Know the Differences

Photo: Tristar Glass

Which Interlayer is Right for Your Next Run?

by Ellen Rogers

Laminated glass comes in a wide variety of shapes and sizes, offering many different performance capabilities and aesthetic benefits. Safety, however, is still the key benefit, no matter the shape or size of the glass.

While laminated glass was first designed for use in automobile windshields, during the past decades its use in architectural applications has exploded. According to a Glass Performance Days (GPD) 2017 presentation from Bjorn Sanden of Kuraray Europe GmBH, the use of laminated glass in architecture was driven by requirements for increased daylighting in buildings through more glass surfaces, as well as development of safety standards in building codes. And recently, we've seen even more requirements that have added to the performance abilities of laminated glass, such as acoustics, as well as increased security and natural-disaster glazing.

As Sanden notes, "these requirements have led to a dramatic increase in interlayer solutions."

There are a number of materials that can be used to construct laminated glass, but poly vinyl butryl (PVB) is the most common. According to Sanden, more than 70 percent of laminated glass applications are constructed with PVB, which is used primarily to enhance safety or the security of the glazing. In addition, it can also offer acoustic and ultraviolet protection. While there are a number of other options available, not all are right for every architectural application. How do you know which product to use where? Here's a closer look.

PVB and EVA

Rob Carlson, who works in mechanical engineering with TriStar Glass in Catoosa, Okla., describes PVB as the "bread and butter" of interlayers.

"Its low cost and clear finish make it a first choice for most applications, and it's also offered in a variety of colors and thicknesses," he says. "To correctly process PVB, it must be climate-controlled for both temperature and humidity."

Ethylene vinyl acetate (EVA) is another interlayer option. Carlson says it is known for the ease in which it can be handled, laminated and stored.

"EVA is ideal for laminating metal, wood and other non-glass materials to glass. It's also used under very wet conditions such as a swimming pool or sauna," says Carlson. "EVA is not as clear as PVB and is significantly more expensive. Capital requirements for producing EVA are much lower, though, as it doesn't require special climate control for processing."

Carlson feels while PVB is more suited for mass production of clear architectural flat glass, EVA is better suited for decorative glass applications. And for fabricators, he adds, the big plus is that EVA doesn't require moisture climate control [i.e, a clean room].

It may be more expensive, he says, "but if it means getting into the laminating game for $200,000 compared to $2 million, there might be an argument to be made ..." He adds, though, that most companies that start out using EVA often end up adding some form of climate control and incorporate PVB, because it's less expensive and most often specified.

Glass-Clad Polycarbonate

For applications that require safety and security, such as blast- and bullet-resistance and forced entry, a glass-clad polycarbonate provides high levels of resistance without spall (breakage into small pieces). This glazing make-up is constructed of layers of glass, urethane and polycarbonate, and the laminating process is the same as with PVB.

Left: Workers prepare the glass sandwich (glass, interlayer, glass) to go through the nip roll oven, carefully aligning the fabricated holes in the top lite with those on the bottom and then trimming the excess interlayer.

