

Perhaps you've seen it—it's showing up in the United States at what seems like an accelerated pace. It's a design movement involving massive amounts of glass and a few bits of hardware that holds the glass together at its points—hence, its name, point-supported glass (PSG).

With roots planted in Europe, the PSG movement began creeping its way into the U.S. architectural community around 20 years ago. It's a practice that some say is for the elite. It requires caution, care and concern. Knowledge, experience, science and engineering are all essential to make the architects' vision—an as-transparent-as-possible façade—a reality.

Transparent Transformation

Point-Supported Glass Finds Its Way Into the U.S. Architectural Community

by Ellen Giard Chilcoat

Birth of a Movement

Today's point-supported glass products are the offspring of Pilkington's patch plate system, first used approximately 30 years ago in Europe. Through this method, patch plates connected a matrix of frameless glass lites. In 1982 Pilkington introduced its Planar™ system, a flushed exterior planar system in which countersunk holes are drilled in glass, through which bolts are inserted to hold the glass together.

"The need came from an architectural demand, which had been met in North America through structural silicone glazing," said Jim McCann, Pilkington architectural marketing and sales manager. "The big question with that was, 'how long will the adhesion last?' A lot [of people] tried to overcome this by designing two-sided silicone fixed assemblies, with the other two sides fixed mechanically in some type of frame."

The Planar system is only available through Pilkington's network of accredited installers, and in the United States that title goes to W&W Glass Systems of Nanuet, N.Y.

Around 1980, W&W had developed its own system, which it called Glaswal, in conjunction with a Canadian engineer. According to Ron Haber, president, W&W got involved in this area because it had been installing glass for a lot of squash and racquetball courts, which feature a similar concept. In 1993, W&W joined forces with Pilkington.

Since then a number of other companies, such as Oldcastle Glass, which began producing its system, Stackwall™, about ten years ago, have gotten involved.

"We got involved because of the demand for mullionless glazing applications," said Joe Marks, Oldcastle's president of architectural systems. "There's not an abundance of people who can take on the engineering, fabrication, etc., that's involved in these applications. It takes coordination, tight tolerances and engineering to provide this service."

While glass is the predominate ingredient, a number of other elements are included. Hardware to join the lites and a support to hold the structure up are also essential.

A number of hardware choices are available. Options include bolt and screw fittings and spiders.



The Itsy-Bitsy Spider

The French company SADEV is one hardware manufacturer; CHMI based in Keokuk, Iowa, is a distributor for SADEV. According to Joe Hendrickson, an engineer with CHMI, different fittings are designed for different types of glass.

"With fittings, it depends on whether the glass is an insulating unit, laminated or monolithic tempered glass," said Hendrickson.

He explained that their rotules fittings, for example, are designed to accommodate exterior applications in which wind loads, expansion, contraction, etc., are concerns. Other lines are designed primarily for interior applications.

Spider fittings can be used both in interior and exterior applications. A number of styles and designs are available, Hendrickson explained, to accommodate different design preferences.



A cable net served as the backing system on the Kimmel Center.

Back Me Up

With hardware in place, the glazing is then bolted into a back-up structure. This could be glass, or it could be metal piping, rods, cables

or cable netting. TriPyramid of Westford, Mass., is a provider of these systems, and has been involved in projects such as the Rose Center and the Soho Apple Store in New York.

"We're often involved in the design of the overall system before the glazing is involved," said Tim Eliassen of TriPyramid.

But the element that makes PSG structures the wonder that they are is the glass.

"For those who haven't seen one before, it's startling to see a glass wall [held together] with four buttons," said David Wallace, an architect with the Polshek Partnership, designers of the Rose Center. "People are immediately attracted and interested."

McCann agreed.

"Architects have always been in love with glass. And these systems can bring out that transparency."

"[Architects] want walls to be clear with no structure—the

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less structure the better—and maximum clarity. Point-supported glass is a type of system that offers that,” said James O’Callaghan with Dewhurst Macfarlane and Partners, a structural engineering company that has worked on such projects as the Kimmel Center in Philadelphia.

However, Haber points out that while it may seem like PSG is growing in terms of its U.S. usage, the number of jobs going up is minimal; it’s simply that these jobs are more recognized than standard curtainwall.

