. Typically edit by deletion based on your project requirements. Please call 408-514-6512 or visit www.view.com for more information.

SECTION 27 10 00 – INSTRUMENTATION AND CONTROL FOR SMART WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes: Communication and Control for Manufacturer's Glass Smart Glass system. Work by the low voltage electrical subcontractor includes, but is not limited to, installation of the Smart glass system's wiring and controls. Work also includes wiring and controls outside of the framing system.
- C. Related Requirements:
 - 1. Section 08 80 00 – Smart Glazing.
 - 2. Section 25 13 00 - Integrated Control Network for Smart Windows.
 - 3. Section 26 09 00 – Power for Instrumentation for Smart Windows
 - 4. Division 26 - Electrical

1.2 DEFINITIONS

- A. Refer to other divisions for industry standard glass and glazing definitions. The following apply to this section:
 - 1. IGU: Insulating Glass Unit.
 - 2. IGU Smart Window Connector: Wire extruding from each Smart Glass insulating glass unit.
 - 3. Network Window Controller: Control module for Smart Glass System.
 - 4. IGU Cable: Wire that connects one IGU smart connector to one Network Window Controller.
 - 5. Sky Sensor: Photo and infrared sensor that detects light levels and cloud cover.
 - 6. Network Window Controller:
 - a. Controller that sends voltage signal to one or multiple IGUs.
 - b. A device connected to trunk line via a drop cable and responsible for facilitating power delivery to connected IGU(s)
 - c. A device to deliver power over ethernet (PoE) to connected devices
 - 7. Network Adaptor: A controller that provides power and data to a connected device.
 - 8. Controls Integrated in Shop: For shop glazed units, in addition to Smart glass.
 - a. Note: Control components including window controller and cables can be integrated into the framing system by the glazier. This is the recommended method to ensure higher quality product and lower install cost and complexity.
 - 9. Controls Integrated in Field: For field glazed units.
 - a. Note: Control components including the window controller and cables need to be integrated into the framing system or building envelope by the Electrical Contractor.
 - 10. BACnet: ASHRAE, ANSI, and ISO standard communications protocol for building automation and control networks.
 - 11. REST API: Cloud based API's using the Representative State Transfer rules
 - 12. Power over Ethernet (PoE): Cable or ports that pass electric power over twisted-pair Ethernet cable to powered devices (PD), in addition to data.

1.3 SYSTEM DESCRIPTION

- A. Basic communication and controls system: Smart Glass insulated glass units shall be operated by manufacturer's Smart Glass control system.

1. Smart glass control system must be based on a computer model that represents the entirety of the building, its surrounding and location in 3D as a digital twin, to optimize user comfort while accounting for solar position and occupant locations.
 - a. System glare control shall primarily be done via calculations of sun angle, time of the day and year, window location, occupant seating, and penetration depth using prediction methodologies with deep learning algorithms, not via light sensors
 - b. The system shall use a single Sky Sensor per building, to be located on the roof. No interior light sensors shall be permitted. The Sky Sensor shall be used for exception-based control only, modifying the base schedule in response to real-time weather and lighting conditions. The Sky Sensor shall be capable of 360-degree ambient light sensing (on a 30 degree interval) and infrared measurement of cloud cover, including speed and direction of clouds
 - c. The system shall utilize a single exterior Sky Sensor per building to minimize installation and wiring costs but provide the capability to monitor light levels every 30 degrees to optimize user comfort
 - d. System must be capable of a remote connection to the manufacturer's 24/7 remote monitoring facility and allow for tracking of individual IGUs, remote schedule changes, system parameter modification and over-the-air (OTA) software upgrades
2. Smart glass wiring must be linear trunk line based ethernet communication system with a coaxial trunk line carrying power and data back to a central control panel.
3. Smart glass wiring must allow individual IGUs to be disconnected from the system, for service purposes, without effecting the connectivity or operation of any other IGU in the system.
4. Smart glass system shall be capable of creating functional blocks of IGUs called "Zones". Zones can range in size from a single IGU to the entire system, and individual IGUs shall be assignable to more than one zone. Zone configurations shall be entirely based on software, and shall not require any field wiring changes to be modified
5. Smart glass wiring featuring pre-terminated and field terminated connections to minimize wiring errors, labor cost and give design flexibility
6. Control panel must have redundant power over ethernet switches
7. Control panel must have enterprise grade server on rack
8. System must have vertical fiber optic backbone that connects all control panels and is fault-tolerant with built-in redundancy
9. System must be capable of integration with 5G radio devices by delivering data and power over optical fiber and CAT6A cables or just CAT6A cables
10. Smart Glass system shall be capable of communicating to 3rd party systems via BACnet/IP and REST API's.

