



Protecting the Beauty Within

A Gallery's Skylight Retrofit Keeps Historic Look, Adds Modern Performance

by Megan Headley

Usually when you think of skylights, it's about getting more daylight in the building," says George Petzen, estimator with LinEl Signature in Mooresville, Ind. True. But when the skylight in question covers about 85 percent of the roof of the largest privately held art gallery in Washington,

D.C.—and much of that skylight is original to a building constructed in 1897—then letting in more daylight might be your last concern.

"It's an art museum, and the existing glass was wired glass on the exterior and a rolled textured glass ... they weren't really cutting down on any UV," Petzen explains. "[The owners] were

starting to get very concerned about the longevity of the artwork on the wall."

Damaging UV rays were one motivation for the Corcoran Gallery to begin restoration on the roof of its historic building early last year. The roof covers approximately 48,000 square feet—the majority of which is glass—and features multifaceted structures with



The Corcoran Gallery's original wired glass skylight was replaced with laminated insulating glass units.

varying types of construction, drainage and elevations. Further complexities have been added to the design by later replacements and alterations, including the addition of a wing in 1927. No comprehensive repair program has been undertaken to address the roof and skylights since the early 1980s.

In addition to controlling the light and heat transmitted into the interior, museum officials note that the restoration is intended to seal off the building from moisture and update the climate control equipment located in the attic. The flat roof was replaced and the elaborate skylight system retrofitted with new glass to control the heat and light transmitted into the galleries.

"Because there's so much volume to [the skylight] they were looking to improve the thermal efficiency of the

building envelope," Petzen adds. "Half-inch wired glass isn't very thermally efficient. Going to high performance low-E and ceramic frit accomplished that for them."

Landmark Challenges

LinEl Signature replaced roughly 21,000 square feet of glass atop the Corcoran and faced all of the challenges entailed in doing a historic retrofit. The installation began in May 2009 and was complete by the end of April 2010. An additional seven or eight months was spent working through construction logistics.

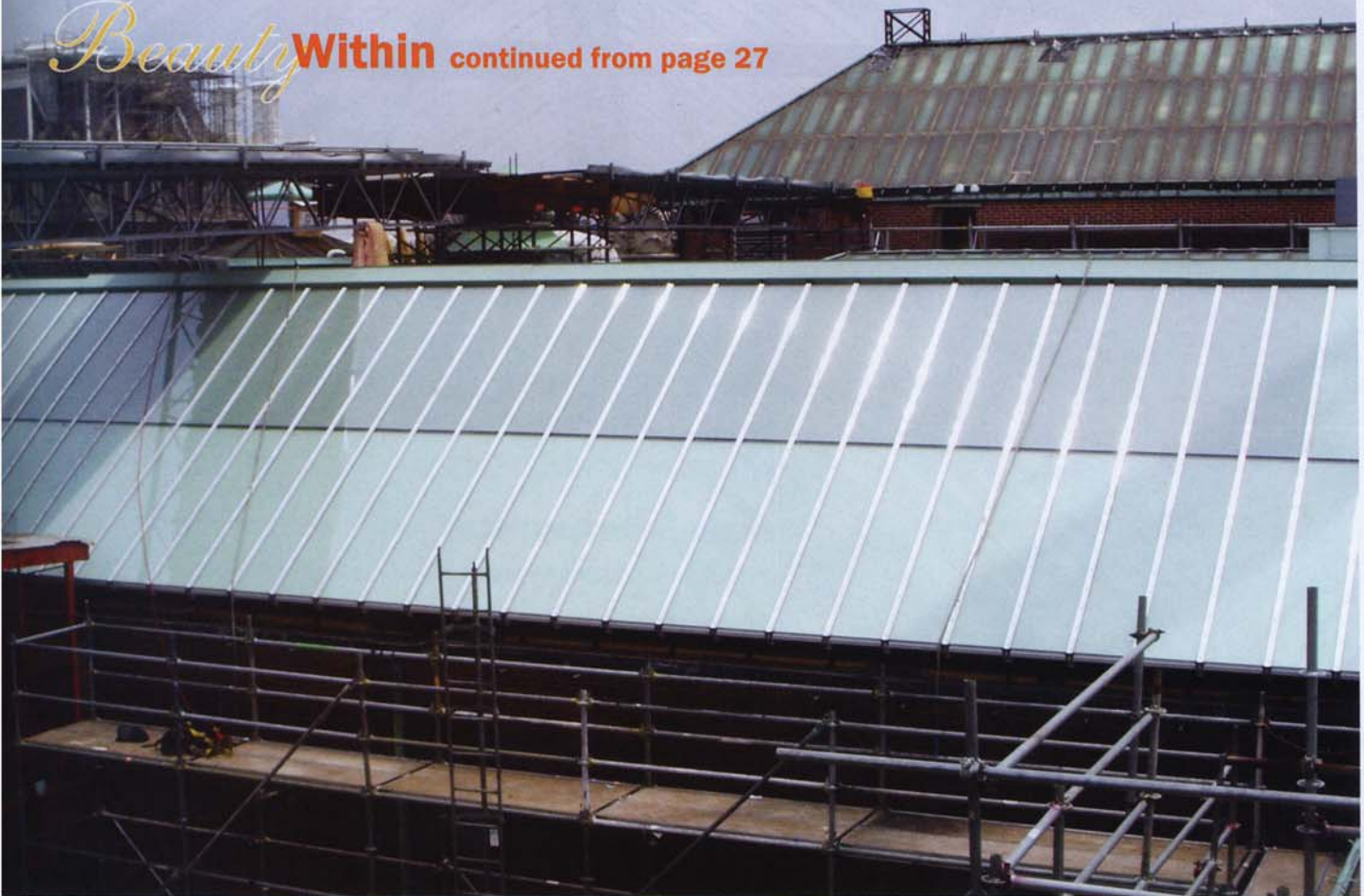
"Because it's a landmark building you have some hurdles," Petzen says. "You're going to have some interface with the historic preservation board. ... They want to make sure that when

