



Resources

Stained Glass Association of America, Raytown, Mo., 800/438-9581, www.stainedglass.org

Baut Studios Inc., Swoyersville, Pa., 800/326-9421, www.baut.com

Botti Studio of Architectural Arts Inc., Evanston, Ill., 800/524-7211, www.bottistudio.com

Conrad Schmitt Studios Inc., New Berlin, Wis., 800/969-3033, www.conradschmitt.com

Femenella & Associates Inc., Annandale, N.J., 908/437-6147, www.femenellaassociates.com

Restoration paradox

Fenestration experts can improve the performance of stained glass

By David H. Martin

If butterflies were windows, they would be adorned with the fragile came fabric of historic stained glass. According to some of today's most accomplished renovation experts, ancient stained glass represents a triumph of artistic beauty, far exceeding secondary considerations such as structural strength and thermal performance.

It's almost a Frank Lloyd Wright-like perspective

to insist that "form trumps function," with the aesthetic preeminence of stained glass paradoxically discouraging the logical use of protective glazing to enhance performance without compromising beauty and visibility.

"There are certainly conflicting paradoxes in renovating and repairing historic leaded glass," says Conrad Baut, partner in the third-generation firm

specializing in church windows, Baut Studios of Swoyersville, Pa. "With stained glass, the truth is sometimes counter to common sense," adds Arthur Femenella, principal and owner of Femenella & Associates Inc., Annandale, N.J. As a strict preservationist, he insists that considerations of aesthetics must always take precedence over energy savings. "Indeed, the techniques to increase energy efficiency in an old building can unfortunately also increase the rate of deterioration of stained glass," he says.

For example, protective polycarbonate or glazing panels applied to the exterior or interior of historic art glass cannot be assumed harmless to fragile glass. "Without proper venting, the storm panel can cause damaging build-up of heat and humidity in the interspace," says Chris Botti, who heads Botti Studio of Architectural Arts Inc. in Evanston, Ill. "That's why you don't want to seal protective glazing. You want to vent it with an operating hopper, a plastic breathing tube or staggered sealing system." He suspects the need to vent protective panels makes them relatively ineffective as energy-savers. Through their years of experience, Botti and Femenella have seen numerous cases of stained glass damaged by severe heat buildup in interspaces.

"Lead has a relatively high coefficient of expansion, and a low modulus of elasticity," Femenella

says. "When the lead—the material that forms the fabric with the glass—is heated, it expands. When it cools, it doesn't shrink to its original plane, it retains its deformed state. Then, when the glass heats up again, it continues to expand more. The force generated on the glass is extremely high, making the window buckle in or out to relieve pressure. Once, we put a sensor in the interspace at a Philadelphia church where the outside temperature was 45 degrees Fahrenheit. Meanwhile, the interspace temperature reached 120 degrees. Putting that pressure on historic stained glass can fatigue the lead and damage the painted artwork."

In 1996, Femenella took part in a national field test and study of art glass in churches conducted at 120 locations by the National Park Service in Washington, D.C., the federal agency that oversees historic buildings. "The Park Service's Protective Glazing Study concluded that exterior protective glazing was added to church windows for two reasons: to prevent vandalism and to save energy," he says. "In either case, the Park Service researchers found that the procedure was hard to justify."

The federally funded study was conducted during an 18-month period from October 1994 to April 1996 and addressed energy, security, sound and light transmission, aesthetic and conservation issues sur-

Above left: Century-old stained glass windows, created by the Louis C. Tiffany Studio, were meticulously restored in 2005 by Conrad Schmitt Studios Inc. for the Broad Street Presbyterian Church, Columbus, Ohio.

Above middle: 116 stained glass windows, created in France in 1873, for the Basilica of the Sacred Heart on the campus of Notre Dame University in Notre Dame, Ind., were recently restored by the craftsmen of Conrad Schmitt Studios Inc.

Above right: The 'Great West Window' is one of 28 windows comprising over 10,000 square feet of stained glass restored by Femenella & Associates Inc. for the Princeton University Chapel in New Jersey.