1.4 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 1. Product Data: Manufacturer's Smart Glass literature including data sheets, installation instructions, use restrictions and limitations.
 2. Interconnect drawing: Electrical subcontractor shall review View Interconnect drawings and note any revisions to View related to trunk line lengths and window controller locations.
 - a. Interconnect wiring diagrams: Show framing system and integrated cables, cable routing, components, location of connectors, and exit from framing.
 - b. Include identification, lengths, quantities and locations of cabling and components.
 - c. Large scale drawings for fabrication, installation and erections including plans, elevations, details, anchorages, connections and accessories along with head, jamb, sill and joining details. Provide templates for work installed by others.
 - d. Take accurate field measurements before fabrication and indicate same on shop drawings.
- B. Ensure electrical schematics and shop drawings for control system have been reviewed and approved by manufacturer before being submitted.

1.5 QUALITY ASSURANCE

- A. Installer qualifications:

1. Experienced with comparable installations and having successful performance on not less than 3 such installations.
 2. BICSI Cabling Installation Certifications
 - a. BICSI Installer 2 Copper (INSTC)
 - b. BICSI Installer 2, Optical Fiber (INSTF)
 - c. BICSI Technician (TECH)
 3. Acceptable to manufacturer.
- B. Controls, Software, and Services installers will attend a minimum of (1) pre-installation training session conducted by View Project Manager either in person or via web hosted by View Project Manager prior to Controls, Software, and Services installation. Attendance at training session to be confirmed by View Project Manager.
- C. Pre-Installation Meetings: Conduct meeting to review procedures, schedules, safety, and coordination with other project elements.
1. Recommended Attendance: Architect, Contractor, glazing contractor, framing manufacturer, electrical contractor, automation engineer, Smart Glass manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Comply with product requirements, delivery storage and handling provisions of Division 01 and the following:
1. Do not deliver components until job is ready for installation.
 2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 3. Store materials in original packaging, protected from exposure to harmful environmental conditions including static electricity, and at temperature and humidity conditions recommended by manufacturer.
 4. All cables supplied by manufacturer shall have an installation temperature rating of -20°C to 80°C. All cables must be stored at room temperature of 23°C (74°F) 24 hours prior to installation. Install cables within 8-hours after removing from room temperature.

1.7 PROJECT CONDITIONS

- A. Verify conditions including:
1. That frame channel dimensions are adequate for wire runs as designed.
 2. That penetrations for frame/sensor cables are in place and correctly located.
- B. Environmental Requirements: Install assemblies only in indoor, clean, climate-controlled spaces using the final building mechanical system.

1.8 WARRANTY

- A. For Controls, Software, and Services Components necessary for operation and control of insulating glass units, the manufacturer shall warrant the system free of defects in material and workmanship as follow:
1. Warranty period shall commence on the date of delivery of components by the system manufacturer.
 2. Warranty period: 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design: View Smart Glass Instrumentation and Control assemblies as manufactured or supplied by:

VIEW Inc.
 195 S. Milpitas Blvd, Milpitas, CA 95035
 Telephone: 408-514-6512
 E-mail: salesops@viewglass.com
 Internet: <http://www.viewglass.com>.

- B. Manufacturer Experience: Instrumentation and Control assembly manufacturer should have manufactured and shipped 100,000 or more units of dynamic glass and should have been in operation for 10 years or more. Manufacturer should have experience in at least 10 or more large scale projects, with smart glass installation of 50,000 square feet or greater.
- C. Substitutions: Not permitted
- D. Proposed substitutions: Will be reviewed only if submitted in writing for approval by the design professional of record a minimum of 10 working days prior to the bid date and made available to all bidders. Proposed substitutes shall be accompanied by review of specification noting compliance on a line-by-line basis.

2.2 MATERIALS

- A. Smart Glass Control Panel:
 1. Floor mounted enclosure housing power supplies and controllers operating control system, containing only class 2 power outlets.
 2. Power specification:
 - a. Input Power: 208 VAC (three-phase), 60 Hz.
 - b. Output Power (at each power output): 48VDC, 2.0A.
 3. Components include:
 - a. Floor Controller; an enterprise grade server
 - b. Enterprise grade network switches
 - c. Fiber optic cassettes
 - d. Class 2 Power supplies.
 4. Capacity: Each control panel should be able to support a minimum of 150 IGUs to optimize space utilization in electrical and telecom rooms or closets.
- B. Cabling: Provide cabling by system manufacturer using only approved parts and including:
 1. Trunk line coaxial cable capable of carrying data at speeds greater than 1 Gbps and power
 2. Trunk Wye connector with impedance matching.
 3. Drop line RG-58 cable
 4. IGU cable with FEP material or robust equivalent
- C. Network Window controller: Controllers shall be connected to at least one insulating glass unit and be must be capable of powering one additional PoE powered device. Refer to definitions for functional description.
- D. Network Adapter: Controllers will be optional for the provisioning of PoE devices without the need for a connection to an insulating glass unit.
- E. IGU Smart Window Connector: Manufacturer's custom cable as follows:
 1. Length: 15.5 inches
 2. Termination: IP67 rated, environmentally sealed, 13/32 inch (10mm) circular connector.
 3. Minimum diameter hole through framing: 7/16 inch (11mm).
- F. Control Sensor:
 1. Outdoor Photo sensor: up to 100,000 Lux
 2. IR sensors for cloud detection
 3. PoE powered with CAT5 ethernet cables
- G. Optional Accessories:
 - a. Operable solutions for doors and windows
 - b. Wall mounted interface for Smart Glass control
- H. AC Wiring: Supplied under other sections by Electrical contractor.
- I. Ethernet Wiring: Supplied under other sections by Electrical contractor or IT facilities installers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site conditions and ensure that:

