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DUBAI

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THE KIMMEL CENTER FOR THE PERFORMING ARTS  
PHILADELPHIA, PENNSYLVANIA



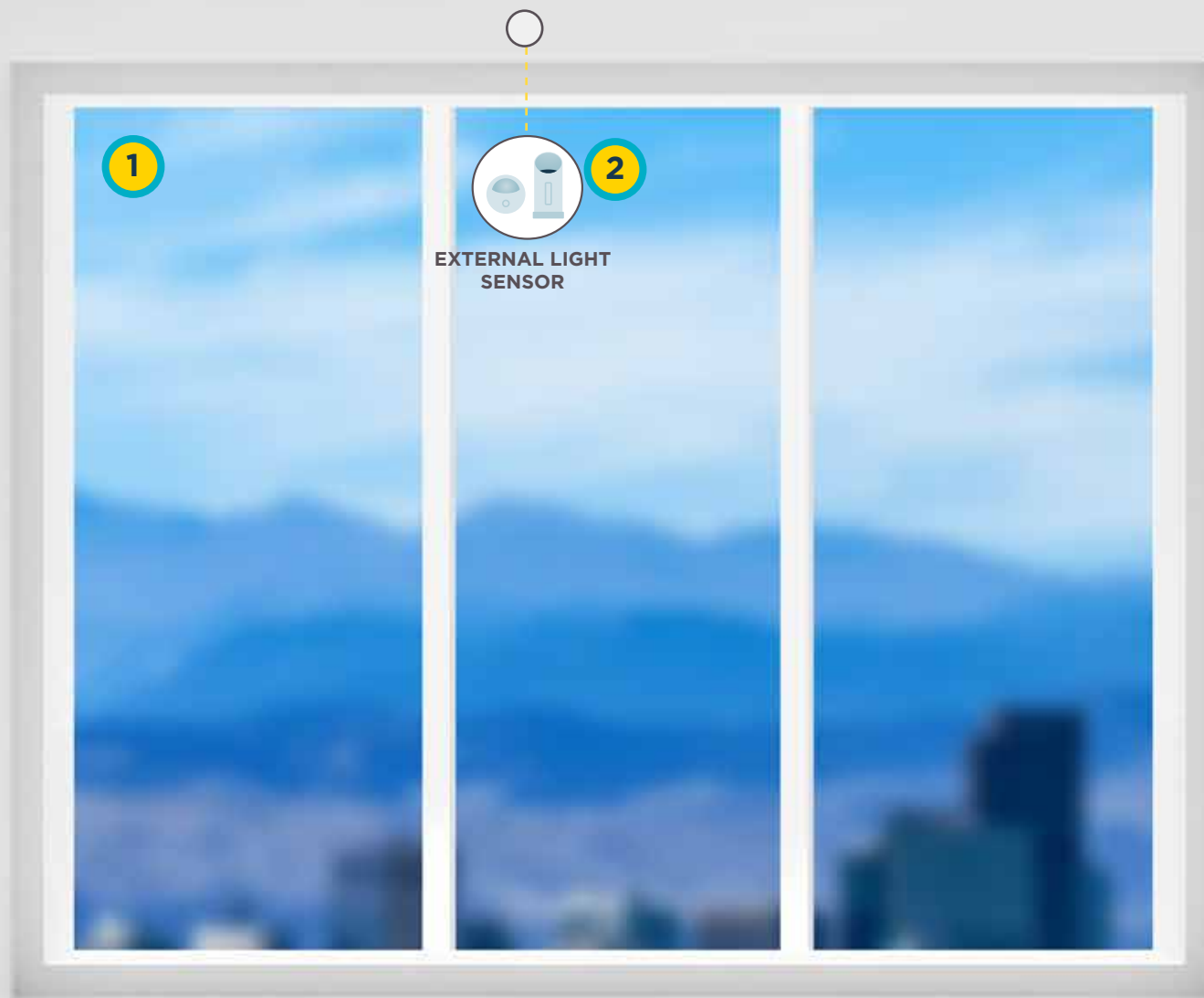
MUSEUM OF SCIENCE  
