



PRESERVATION MATTERS: HISTORIC PLACES OF WORSHIP

PROTECTIVE GLAZING OF STAINED GLASS

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Stained glass in places of worship can light up religious spaces in beautiful and inspirational ways. They serve as teaching guides, works of art, and important pieces of history. Their preservation, however, can be difficult and expensive. Many places of worship have turned to protective glazing as a lower maintenance, affordable option to protect their stained glass. Also known as secondary glazing or storm glazing, protective glazing is a plastic or glass pane that is added to stained glass, typically on the exterior of the building.

The installation of protective glazing over stained glass windows should be carefully considered as it can cause other preservation issues. This document will help determine when protective glazing is appropriate, and if so, what considerations need to be met if protective glazing is installed.



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TYPES OF PROTECTIVE GLAZING

There are two main types of protective glazing: plastic and glass.

Plastic: A relatively light and easy to install glaze. It may be polycarbonate (trade names: Lexan, Makrolon, etc.) or acrylic (trade names: Plexiglass, Lucite, Perspex, etc.).

- *Polycarbonate: A plastic sheet offering more resilience than acrylic, it is typically used when the threat of breakage is a concern. It is usually more expensive than acrylic options.*
- *Acrylic: A more transparent and light-emitting plastic sheet, it is typically used when display of stained glass is a priority. It is the least expensive option for protective glazing.*

Glass: A heavier, more expensive, and more difficult glaze to install. It does not affect the color or the amount of light that enters the stained glass. It is typically seen as a more aesthetic option than plastic. It may be laminated, tempered, or standard float.

- *Laminated glass: A high-strength glass made by bonding layers of glass with a layer of plastic. It holds together when struck by force, producing a "spider web" design when impacted. It is typically more expensive than tempered glass.*
- *Tempered glass: Also known as toughened glass, it is strengthened through controlled high-pressure, thermal, or chemical treatments. It shatters into small granular pieces (instead of jagged shards) when broken. It is typically cheaper than laminated glass.*



Tempered glass forms small granular pieces when it breaks.

Source: Pixabay.com

- *Standard float glass: A type of glass typically found in modern windows. Unlike laminated or tempered glass, it is not a safety glass and therefore does not provide protection against breakage.*



ADVANTAGES AND DISADVANTAGES

Stained glass production peaked in the United States in the late-19th to early-20th centuries, but it suffered a swift decline during the Great Depression and Second World War. The stained glass industry began to focus on helping customers protect their existing stained glass, and therefore it turned to selling protective glazing. This section identifies advantages and disadvantages identified by conservators after studying the effects of protective glazing on stained glass windows.

Advantages:

- *Protects stained glass from accidental breakage (weathering, debris) and intentional breakage (vandalism, break-ins)*
- *Increases energy savings*
- *Protects from environmental pollutants*
- *Filters ultra-violet light*
- *Reduces street noise*
- *Slows rate of putty and came deterioration*

Disadvantages:

- *Promotes condensation in the interspace between the stained glass and protective glazing ("greenhouse effect"); this moisture cannot be easily removed*
- *Causes heat to build up in the interspace, which may cause:*
- *Window's rate of expansion/contraction to increase*
- *Painted wooden surfaces to blister*
- *Rate of lead came corrosion to accelerate (comes are the metal strips that hold pieces of glass together)*
- *Stained glass to sag and buckle*
- *Eliminates natural ventilation if the original stained glass windows were operable*
- *Reduces access to window maintenance*
- *Breeds complacency towards window maintenance*



Protective glazing can promote condensation and cause lead comes to corrode.

Source: Jason Church.

- Generates poor energy payback for cost of installation
- Physically damages the window when improperly installed
- Reduces light transmission
- Polycarbonate and acrylic glazes yellow and cloud with time, which hides maintenance issues and prevents stained glass from being seen from the exterior façade
- Polycarbonate and acrylic glazes scratch easily
- Mutes or masks the appearance of stained glass

Main takeaway: There are many drawbacks to protective glazing and it may not actually offer the desired level of protection for stained glass!



*Plastic protective glazing will cloud and yellow over time.
Source: Jason Church.*



ASSESSMENT

It can be difficult to assess whether stained glass would benefit from its installation. Some points to consider include:

- *Energy savings: Protective glazing is marketed for its energy savings potential. However, many studies have demonstrated that the cost of installing protective glazing could take many generations to offset. More importantly, there may be better energy savings investments. Other options include programmable thermostats and zone valves in cold areas, or shades and landscape features (e.g., exterior awnings, trees) to shelter the building in hot areas.*
- *Stained glass integrity: Protective glazing is marketed for its protection against air-born pollutants. However, this preservation threat is more of a concern with medieval glass, as it is very susceptible to corrosion, whereas modern glass is very durable (due to a different alkali composition). Given that American-produced stained glass is modern, places of worship in the United States are unlikely to need protective glazing for this reason. Historical research on the stained glass can help identify whether it was imported and produced prior to the 19th century. In such cases, protective glazing may be warranted.*

- *Threats of damage and breakage: The most compelling reason to install protective glazing is if intentional breakage (vandalism, break-ins) or severe weather (tornadoes, hurricanes) are a real concern. Laminated glass may be a good option, as its high strength creates a barrier that is difficult to break through. However, it is heavy and its installation will place stress on the window frame. A stained glass or preservation specialist should conduct a careful survey of the frame to ensure it is strong enough to support the glass pane.*
- *Also consider other protection options, such as wire screens, trimming tree limbs, or a fence around the property, which may be less expensive and less invasive. Be aware that alternative options could have their own drawbacks, such as wire screens which may rust and cause damage to sills and wall below.*



*Wire screens provide an alternative to protective glazing.
Source: Stéphanie Machabée.*



INSTALLATION

If protective glazing is deemed necessary for the stained glass, a good design and proper installation is key for ensuring it provides the intended protection. The installation of protective glazing should:

- *Include proper ventilation. Without it, the interspace between the protective glazing and the stained glass can easily build up heat and moisture, thereby causing other preservation issues (such as the corrosion of metal window frames). Air circulation is essential!*
- *Consider the current condition of the window and its surroundings. The weight of glass protective glazing, for instance, adds additional pressure to the window frame. The frame must be strong and sound enough to support the glaze.*
- *Consider the material used in the framework for the glaze. Wood is sometimes used, though metal is oftentimes more appropriate. Aluminum is a popular option. If the local environment is especially salty (such as from the sea), care should be taken to avoid corrosion (through special coatings or alloys).*
- *Consider aesthetics. Ensure the glaze will not alter the appearance of the stained glass by becoming opaque and/or yellow. Use framing materials that complement the stained glass window and the building.*
- *Be reversible, easily removable, and as maintenance free as possible for cleaning and care of both the glazing and the stained glass windows they are meant to protect.*

Most importantly: it is better to not install protective glazing than to install it incorrectly!

Removing Protective Glazing: Some Considerations

Removing existing protective glazing at a historic place of worship may help preserve the stained glass in the long term. If removal is a consideration, be aware of the following:

- *Removal and remounting can be difficult and time consuming.*
- *Protective glazing may be hiding serious deterioration of the windows.*
- *Protective glazing may need to stay in place until adequate funds are raised for preserving the windows.*

If opting to remove, obtain multiple bids from professionals, and select someone who has experience removing protective glazing!



Louver vent added to protective glazing can improve air circulation in the interspace between the stained glass and protective glazing.
Source: Jason Church.



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