“They seem bigger than they actually are because they are so special—they are spectacular,” Haber said.

The Elements

So, what does it take to bring one of these structures to life?

“The first thing you need is an owner willing to go there,” said Haber. He said owners need to understand what these systems can do for the end result, so added costs can be balanced out.

Next, an architect sketches his ideas and takes them to the owner to discuss possibilities.

With a stellar design, the next hurdle is the budget.

“It’s more expensive than aluminum curtainwall, so that narrows the range,” said Wallance. “It continues to grow, but we keep coming up against budget issues. We can prepare early, but then have to back down because of the budget.”

“It’s not as economical,” agreed Timm Walker of Mero Structures of Menomonee Falls, Wis., a specialty glazing contractor and PSG systems provider.

“In a large city, such as Chicago, typical aluminum curtainwall may cost \$55 a square foot, whereas PSG could cost \$125 to \$250 a square foot depending upon the desired level of transparency.”

Once past the budgeting phase, the most important step is engineering. The systems have to be engineered to withstand loads, expansion and contraction, and they have to be safe.

“Glass breaks, and you have to always start with that assumption,” said O’Callaghan. “If it breaks, it must not fall out, so you laminate it.” He explained that testing and research are necessary to assure the structure doesn’t fail.

According to Bill Coddington of W.S. Coddington

Consulting LLC (and chair of the Glass Association of North America’s [GANA] point-supported glass task group within its laminating division), these structures require more engineering than some designers are willing to spare. Using the right glass, he explained, is crucial.

“If the glass is too thin and subject to heavy wind or snow loads it will cause stress at the points. With laminated glass, long-term loading such as snow loading deflects [it] greatly and causes stress at the holes. When the glass deflects and bends it

puts stress on the sides/edges of the hole. With thicker glass you don’t get as much stress on the holes,” said Coddington.

To provide that engineering, companies can turn to firms such as Dewhurst Macfarlane and Gratec Inc.

“We tackle everything we do from the engineering end,” said Greg Williams with Gratec of Fort Mill,

S.C. “And what separates the quality players is the experience and know-how.”

He continued, “We do a lot of work up front with the architect, designers and owners, and try to help them understand that there are constant issues and performance requirements. On the back end, we may work with the glazing subcontractor, typically supplying information.”

Pulling it All Together

While there may be numerous glazing contractors with the experience to take on, for example, a complex curtainwall installation, it’s a different case with PSG. Some say with the proper guidance and engineering expertise most glaziers could take on one of these jobs; others disagree.

“The subcontractor’s job is to take the architect’s vision and build it; [he] delivers craftsmanship and economy,” said John Burger, a project manager with Harmon Inc., who has worked with W&W on PSG projects.

“The typical glazier doing these jobs would be one that is comfortable with engineering projects; it’s not for every glazier,” said Marks. “There are those who are qualified but they shy away because of the complexity. You need to have the right experience and the right partner.”

Walker agreed, adding that few recognize or believe they can do the job.



Photo provided by Oldcastle.



Photo provided by Oldcastle.



Examples of engineered PSG hardware.

Photo provided by Oldcastle.

“There’s a lot of engineering that goes into the glass alone that some companies are just not equipped to handle,” Walker said.

Haber said the glaziers with whom they work go through training on Pilkington’s Planar.

“You can never let a non-trained person put one of these systems up,” Haber said. “If [he] makes a mistake, the glass can come out and cause serious damage.”

He also said in such cases owners are not getting the same level of safety you get when buying from a sole-source.

“He is taking on more risk if the system seller does not have an experienced installer as part of [its] contractual responsibility.”

Williams, however, disagreed and says that by working closely with the engineer, such jobs can be constructed by most any glazier.

“That’s one of the ways we try to empower people,” he said. “If they have the confidence to do one, we send someone on site to help them get going. We let them use our knowledge.”

“Any glazier is capable, and those who aren’t are the ones who see a reason not to try,” added O’Callaghan. “There are those who say they are specialty glaziers, and they are the ones used to doing it. We try to encourage those who haven’t done it and try to educate them through the process.”