you're done it still mimics the original historic look of the building."

For this skylight installer it meant essentially recreating the original skylight while adding some modern performance benefits.

"We had to maintain the same exterior sightlines and the same dimensions, we had to have the metal and the extrusions that are visible from the exterior basically in the same size and the same position as the originals," Petzen says. "So what we had to do was physically dimension the exterior caps and create new dies. For this project we actually created a completely new system from the ground up. When all was said and done it looked like it did when it was 1897 and freshly installed."

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All photos courtesy of LinEl Signature.

The new skylight, pictured in the foreground, is better able to protect this gallery's artwork than the original skylight (seen in the background).

Updated Performance

The historic review board stepped in during the design phase when it came to the make-up of the glass. Laminated glass with varying ceramic frits and, in some instances, opaque interlayers was specified in order to minimize the daylighting in the gallery.

"When we first started the project there were three different make-ups of glass. It was the same thickness, but the frit patterns were different," Petzen recalls. "We went from custom holes and dots in different colors with three different types, then they changed and went to six, and juggling all the different sizes and mapping out six different types of glass in the plane of all these undulating skylights was kind of challenging. At that point the historic review board said that was too many colors and they compromised on five, which is what we ended up with."

In the end, Oldcastle Glass headquartered in Santa Monica, Calif., pro-

vided five separate laminated insulating glass units with a range of transparency for the project. The skylights each featured 6-mm lites of PPG's Solarban low-E glass sandwiching a 12-mm mill finish aluminum airspace and a laminated assembly lite with 0.060 PVB Saflex interlayers from Solutia Inc. Each laminated lite featured three interlayers—ranging from all clear, to Arctic Snow to Polar White—while three of the five make-ups included a "hole" or "dot" frit pattern.

During the design phase, LinEl also coordinated with Solutia and the lighting consultant to determine the proper light transmittance for the installed products.

"Their intention was to allow very little direct transmitted light into the space, not have the space look dark and, most importantly, to protect the assets of the museum as well as meeting all the applicable safety and energy requirements for glazing in a hazardous location," explains Julia

Schimmelpenningh, global architectural applications manager of Saflex, a unit of Solutia.

