

## A guide to installing electronically tintable glass

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Electronically tintable glass provides the building envelope with the ability to dynamically respond to the ever-changing exterior environment. The glass can change its visible light transmission and solar heat gain coefficient at the touch of a button or automatically via building automation systems responding to exterior conditions, for example.

As manufacturing economies of scale reduce product costs, adoption in the marketplace is growing, and it is becoming more likely that contract glaziers will come across such products in a bid

package. Electronically tintable glass looks like, and installs much like, any other insulating glass unit. The most important recommendation for installation is to follow the standard industry glazing guidelines such as those published by the Glass Association of North America, [www.glasswebsite.com](http://www.glasswebsite.com), and the Insulating Glass Manufacturer's Alliance, [www.igmaonline.org](http://www.igmaonline.org). However, there are a few additional, important considerations that installers should take into account in order to ensure a smooth installation.

### System overview and scope of work

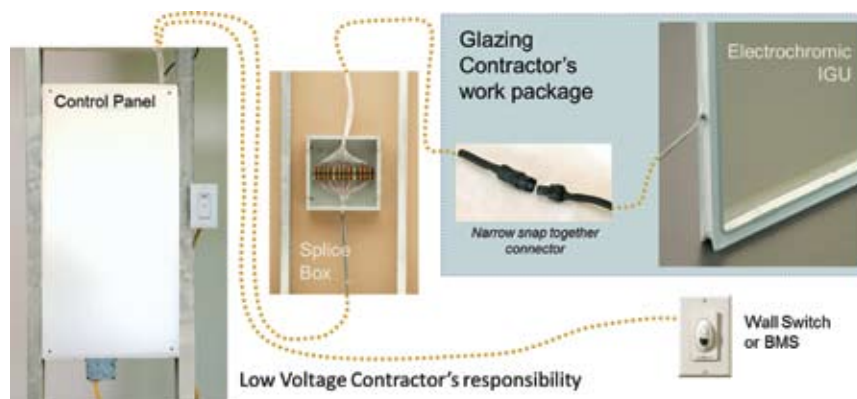
The electronically tintable glass product system consists of two main sections (See Fig. 1):

- The insulating glass unit and associated frame wiring and
- The control system, with associated electrical boxes and interior building wiring.

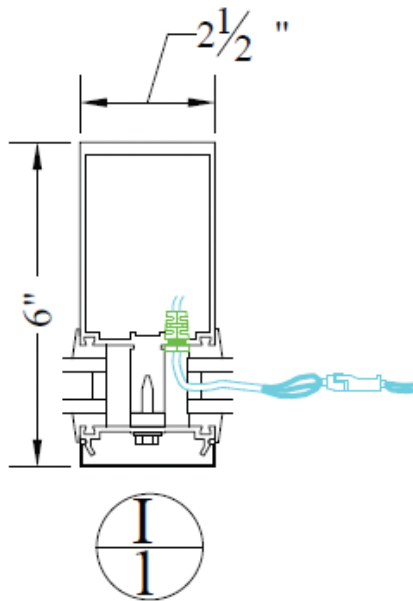
From a glazing contractor's standpoint, the



Installers from Pal's Glass Service Inc., [www.palsglass.com](http://www.palsglass.com), set electronically tintable glass and make the electrical connection for the glass at the Siemens' wind turbine facility in Hutchinson, Kan.



**Fig. 1.** A diagram of the electronically tintable glass system. The glazing contractor is responsible for running the frame wire harnesses, glazing the glass and making the connection between them. The electrical contractor is responsible for the interior wiring. Note that the pigtail exiting the IGU is terminated with a slim-line connector, and the frame wire harness has a mating connector. They snap and lock together in only one way, providing for an error-free, firm connection.



**Fig. 2.** An example wire integration solution for a curtain wall system.

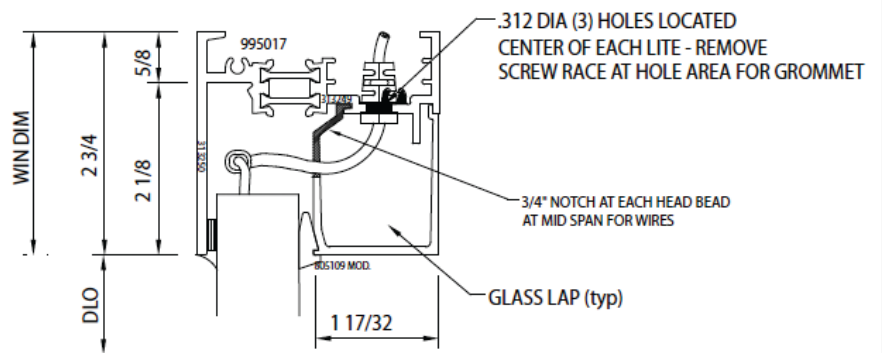
scope of work stops at the point where the wires running through the frame exit the fenestration system. The electrical contractor is responsible for all the interior wiring and connections, and the installation and hook up of the control system. Most electronically tintable glass operates using low voltage DC (less than 5 volts), so all the wiring is National Electrical Code Class 2, ensuring safety and generally not requiring conduit for installation.

### Coordination

In the planning phase, there should be coordination between the glazing contractor and the electrical contractor to agree upon the point(s) at which the frame wires should exit the fenestration system. This exit point is often already detailed in the architectural and/or electrical drawings, along with the position of the other control system components.