An example of such a job was the Kimmel Center’s PSG wall. Working closely with Dewhurst Macfarlane, National Glass and Metal Co. Inc., in Horsham, Pa., was the project’s glazing subcontractor. Joe Clabbers, president of National Glass, said that prior to the Kimmel Center his company had done smaller PSG jobs, typically with glass fins, but nothing to the scope of this project, which included a cable support system.

“We got together up front with the construction manager and the architect and assembled a team to handle the challenges on almost a design build basis,” said Clabbers. “Some components and details were not worked out fully, so we worked with Dewhurst Macfarlane, the architect and the

construction manager to make it buildable.”

He added that engineering was critical.

“We had to make sure that the proper amount of engineering was done by the design professionals,” Clabbers said. He explained that’s what Dewhurst Macfarlane was able to provide—extensive design experience, while they brought experience in building erection.

The International Union of Painters and Allied Trades (IUPAT) also takes steps to ensure glaziers are educated.

“Glaziers have to stay abreast about the latest applications, such as point-supported systems,” said Bill McDevitt with the IUPAT. “We train apprentice and journeymen glaziers through our upgrading training courses on the new systems and safety involved in these applications. Safety and training go hand in hand for the IUPAT.”

All or Nothing

There are two ways to bring a PSG structure together. Each element of the project can come from a different supplier, meaning engineering, glass and hardware come from different

sources. Through the second way, the system is purchased from one provider. Single-source providers are those companies such as W&W (offering Pilkington’s Planar) and Oldcastle. Gratec has also begun offering a system.

“We’re not manufacturing, but we work with a number of vendors to provide a complete system,” said Williams.

Many agree, that single-source is the best way to go.

“From a contractual view, buying a complete system is important because of the need for a single point of responsibility,” said McCann. “You’re much better off to have a single company with experience in both areas, having control over the materials and performance.”

“I’m strongly opposed to contract glaziers having the fittings spec’d from one source, the glass from another, etc. My fear is that PSG becomes treated like a commodity and the products can be purchased without any engineering, which



Photo provided by Mero Structures

First National Center, Wintergarden, in Omaha, Neb., constructed by Mero, is an example of a point-supported glass facade.

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could lead to failures in the field, ultimately damaging its acceptance," said Marks.

Some have engineering concerns when it comes to hardware.

"The hardware that has been developed and used in Europe for the past 12 to 15 years is pretty good, if used in the right applications," said Coddington. "Some companies offer so many different pieces because there are so many differences in designs. This could be bad if you buy the wrong hardware for the application. Each piece is for a different project for a different reason."

Hendrickson says they get involved at different levels to assure the proper hardware is used.

"Sometimes we're contacted by the engineering firm and sometimes directly by the architect," said Hendrickson. "Even if we're contacted by the architect, we have an engineer that we use who will get involved in the design process."

Issues and Concerns

The question of from where the system is coming leads to another concern: who is assuming the risk?

"With the warranty, the owner is relying on one company to back the system. It's important to send that message of who is behind it," said Haber.

With single-source systems the provider typically provides the warranty, but in other cases it's questionable.

"Who's responsible when you have an inadequate design? The supplier? Fabricator? Installer? Architect? It's really not clear until there's a lawsuit," Coddington said.

He explained that architects are putting a provision in their specs saying what they are showing is aesthetics only and the final design has to be certified by the contractor's engineer.

"In 1998, the AIAA 201 document shifted the responsibility of engineering and design away from the architectural community and on to the contracting community," said Coddington. "That was a big shift [because the



Photo provided by Gratec Inc.

PSG can be used in interior as well as exterior applications.

responsibility] was now on the contractor and ultimately the glazing sub and the suppliers."

With the risk shifted toward the construction end, those involved are searching for ways to lessen the risk. Burger said in some cases the engineer attempts to reduce the liability.

"How much risk are you willing to accept?" asked Burger. "Some [glaziers] are not familiar with the risks these systems can present. You have to lessen [the risk] to a lower level." He said in cases in which the system comes from a single source, the supplier typically warrants the product, but installers must still back their work.

Engineers can also assume some risk.