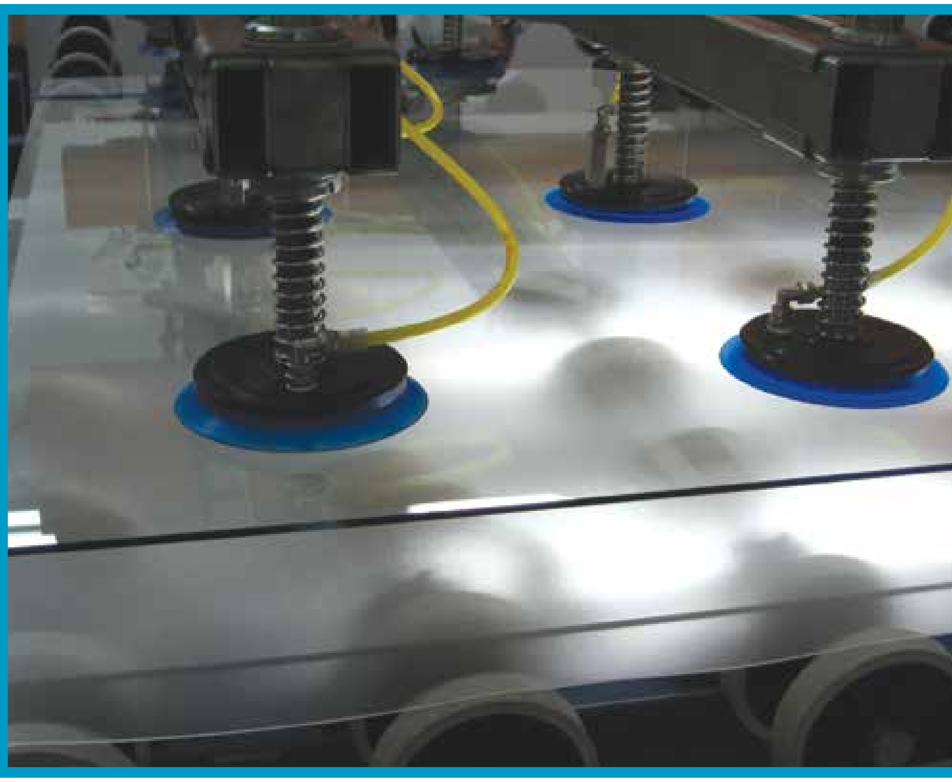


Photo: Prelco

Prelco assembles its laminated glass in what's called a "white chamber" or "clean room." Here, suction cups place a lite of glass over PVB, which tops the bottom layer of glass.

One consideration with glass-clad polycarbonates, however, is the expansion differential of the components during the manufacturing process.

"Exterior use (in an IGU) is not recommended because of the expansion differential between the components," says Nathalie Thibault, architectural sales director and technical advisor, U.S., with Prelco in Rivière-du-Loup, Québec. "A difference in temperature could lead to delamination. One way to overcome this characteristic is with a sealed unit composed of an all-glass composition and a tempered glass lite. In this instance, the all-glass composition will be exposed to the outside and the tempered glass will be toward the interior of the building. The tempered glass will block the shards produced during breakage of the all-glass composition, ensuring the protection of the individuals inside the building," she says.

Structural Interlayers

Another laminated glass option involves the use of what's known as a structural interlayer. This type of material is much stiffer compared to traditional PVB and is commonly used in applications such as overhead glazing, glass balustrades and those with minimal support, according to Sanden.

Thibault says the laminating process remains the same, whether using a PVB or a structural interlayer.

"The interlayer is cut, and then goes to a white room to be cleaned and assembled. It is then heated and bagged before being placed in an autoclave to complete the process of bonding the glass lites and interlayer(s). The combination of high pressure and high heat ensures perfect adhesion between the elements," she says, adding that structural interlayers are more difficult to handle and cut compared to PVB.

Structural interlayers, she adds, are "ideal for specific applications where the glass must meet a specific load, such as in a railing design." In these cases, she points out, PVB isn't typically recommended due to the risk of delamination, which isn't an issue with the structural option.

Poured Resin

Another option for laminated glass fabrication is the poured resin process. Mark Smith, product development manager with Innovative Glass Solutions of Dallas, N.C., explains that the poured resin process begins with two lites of glass. They are separated by an edge tape, placed together on a horizontal vacuum table. The edge tape traps the resin in liquid form.

"The resin is pumped through a nozzle into the cavity formed by the edge tape on a tilting table. The table tilts the glass until the resin has filled the space between the lites uniformly," says Smith. "The glass unit on the table is then moved underneath ultraviolet lights which cure the resin. Once cured, the glass edges are cleaned. The entire process takes approximately 20-25 minutes per unit from start to finish, depending on the size of the unit."

"The glass can be annealed or tempered, and although there is still a sightline, glass edges can be polished and fabrication done prior to laminating the glass," he says.

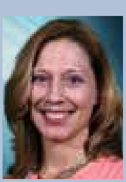
Glass can be produced in small quantities, and doesn't require an autoclave or film storage.

"The process is labor-intensive, but is very customizable," he adds. "Because of the labor involved, the square-foot cost of resin laminated is typically higher when compared to PVB."

He adds that flexible resin laminated glass can be used in all the same flat glass architectural applications and requirements as PVB.

"It is fabricated in accordance with ASTM C1172 standards and meets the requirements of ANZI Z97.1 and CFR 16CFR to qualify as safety glass." ■

the author



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