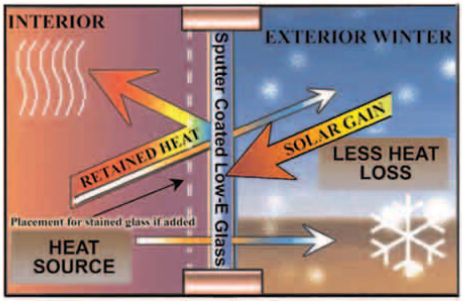

The workings of a sputter coat system typically used on surfaces 2 or 3 of an insulated glass unit (surface 2 is the interior side of the exterior glass pane; surface 3 is the exterior side of the interior glass pane) is graphically displayed here.

Low-E glass used as exterior glazing for stained-glass windows can cause significant problems. There are various types of low-E coatings for glass on the market today. The way the various coatings function when stained-glass windows are installed inside of the low-E glazing systems vary with the type of low-E coating on the glazing system.

A low-E sputter coat is designed to pass solar energy through the low-E glass and prevent heat from exiting out of the low-E window glass (see diagram). If stained glass is placed on the interior of the low-E glass in winter, the solar energy passes through the low-E window glass and is blocked by the stained-glass window from entering the building. The heat is trapped between the stained-glass window and the low-E glass, which is designed to block heat transfer back through the window glass in the amount normal window glass would allow. This can exaggerate heat buildup.

Typically, the most immediate failure is in the low-E glass itself. This was explained to me by a technical person at Atofina Chemicals, Inc., a leading manufacturer of the low-E chemicals supplied to major glass manufacturers for the production of low-E glass.

The low-E glass, exposed to the solar-energy heat gain, gets hot. The portion of the low-E glass that is set into the sash is not exposed to the solar-energy heat gain and stays cooler. When exaggerated by heat buildup from stained glass, this difference in temperature can create enough stress in the low-E glass pane to crack it.

We have seen specific examples of damage when a combination of low-E glass and stained-glass windows is installed in non-vented protective glazing systems. The low-E glass cracks and the new stained-glass windows severely buckle within a short period of time.

During the past year, I have discussed this issue with two large glass companies' laboratories as well as with commercial window companies. Our representative, Mark Davidson, has discussed this issue with five low-E glass manufacturers. The concurrence is that different coatings will produce different results and precise conclusions cannot be arrived at until scientific studies are done on the various low-E coatings in installations with stained-glass windows.

Some low-E coatings reflect significant amounts of solar energy at all times allowing less solar energy to enter the building. These types of low-E coatings would reduce the amount of heat from solar energy entering through the window glass to be trapped between the stained-glass window and exterior glazing, but the heat entering the space has resistance escaping back out through the low-E window glass, and would be trapped in a non-vented system. Until a scientific study is conducted, the precise effects of stained-glass windows installed behind low-E glass are anecdotal and observable only in specific cases. The installation of stained-glass windows behind low-E glass voids the warranties for low-E glass.

All of the experts with whom I have discussed this subject strongly state that adequate ventilation is required between low-E glass and stained-glass windows as with stained-glass windows and any exterior glazing system.

We do not know the proper amount of venting required for stained-glass windows set on the interior side of low-E glass installations as we do for exterior glazing systems that do not include low-E glass. The minimum 1 sq.in. per 16 sq.ft. at the top and bottom of the unit, required for standard protective glazing systems, has been shown to work.

Our conclusion is, use caution when installing stained-glass windows inside of low-E glass exterior glazing systems and absolutely use adequate ventilation.

Architectural Impact

If you add a protective glazing system to stained-glass windows, you need to be aware of the protective glazing's impact on the architectural features of the building and mitigate its impact as much as possible. A properly designed system requires a minimum of 1 in. of air space between the stained-glass window and protective glazing. Therefore, at least 1 in. of the frame's reveal will be lost. We want to leave as much of the reveal as possible exposed as a significant architectural feature. The divisions for the protective glazing should follow the design of the original frame and stained-glass window as much as possible. Stone frames after the 1920s often have the channel for the protective glazing built into them.

Protective glazing systems need to have as little aesthetic impact as possible on the stained-glass window as well as on the architectural integrity of the building. It is essential that protective glazing systems are properly designed to preserve our nation's precious stained-glass heritage for future generations. ◆

After several years as an independent artist, Ron Bovard started Bovard Studio in Fairfield, IA, in 1986, where he assembled a team of leading stained-glass artists and craftspeople. In addition to designing a vented framing system for stained-glass windows, he is the author of Windows For the Soul, *and has been the subject of three PBS shows. For more information, go to www.bovardstudio.com.*

This ¼-in. plate-glass protective glazing system was installed in a new mahogany wood frame at St. Paul's Episcopal Church in Kansas City, MO.