BOSTON, MASSACHUSETTS

# CONTROL SYSTEM

## OVERVIEW



# VISIBLE COMPONENTS



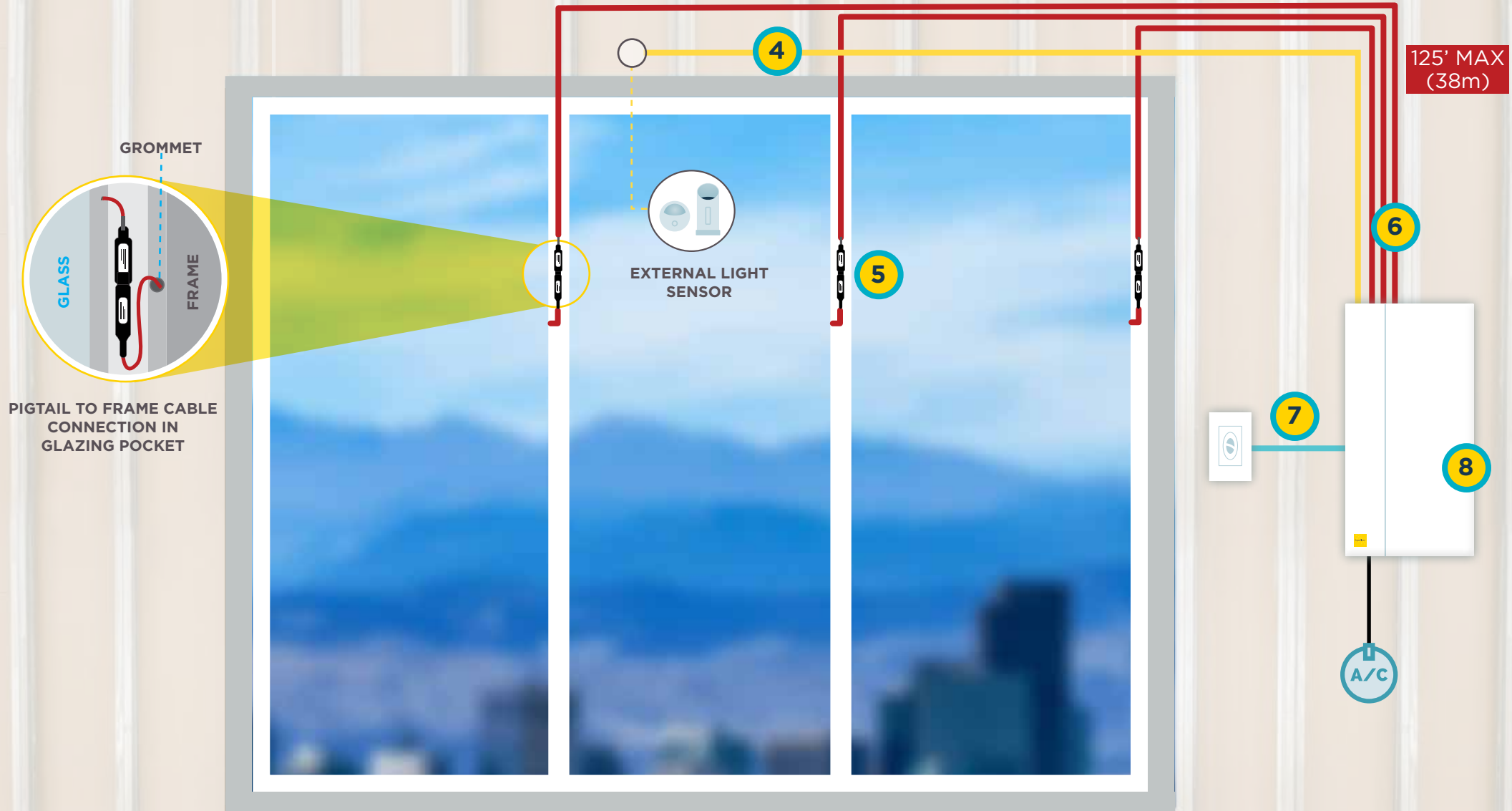
**1 SAGEGLASS INSULATING GLASS UNITS (IGU):**  
Tint automatically to control heat and glare, as well as maximize daylight.

