Introduction

English churches are particularly rich in windows containing stained glass from a wide range of periods and styles. For many people these are the most fascinating examples of church decoration.

This section will help you identify the signs of damage to stained glass and historic glazing and understand the causes of damage. You will also find practical maintenance tips, as well as information on the different types of protection available for historic stained glass.

Every window is unique and needs to be understood and respected. Historic glass is one of the most fragile materials in a church building, yet it also keeps the building weathertight, so if you are concerned about your stained glass windows, the advice of your inspecting architect should be sought in the first instance. They can help you to identify the causes of damage and appoint an accredited stained glass conservator should treatment be necessary.

What can I look out for?

You should regularly check the condition of your church windows. Look for the following signs:

- water droplets on the glass
- a greenish layer of algae growing on the glass
- pitting and discolouration of the glass surface
- loss of colour and flaking from painted areas of glass
- loose or rattling glass
- any bowing or bulging of the glass
- rusting of the window's iron framework (known as the ferramenta)
- cracks or white, powdery deposits on the lead dividers (known as the leading)
- water staining to the stone, mortar or brickwork around the window
- moss, algae or mould growing around the window inside or outside
- damaged and crumbling stone, mortar or brickwork around the window

What are the causes?

Cracks, bowing and breakage can all be caused by:

- **physical damage** from vandalism and break-ins, or from high winds, falling trees or inappropriate cleaning
- **structural defects** in the window such as inadequate support and failure of lead and copper ties, causing windows to crack or bulge (cracks always require the attention of a stained glass conservator)

Historic stained glass is particularly vulnerable to poor environmental conditions, which can be caused by:

- **interior problems** like poorly designed ventilation and heating systems or poor maintenance, leading to high levels of humidity
- **exterior problems**, such as leaks, or defective gutters and drains, introducing moisture or causing high levels of humidity

There can also be inherent problems in the glass, such as **poorly fired paint**, that can easily flake off.

How can I maintain my stained glass windows?

- As part of the general inspection of the building, look out for leaks and water staining throughout the church, inside and out (not just around the windows) and resolve the causes. The principal cause of a poor internal environment, leading to damage of stained glass, is a poorly maintained building.
- Use only a very soft bristle brush to dust the inside surfaces of stained glass windows. Do not wet-clean.
- Regularly inspect the stained glass windows for signs of paint loss. If you see signs of paint loss, avoid dusting or wet-cleaning the window surfaces.
- If you find any damage, consult your inspecting architect and an accredited stained glass conservator to assess it. They can advise on what measures should be taken.
- If there is a breakage, collect and save every fragment of broken glass and lead, both inside and outside, and consult your inspecting architect and an accredited stained glass conservator.
- You might want to consider installing protective window guards or grilles if there is a high risk of physical damage (such as vandalism) to your windows. Report any vandalism to your DAC, inspecting architect and insurer.
- Maintain a photographic record of your church windows to assist with future conservation, and include any information such as date, donor, subject matter and inscriptions.

Window protection

Your architect may recommend that your stained glass windows are protected in some way. This can take two forms: 'environmental protective glazing' (sometimes referred to as 'isothermal glazing'), or the protection of the exterior of the glass from physical damage using wire guards or polycarbonate sheeting. They have different purposes and you should always seek the advice of your architect and your DAC.

Environmental Protective Glazing (EPG)

EPG functions by removing vulnerable stained glass from its position as a weather barrier, moving it further inside the window opening in its own metal frame, and placing new protective glass in the original glazing groove. This is normally only recommended when the glass is of high significance and the deterioration is caused or exacerbated by environmental factors.

This is a major intervention that should only be carried out by specialist conservators. For more information on environmental protective glazing, please refer to the Historic England guidance on this subject, *Stained Glass: Managing Environmental Deterioration* (2020), available to download from the Historic England website.