Schimmelpenningh notes that the Polar White interlayer, when laminated with 3-mm glass, lets in approximately 7 to 8 percent of the visible light with greater than 95 percent haze, making it a good diffuser.

"Several mock-ups were made for aesthetic evaluation as well as spectrophotometer measurements compiled on the desirable combinations to ensure they met the technical requirements being put forth," Schimmelpenningh says.

She adds, "It is the first completed skylight application using Vanceva Polar White in the United States and has set precedence for these types of applications. This project is already being discussed in specifications for museums on a global basis."

The metal framing was upgraded as well—but the owners wanted to make sure that the extrusions maintained a

historic look. The interior featured a white painted finish, while a custom green Kynar® on the exterior mimicked the look of aged copper.

“They do have a lot of copper roofing that was replaced and a lot of copper flashing adjacent to the skylight, which you know goes in looking like a bright copper penny, in six months it’s black and in ten years it’s green,” Petzen explains. “We just went straight to green through the Kynar paint finish.”

Site Constraints

Retrofits can labor under some unique site constraints, particularly in cases such as this where the public building remains open throughout the installation.

“The museum never closed for the construction process,” Petzen says. “It was all coordinated in the field so that when an exhibition ended, and they had to pull that out and prepare for the next incoming exhibit, that’s when the skylight replacement happened. That one room would be closed off as the artwork came out, then the skylights went in and as we were finishing up they’d bring the new artwork in for their next public exhibition.

“People could come in and not know there was something going on above them,” he adds.

Because the Corcoran’s roof features several different skylights, the time-lines varied—some were tighter than others. In some cases installers were able to give an estimate as to how long the process would take for a particular area. “In some instances they would say ‘This is our window, so we expect you to be able to start on our about this day and have it finished up on whatever the opening day is,’” Petzen says.

The removal and installation teams worked together in a quick and orderly fashion.

“We had a demolition crew taking out skylight lineals in a linear fashion and the installation crew was chasing them. They’d take out four or five bays

“At the end of the day it looked like it did when it was 1897 and freshly installed.”

—George Petzen

of glass and we’d chase them so at the end of the day we’d be caught up and there’d be a temporary protection between the joints,” Petzen says.

Expecting Surprises

Of course, as the installers proceeded along the roof, the old building threw out a couple of surprises.

“As you can well imagine with a building that old, they had some basic structural issues that cropped up,” Petzen says.

Among those issues were problems with the original structural steel.

“You know, 120 years ago codes weren’t what they are now,” Petzen quips, adding, “and we realized that in some areas of the building their structural steel was not going to be adequate—they had some sag. We had to work with [the Corcoran’s] structural engineers in order to come up with some fixes for their structural steel that wouldn’t impact us.”

Petzen also recalls an interesting challenge posed by the largest span of the skylight, a sloped pyramid that featured a pedestal on each end topped

with sculptures. “The sculptures had to come off to get refurbished and then the ridge flashing that runs between them, which is a custom stamped copper product, had to be removed and refurbished as well. We had to design a kind of armature, if you will, in order to adequately support the new copper as it went back on,” Petzen says.

But snags such as these should be part of the expectation of working on a historic retrofit, according to Petzen. He advises that installers go into the project knowing full well “you will always have things that come up as a surprise—so prepare for the unexpected.”

Thorough upfront work is the most important key to limiting those “surprises,” which is why Petzen offers his second caution to other glaziers taking on these challenges: “It’s going to take longer to measure than you thought.”

As he explains, “One of the biggest challenges we had before we started working onsite was taking field dimensions. I think our field dimension process was, all told, probably six months. In this particular instance you had interior brick walls underneath the glass, you had structural steel, and some of it is really, really difficult to measure.

“If it’s not simple on the face of it don’t try and figure out what it’s going to take from looking at the blueprints—go to the jobsite, walk the jobsite and figure it out from standing underneath it,” he adds. “If we hadn’t been involved on the jobsite before the bid to walk-through and tried to figure out what we needed to do to get to where we need to be—we’d still be there.” ■

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