**2 EXTERNAL LIGHT SENSORS:**  
Inputs for the Automatic Control System.

**3 SWITCH OR MOBILE APP:**  
Manually adjust IGU tint levels to temporarily override the Automatic Control System.



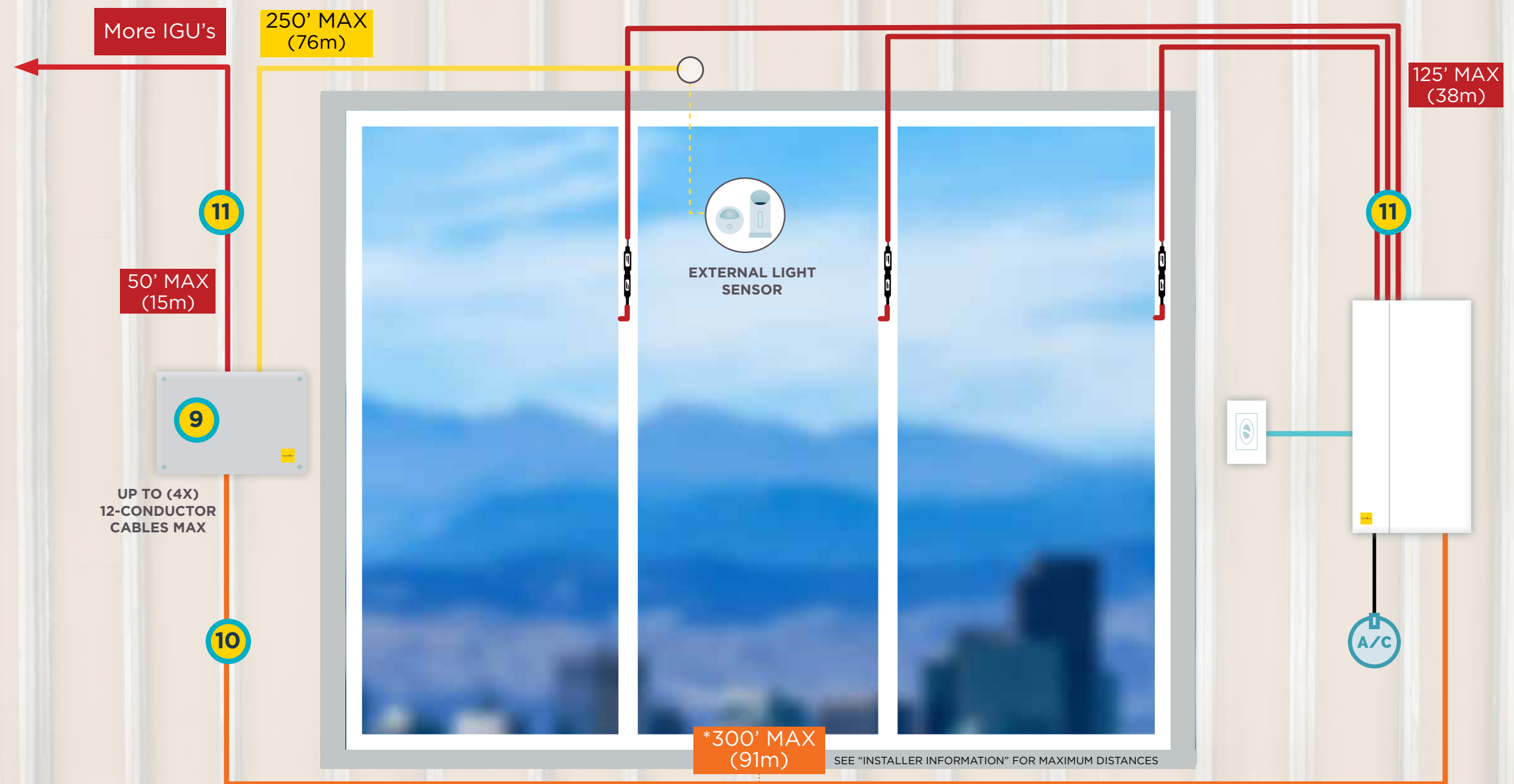
# WIRING OPTION 1



- 4 SENSOR CABLE:** Connects the sensors to the Terminal Box and/or directly to the Control Panel.
- 5 PIGTAIL:** Connects the IGU to the Frame Cable.
- 6 FRAME CABLE:** Connects the Pigtail to the Control Panel.

- 7 SAGEBUS CABLE:** Connects the SageGlass Switch to the Control Panels, connecting in “daisy chain” fashion.
- 8 CONTROL PANEL:** The electrical panel to connect, control, and power the SageGlass System.