"We offer to take the risk and responsibility for design, reducing the responsibility of the contractor; we're the middle man," said O'Callaghan. When there's a question of is it going to leak, break, etc., [we answer it]."

Standard of Installation

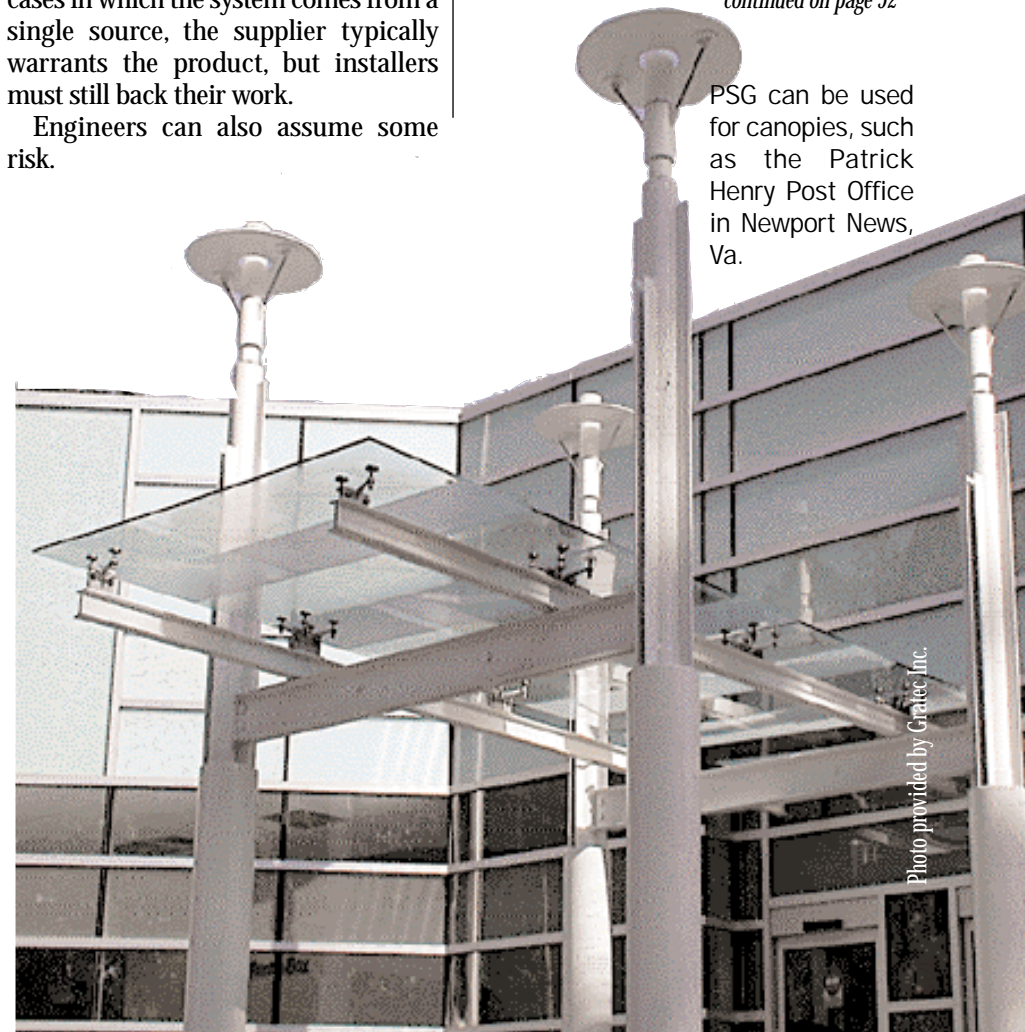
As more and more eyes are turning to PSG, some in the industry are stepping up to provide education. And with safety being a major concern, the question has been raised as to whether a standard practice of installation needs to be established.

The group exploring both these matters is GANA's point-supported glass task group.

"We need to educate the trade on the unique considerations when designing or fabricating PSG," said Coddington. "There is no code or ASTM standard that covers its uniqueness."

The concern, however, is not about

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PSG can be used for canopies, such as the Patrick Henry Post Office in Newport News, Va.

Photo provided by Gratec Inc.