1. Controls network is comprised of linear ethernet coaxial lines from control panel to end of façade and each window controller branches off trunk line.
 2. Equipment, conduit, gang boxes, and other related materials are installed and ready to receive Work of this Section.
 3. Conduit and boxes are concealed.
- B. If correct conditions are deemed unsatisfactory, do not proceed until required corrections are complete.

3.2 CONTROLS INSTALLATION

- A. Using approved submittals, install products in accordance with manufacturer's instructions, recommendations, restrictions and limitations and in environment meeting specified conditions.
- B. Options for Control Integration:
1. In-Shop: Install Network Window Controller, Network Adapters, cables and other control components per framing manufacturer's wiring diagram.
 2. In-Field: Install Network Window Controller, Network Adapters, cables and other control components per interconnect wiring diagrams.
- C. Install Trunk Line cables according to the instructions to form a linear network.
1. Utilize trunk Wyes and drop cables as required to connect Network Window Controllers.
 2. Ensure Trunk Line cable is connected with Trunk Wyes as required for its entire length.
- D. Ensure Trunk line wire run lengths comply with Manufacturer's Smart Glass Control System Design Rules.
1. Refer to approved interconnect drawings for details.
- E. Install drop cables from Trunk Wyes to Network Window Controllers and Network Adapters.
- F. Install Network Window Controllers and Network Adapters using provided mounting holes in locations specified on View Interconnect drawings.
1. Ensure Controllers are accessible for service after installation.
- G. Make final connection between IGU cables (installed by glazier and labeled to match window controller) and Network Window Controllers or Network Adapters.
- H. All cables shall be installed through appropriately sized sleeves wherever said cables penetrate fire resistance rated barriers. A sleeve application shall include steel escutcheon plates and intumescent firestop gaskets sized to fit the outside diameter of the sleeve and sandwich the barrier to lock sleeve in place. The sleeve shall be provided with a sufficient thickness of intumescent firestop putty to seal the ends of the sleeve to restrict the passage of fire, smoke, and superheated gases. The firestop sleeve shall be UL Certified and tested to the requirements of ASTM E814 (UL1479) and CAN/ ULC-S115.
- I. Do not modify IGU smart window connectors, especially the pre-terminated connector. Contact manufacturer's product support if connector is damaged.
- J. Complete View Glass Site Installation and Verification Checklist requirements for low voltage subcontractor to verify Controls, Software, and Services integrity. Controls, Software, and Services testing procedures are to be conducted after IGU installation and testing completed.
- K. Evaluate any performance irregularities and recommend corrective action for any Controls, Software, and Services component or IGU test failure to general contractor and View Glass project manager.
- L. Provide signed and dated Site Installation and Verification Checklist to general contractor verifying that all installed Controls, Software, and Services components are functional based on View test procedures.
- M. Provide Site Installation and Verification Checklist verifying that all installed Controls, Software, and Services components are functional based on View test procedures signed and dated by General Contractor.

3.3 PROGRAMMING OF SMART GLASS SYSTEM

- A. Initial Programming Confirmation: Confirm and define specific programming requirements for Manufacturer's Smart Glass system controls.
- B. Pre-programming of Controls: Pre-program controls at factory to match initial programming requirements.
- C. Final programming: Using manufacturer's personnel, modify and complete programming at end of commissioning period.

3.4 COMMISSIONING OF SMART GLASS SYSTEM

- A. Commissioning must be accomplished using vendor provided mobile apps and web interfaces
- B. Network Window Controllers and other end points must be auto discovered by the Control Panel
- C. Network Window Controllers must be auto located in the building using a position algorithm so that no specific position is required, and no manual location matching is required
- D. Installer will submit digital verification of commissioning to View and have approval from View before commissioning is considered complete

END OF SECTION 27 10 00

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