EPG should not be confused with secondary glazing. The purpose of EPG is to protect the glass, not improve the internal conditions of the building. Secondary glazing is never suitable for historic stained glass windows.

Metal wire guards and polycarbonate sheeting

Where windows are vulnerable to physical damage because of their fragility or because of a history of vandalism or break-ins, protective guards may be recommended. However, it is important that guards are compatible with the church architecture and as reversible as possible. The following points are provided as an illustration of the points that need to be addressed when considering protection for your windows. It is best to discuss the details of your window protection with your inspecting architect and your insurer.

Metal guards or grilles

- Metal wire guards offer protection from vandalism, but may not resist small missiles such as airgun pellets.
- It is important to consider the metal and finish. Galvanised ferrous metal (steel) wire guards will rust, causing irreversible staining to stonework. Copper guards also stain stonework; the only difference is that the staining will be green rather than red. Stainless-steel wire guards secured with stainless fittings do not stain, but manufacturers sometimes skimp on the specification and produce a guard lacking in rigidity.
- Powder coating gives good protection to ferrous wire guards and offers a longer life span than the galvanising process. The recommended wire guard is one made of stainless steel and powder-coated in black.
- Metal guards may call to mind an industrial building and the impact on the building needs to be addressed: they should not be fitted over whole multi-light windows, but to each light separately. From the inside, they can be visible as a grid of unwanted lines, reducing transmitted light.

Polycarbonate sheeting

Although commonplace, it is important to bear in mind that polycarbonate sheeting is **not** recommended for the following reasons:

- The reflection of light can give the building an 'blind' look, strongly affecting the external appearance of the church.
- If installed incorrectly, it can encourage condensation on the historic stained glass.
- It can be easily scratched or disfigured with graffiti, can darken with age, and dust and debris that is difficult to access can collect in the interspace.
- The long-term properties of polycarbonate are not known.

If polycarbonate must be used, the following guidelines should be followed.

- Large sheets of polycarbonate, covering stonework as well as glass, are aesthetically and technically unacceptable, and difficult to remove for access. Sheets should be cut to exactly the same shape as the 'sight size' of the glazing; all stonework is exposed and the area of reflection is reduced to a minimum and confined to areas where glass is expected to be.
- Sheets should be 6mm thick, without a frame.
- The large coefficient of expansion (0.5%) of polycarbonate can result in buckling and damage, leading to distorted reflections of light. Space between panels should be at least 10mm, to allow for expansion with temperature.
- Poor quality fittings, such as aluminium, should not be used. Brackets of unpolished stainless steel with fittings of stainless steel and nylon will allow for the expansion of the polycarbonate.
- Polycarbonate protection should be made up of small panels that can be removed for access if needed and which allow for a free flow of air.

How do I find a stained glass conservator?

You can obtain details of accredited conservators on the Institute of Conservation (Icon) Conservation Register. Some conservators may charge for visits and the preparation of conservation reports but we can help you with a grant towards this initial work. Our Churchcare grants also support conservation projects.

The conservation of stained glass church windows will require faculty. This includes like-for-like repairs after vandalism and the repair of pre-1960 clear glass. For churches, contact your Diocesan Advisory Committee (DAC) Secretary at an early stage about a faculty. For cathedrals, please contact your Fabric Advisory Committee (FAC) for advice in the first instance; you can follow the links to get the contact details for each committee.

More information

The Corpus Vitrearum Medii Aevi (CVMA) website gives further information on the conservation of medieval stained glass in Great Britain, including its *Guidelines for the Conservation and Restoration of Stained Glass*. The British Society of Master Glass Painters (BSMGP) also provides information and advice on historic and new stained glass. Both of these websites refer to other resources to help you learn and understand more about your stained glass windows.

For information on commissioning new stained glass for your church, see our guidance on New Glass for your Church and New Art for Churches.

For more information on improving the energy efficiency of your building by making alterations to non-historic plain glass windows, please see our guidance note, A Practical Path to Net Zero.