# WIRING OPTION 2

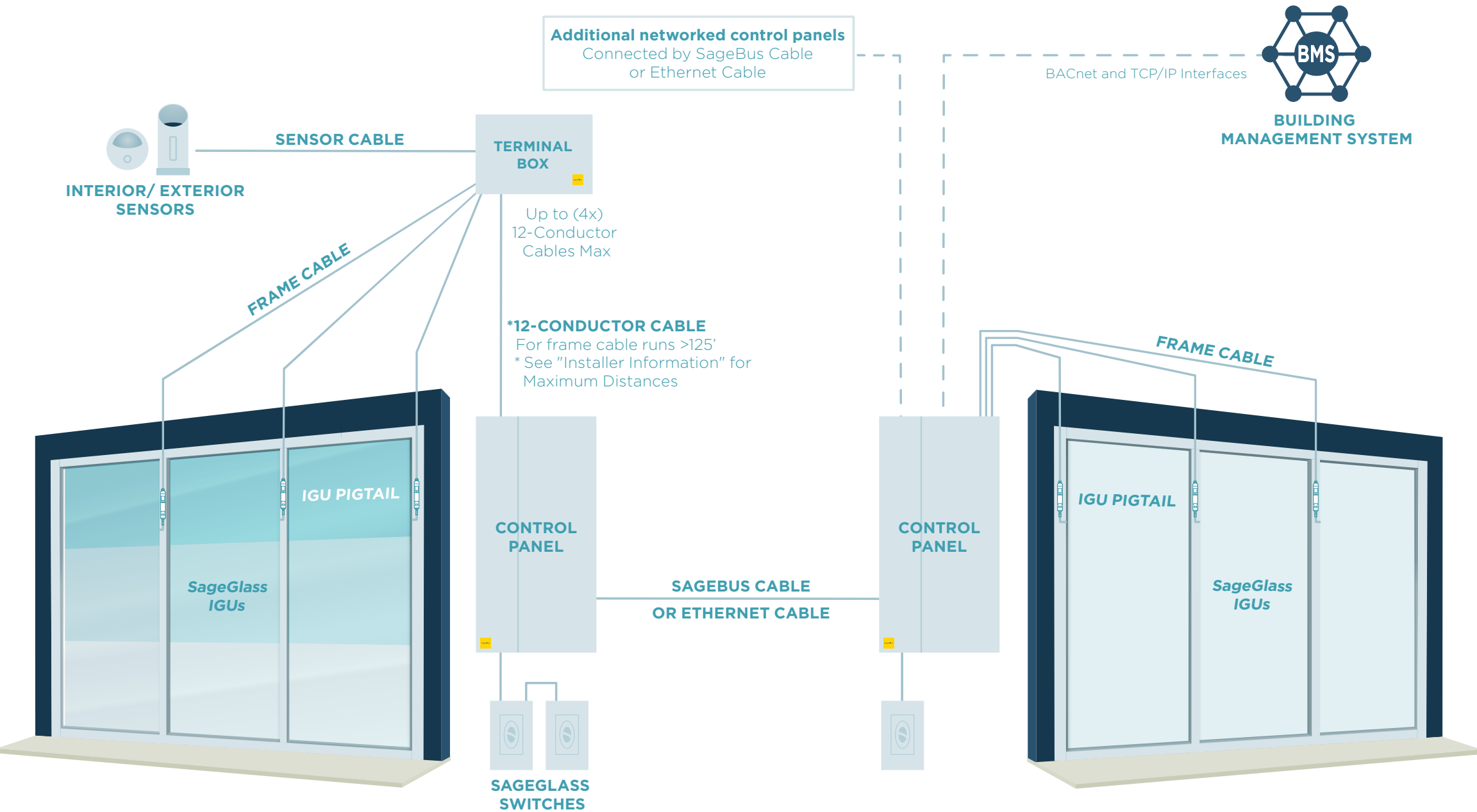


**9 TERMINAL BOX:**  
Optional - Used as a junction box to act as an "extension" for when distances between an IGU and Control Panel are greater than 125 feet.