### Fenestration system integration

Generally, the method for integrating the wires in the fenestration system (i.e. identifying where holes will be made and the route for wires from the glazing pocket to the exterior of the system) will



**Fig. 3.** An example wire integration solution for a window system.

have already been developed with the fenestration manufacturer through the architectural specification and construction document development process. If this is not the case, the fenestration manufacturer in collaboration with the tintable glass manufacturer can assist you in developing a solution.

The electronically tintable glass will likely have a short wire, or pigtail, exiting

the seal somewhere on the perimeter of the unit that has one half of a slim-line connector attached to it. For each pane, there should be an accompanying wire with a mating connector that is routed from the glazing pocket to the exterior perimeter of the fenestration, referred to as a frame wire harness. In this way, the system is designed to provide a connection directly in the glazing pocket

to allow easy installation and replacement if necessary. While the connector system should be water resistant (this is important to check with the glass supplier), locate it in a position that minimizes water exposure. Generally, this means locating the connection point at the head or on the sides, away from the base of the unit. Avoid locating the connection point at the bottom of the unit where it could sit in water. The glass supplier should be able to provide options for the location and length of the pigtail. While the connectors are generally small—about 8 millimeters in height—it is important to ensure that there is enough room between the glass and metal to accommodate it in the glazing pocket. The tolerances of glass fabrication, frame manufacturing and installation should be taken into account.

When evaluating how the wires run through the fenestration system, key issues to consider are air and water infiltration performance, as well as

ease of installation. In one integration scheme, wires transition directly from the glazing pocket into the verticals (See Fig. 2). Another option is to run the wires down the exterior of the system in the space below the pressure plate. In the latter case, ensure the wires are not pinched or penetrated with the pressure plates installed. Fig. 3 shows a solution for a punched opening window system.

### IGU specification and ordering

When ordering the glass, request a particular position for the pigtail on the unit that works with the chosen wire routing scheme (e.g. at the head or on the side). Confirm there is a simple, snap-together connector system for the panes that is error proof and minimizes glazing time.

Bear in mind that electronically tintable glass has low visible light transmission in the tinted state, resulting in a significant contrast between the active coating area and the uncoated perimeter area. Make sure the perimeter area that does

not tint is fully covered by the glazing system to prevent light leakage around the perimeter of the daylight opening. To ensure full coverage, design the openings with sufficient edge bite—or a combination of edge bite and gasket or silicone wet seal—when considering the combined dimensional tolerances of the frame size, glass size and positioning in the opening. The glass fabricator can help reduce installation centering tolerances by marking the position of the edges of the active coatings on each unit.

Finally, functionality of the electronically tintable glass is only as good as the durability of the insulating glass unit. Ensure that the electronically tintable insulating glass is IGCC/IGMA certified and meets requirements of ASTM E2141-06, the standard test methods for assessing the durability of absorptive electrochromic coatings on sealed insulating glass units.

Given the value of the electronically tintable glass product, discuss crating with the supplier and, in particular, how the glass will be unloaded and moved on-site, so that the weight and design of the crate can be constructed appropriately.

### Preparing the openings

Once drilled, the holes in the frame that allow for wire routing should be grommetted to protect the wires from chafing (See Fig. 4). The glass supplier should be able to provide grommets. Once the frame is assembled, you can prepare the opening in the same way you would traditional insulating glass, regardless of whether the system is shop built or site built. The frame wire harnesses should be run, leaving the correct amount of wire with the connector on it hanging in each opening, ready to accept the glass (See Fig. 5). Label the end of each harness as it exits the fenestration system so it is clear which pane it is connected to. The grommetted holes should be sealed with silicone to prevent water or air infiltration. Lastly, use edge blocking to prevent the glass walking in the opening over time and causing light leakage on one side of the unit.



**Fig. 4.** Holes where the wire is routed into the glazing pocket are grommetted and sealed with silicone.



**Fig. 5.** The openings are prepared and ready to accept the electronically tintable IGU. The setting blocks are in place, the frame wire harnesses have been pre-run and holes are sealed.


## Installation

Electronically tintable glass can then be glazed as a normal IGU. When placing the glass on the setting blocks, before setting vertical, firmly snap together the pigtail connection to the frame wire harness, and tuck it into the glazing pocket, taking care not to pinch the wire or connector when moving the glass into position in the opening. In the unlikely event that a wire or connector is damaged, contact the glass manufacturer immediately for assistance on how to proceed. Do not try to do a makeshift repair. The glass manufacturer might supply a field repair kit and instructions for use. The manufacturer might also offer commissioning services where trained technicians can make wire repairs on-site. Alternatively, if attic stock has been ordered—which is recommended—a quick change-out of an IGU can allow the installation to continue while the damaged wire or connector is repaired later.

Take care to center the glass to cover the perimeter that does not tint, using the guides on each glass pane. Once the connections are made and the glass is set, check that everything is working correctly. The glass supplier should be able to provide a test system for

### Quick reference checklist

- ✓ Follow GANA and IGMA glazing guidelines
- ✓ Check with the electrical contractor for location of wire exit point(s) on fenestration
- ✓ Grommet holes to prevent wire chafing
- ✓ Seal holes with silicone to prevent water and air infiltration
- ✓ Use edge blocking to prevent lateral movement
- ✓ Ensure the perimeter that does not tint is covered
- ✓ Locate pigtail connection in the glazing pocket to minimize water exposure
- ✓ Label frame wire harnesses
- ✓ Check glass operation before leaving the job site

this purpose. Once checked, the final installation details can be completed. 

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