**10 12-CONDUCTOR (EXTENSION) CABLE:**  
Connects the Terminal Box to the Control Panel.

**11 FRAME CABLE:**  
Connects Pigtail to Terminal Box and/or Control Panel.

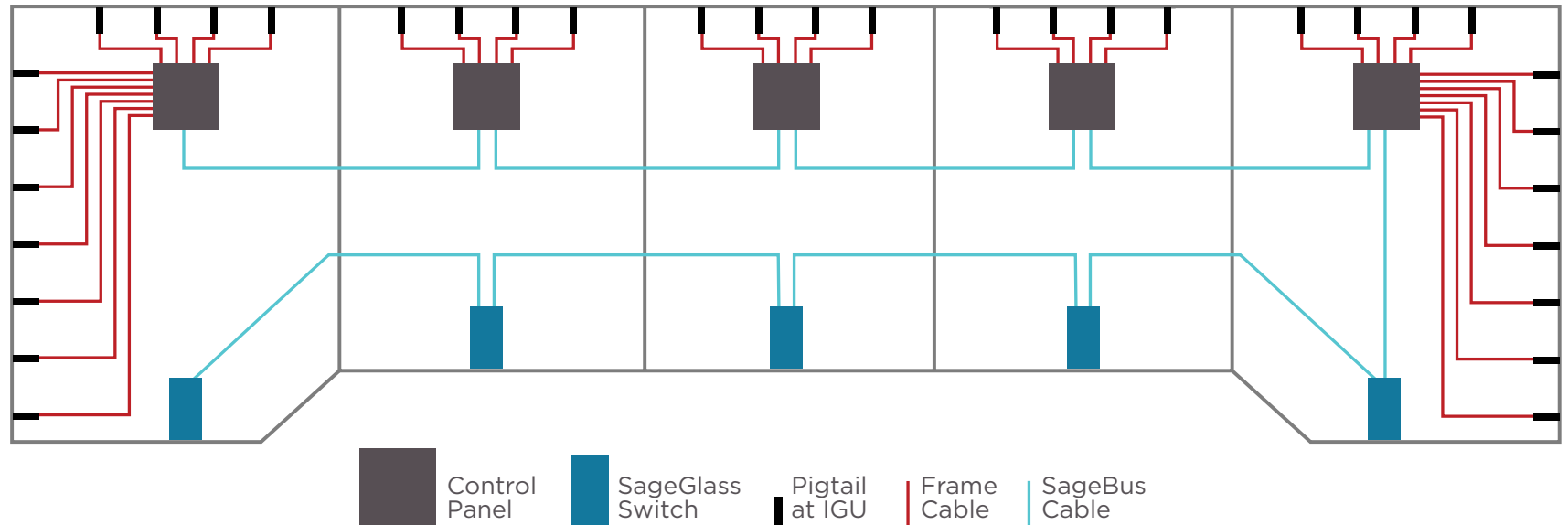
# NETWORK OVERVIEW EXAMPLE



# SAGEGLASS CONTROL SYSTEM

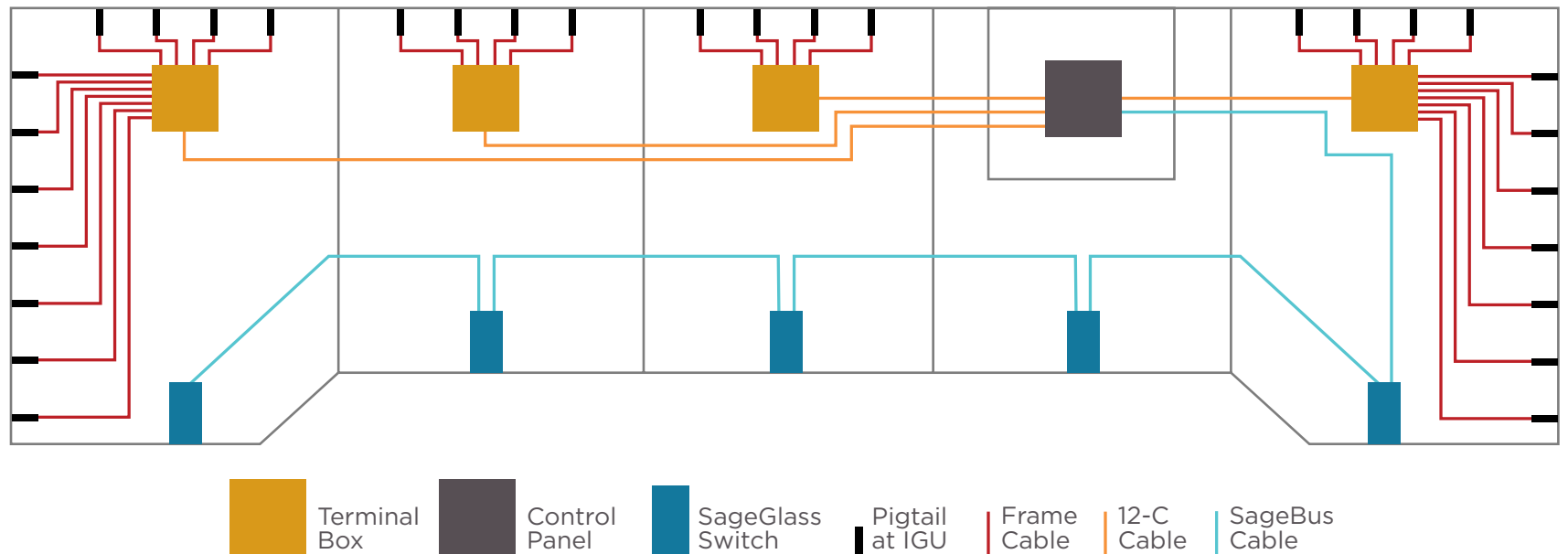
## DISTRIBUTED ARCHITECTURE

The Distributed Architecture is used in situations where the distance between the IGU and the Control Panel is 125' (38m) or less. In this setup, the Terminal Box is not used.



## CENTRALIZED ARCHITECTURE

The Centralized Architecture is used in situations where the distance between the IGU and the Control Panel is greater than 125' (38m). In this setup, Terminal Boxes are used as an intermediary between the IGU and the Control Panel.



# INSTALLER INFORMATION

## STANDARD DELIVERY ORDER OF SYSTEM HARDWARE COMPONENTS (RECEIVED ON SITE):

**ROUGH-IN KIT:** Terminal Box + 12-Conductor Cable + Control Panel (bare) + SageBus Cables, Sensors, and Frame Cables.

**REMAINING COMPONENTS:** Backplanes mounted with control cards (PCBs) and wall switches.

## CABLE ROUTING IN THE FIELD:

- SageGlass provides a detailed wiring diagram specific to each project.
- The SageGlass Control Panel's power output is high-reliability and rated Class 2, and all SageGlass cabling is plenum rated, ensuring safety and permitting cost-effective Class 2 wiring methods.
- All cables should be cut to length and re-labeled when field terminated.
- Frame cable requires 3/8" (10mm) hole (grommeted) in framing member.
- SageBus Cable runs between Control Panels and SageGlass switches with 1500' (450m) max total distance across each single SageBus network.
- Ethernet cables connect separate SageBus networks.
- Maximum distance from IGU to Control Panel is 125' (38m) (Distributed System) or 350' (105m) (Centralized System) - see table below.

## STANDARD DIVISION OF RESPONSIBILITY AT SITE:

**GLAZING CONTRACTOR** is responsible for IGU installation, and the Frame Cable routing / labeling / connecting to the IGU pigtail, as well as testing the integrity of the Frame Cable circuit from the IGU to the frame (tester provided).

**ELECTRICAL CONTRACTOR** installs the balance of the SageGlass Control System: routing / testing of the Frame Cables from the frame to the Terminal Box and/or Control Panel; routing / labeling of the 12-Conductor Cable; routing the Sensor Cable, SageBus Cable, and routing/installing Ethernet Cables & Switches; installation of Terminal Box, Control Panel, Sensors and Wall Switches; and the termination of all the cabling elements (Frame Cable, 12-Conductor Cable, SageBus Cable, Sensor Cable, Ethernet Cable\*, and Power).

## POINTS OF INTEREST TO INSTALLERS/CONTRACTORS:

### CONTROL PANEL / TERMINAL BOX CAPACITIES

- **SMALL PANEL:** 72 IGU's (max) and 144 terminations
- **MEDIUM PANEL:** 144 IGU's (max) and 288 terminations
- **LARGE PANEL:** 216 IGU's (max) and 432 terminations
- **TERMINAL BOX:** 24 IGU's (max) and 96 terminations

## IGU-TO-CONTROL-PANEL DISTANCES

CONTROLS ARCHITECTURE TYPES	MAX LENGTH FRAME CABLE	MAX LENGTH 12-CONDUCTOR CABLE (Terminal Box-to-Control Panel)	MAX TOTAL RUN (IGU-to-Control Panel)
Centralized	50' (15m) (IGU-to-Terminal Box)	300' (90m)	350' (105m)
Centralized	75' (23m) (IGU-to-Terminal Box)	200' (60m)	275' (83m)
Distributed	125' (38m) (IGU-to-Control Panel)	N/A (No 12-Conductor)	125' (38m)

\*Ethernet cable not sold by SageGlass



# GLOSSARY

## **12-CONDUCTOR EXTENSION CABLE:**

The 12-Conductor Cable connects the Terminal Box to the Control Panel in the Centralized Architecture. It is plenum rated.

When used with the Terminal Box and the appropriate size frame cables, the 12-Conductor Extension Cable (16 AWG) allows runs up to 350' (105m) between IGU and Control Panel.

## **BACNET/BMS INTERCONNECTIVITY:**

The SageGlass System is a BACnet compliant system with the requisite "PIC" conformance certification statement (either BACnet/IP or BACnet MS/TP).

## **FRAME CABLE:**

The Frame Cable connects the Pigtail to the Control Panel by routing from the IGU's Pigtail, through the framing system, to the Control Panel at a distance of 125' (38m) or less. Alternately the Frame Cable can run from the IGU to the Terminal Box where distances are greater than 125' (38m). The Frame Cable wires are plenum rated, PVC-insulated, and 22 gauge.

## **INSULATING GLASS UNIT (IGU):**

SageGlass window units tint automatically to control heat and glare, as well as maximize daylight.

## **IGU PIGTAIL:**

The IGU Pigtail is external to the IGU, and it connects the IGU to the Frame Cable. The pigtail has a standard length of 8" (185mm).

## **LIGHT SENSORS (VERTICAL-EXTERIOR OR INTERIOR OR HORIZONTAL-EXTERIOR):**

The Light Sensors are inputs for the Control System's automatic modes. They provide feedback on light conditions to the SageGlass System. This is one of the inputs the SageGlass System uses to operate in "Auto and Glare Modes." The Light Sensors can be either connected directly to the Control Panel, or can be connected to the Terminal Box.

## **SAGEBUS CABLE:**

The SageBus Cable assures communication from the Control Panel to the SageGlass Switch(es) or between Control Panels. All cable runs between these components are done in a daisy chain fashion up to maximum total distance of 1500' (450m). The SageBus Cable is plenum rated and contains both communication (22 AWG shielded twisted pair) and power (18 AWG pair).

## **SAGEBUS COMMUNICATIONS PROTOCOL:**

The SageBus Communications Protocol is a proprietary protocol running over a standard CAN-bus physical layer and other building component systems. A separate, detailed document on the SageGlass Communications Protocol is available upon request.

## **SAGEGLASS CONTROL PANEL:**

The Control Panel houses multiple IGU controllers, a master controller function, and AC-to-DC power components to control and power the SageGlass System. It's available in 3 different sizes, and it offers auxiliary connections, including Ethernet, RS-232, SageBus (connection to switches and other control panels), and optional BACnet connectivity.

## **SAGEGLASS SWITCH:**

The SageGlass Switch provides a manual override to one or more zones of IGUs. It is designed to be mounted in a standard gang box.

## **SENSOR CABLE:**

The Sensor Cable provides a connection from the Light Sensor to the Control Panel (or the optional Terminal Box). The Sensor Cable is plenum rated, PVC-insulated, and 22 AWG. Multiple lengths are available: 50' (15m), 75' (23m), 125' (38m), or 250' (75m).

## **TERMINAL BOX:**

In a Centralized Architecture, the Terminal Box serves as an intermediary junction box for the Frame Cables and Sensor Cables. It is necessary on runs where the distance between the IGU and the Control Panel is greater than 125'. When used with the Extension Cable, it allows for runs up to 350' between the IGU to the Control Panel.





SageGlass®



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**MUSEUM OF SCIENCE**  
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The pioneer of the world's smartest electrochromic glass, SageGlass® is the ultimate connector between the built and natural environments. SageGlass tints on demand to optimize daylight, reduce glare and manage heat - all while maintaining unobstructed views of the outdoors. With SageGlass, architects and building owners can improve occupant comfort and reduce energy demand in buildings. As a wholly owned subsidiary of Saint-Gobain, SageGlass is backed by more than 350 years of building science expertise.

Learn more about how SageGlass helps customers achieve their organizational goals at [sageglass.com](http://sageglass.com). To find a local product expert in your area, visit [sageglass.com/contact](http://sageglass.com/contact).

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