



# Practice Note No 15

## STAINED LEADLIGHT GLASS: CONSERVATION PRINCIPLES

**This Practice Note provides advice on managing stained leadlight glass. The advice supports the Tasmanian Heritage Council's Works Guidelines, which provides guidance on seeking approval from the Heritage Council for works to a place entered in the Tasmanian Heritage Register.**

### Introduction

Stained glass is an art and, more than any other, depends upon skilled craftsmanship in its design, manufacture and construction. It is the only art which relies entirely on natural transmitted light for its effect.

Leadlighting is the unique technique of using translucent coloured glass with 'H' shaped lead strips, known as comes, to hold the glass together. It is thought to have originated in the Byzantine world and had become well established in Europe by 1110 – 1130 when the monk Theophilus described it.

Coloured glass, known as *metal*, was made by adding various metallic oxides to the crucibles in which the glass was melted. Cobalt gave blue, copper green, iron red, etc. The glass was then blown and shaped into sheets. Natural pot metal glass coloured red or blue was too dark to transmit much light so the medieval glaziers developed the technique of applying a thin layer of the coloured glass onto a sheet of white glass.

Stained glass is the technique of painting on glass, in which vitreous glass paints made from crushed glass and mineral earth colours are painted onto the surface of the glass and fused to it when fired in a kiln. This technique burst into prominence around the

11<sup>th</sup> century. When the artist is satisfied with his work, the painted glass pieces were then held together in the same way as is a leadlight.

Further techniques followed around the 14<sup>th</sup> century when the Islamic world introduced the staining of white glass to yellow, ranging from pale lemon to deep orange, by firing on the surface a derivative of sulphide of silver. This meant that the same piece of glass could have different colours. In the 16<sup>th</sup> century, probably in the Netherlands, it was discovered that glass could be painted with enamel colours made by grinding up coloured glass, mixing it with a suitable vehicle, painting it onto the glass and then firing it in a suitable kiln. The enamel colours could be painted directly onto clear glass similar to applying oil colours to a canvas.

The Gothic period of church building followed by the Gothic Revival period of the 19<sup>th</sup> century has given Australia its present heritage of stained glass.

Many Australian stained glass windows are good examples of the peak of their art.

It is important that their value be recognised and that appropriate conservation measures are used to ensure their survival.

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## What is a stained glass window?

Traditional stained glass is not stained but is composed of glass that has been coloured with metallic oxides while still in the molten state called pot metal. The molten glass is then blown or rolled into sheets and cut into pieces conforming to patterns determined by the designer. In making a stained glass window these pieces receive detailing with vitreous paint consisting of ground glass mixed with mineral and metallic oxides in a liquid medium. The paint can be a simple application of a traceline to indicate features or the creation of three dimensional effects using *backpainting, matting, stippling, quill work* or *scratching*. The painted glass is then fired so that the ground glass mixture fuses with the original glass surface.

The finished pieces are then joined together with thin lead strips called *comes* to create the pattern. The comes are soldered at their joints and puttied to make them watertight. The finished window is then placed in a frame of metal, stone or wood set into the building. Additional strength is provided by support bars set in the window frame and tied to the comes with sometimes the addition of came stiffeners.

A variety of techniques can be used for effects on the glass:

- Flashed glass consisting of a layer of thin coloured glass can be fused onto a clear or differently coloured sheet.
- Acid etching or abrasion can be used to cut away areas of the flashed glass coloured layer to produce a strong two-toned effect.
- Traditional earth mineral oxide colours can be painted on the glass and then fused during kiln firing.
- A stain made of silver nitrate painted on the glass gives various shades of transparent yellow when fired. A yellow stain on blue glass, for example, gives a green.
- Enamel colours can be painted on the glass and then fused.

## Definitions

**The Historic Cultural Heritage Act 1995 and the Burra Charter:** The *Historic Cultural Heritage Act 1995* is the statutory basis for management of places entered on the Heritage Register. It contains a number of definitions. It is based on principles of the *Burra Charter* which provides a basis for the understanding of conservation principles, processes and practice.

**Conservation** in relation to a place, includes the retention of the historic cultural heritage significance of the place, and any maintenance, preservation, restoration, reconstruction or adaptation of the place (the Act). Conservation of a stained glass window is not concerned with making it new again, but with retaining its cultural significance including its artistry and ensuring its long term survival.

**Maintenance** means the continuous protective care of the fabric and setting of place (in this case, the window). It is different to repair which involves reconstruction or restoration (the *Burra Charter*).

**Preservation** means retaining the fabric of a place (including the window) in its existing state and retarding deterioration (the *Burra Charter*).

**Restoration** means returning the existing fabric of the place (the window) to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material (the *Burra Charter*).

**Reconstruction** means returning the window to a known earlier state and is distinguished by the introduction of new materials (the *Burra Charter*).

**Adaptation** means modifying the window to suit the existing use or a proposed use (the *Burra Charter*).

## Conservation Principles

- All work is to be in accordance with the *Historic Cultural Heritage Act 1995*, the *Tasmanian Heritage Council's Works Guidelines* and the principles of the *Burra Charter*.
- Stained glass windows are both works of art and artefacts. No works are permitted which will adversely affect the artistry.
- Stained glass paints and coloured enamels, no matter how apparently robust and well fired they may appear, are, by their nature, more vulnerable than the glass to which they are fused. Consequently, many techniques which are perfectly sound when used on a leadlight are highly deleterious and irreversible when used on a stained glass window.
- The understanding of the original painting materials and techniques, and analysis of their current condition is a highly specialised skill. A conservator should:
  - fully document the condition of the window before any intervention is considered; and
  - determine the window's historic evidence and cultural significance;
- Only very skilled artisans should carry out the works for windows of high heritage significance.
- All materials deteriorate and this is irreversible. It is the job of the conservator to slow the deterioration as much as is feasible and to ensure not to do anything that might accelerate the deterioration.
- Any intervention must be the minimum necessary and be in accordance with the *Burra Charter* principles.
- Any proposed interventions should be reversible; not prejudice a future intervention; allow the maximum amount of original material to be retained, whilst taking into account deterioration and accessibility factors; be harmonious with the original; and not be undertaken

without seeking and using expert proven competent advice.

- Because stained glass work is an art, the artistic merit of the fabric is of more importance than is the case with other conservation projects. This may mean that in the hands of a skilled conservator, judgements of aesthetic factors are often necessary.

## Conservation stages

**Reporting:** A conservation report should be written by experts in stained glass history, manufacture, evaluation and conservation. It should include the following:

- a background detailing the names of the artist /designer and the person who commissioned the work; fabrication and installation date; the subject matter of the window and its composition; and details of previous repairs; and an overview of the inspection conducted to determine the condition of the window, including;
- drawings and photographs as appropriate of all window segments, defects and damage; a discussion on the design, manufacturing, construction and installation and consideration of identified defects and weaknesses of all materials.

**Inspection:** Inspecting a stained glass window should provide answers to the following questions:

- Is the glass paint loose or flaking? Is there deterioration?
- Are the panels solid or do they bend easily? Are the panels bowed or buckled?
- Are the cames sound or are they cracked? Are the soldered joints cracked?
- Is the came putty defective?
- Is there broken, cracked or missing glass?
- Is the glass corroding? If yes, is it due to a water condition or to chemical attack?
- Is the glass dirty either externally or internally?
- Is water entry occurring? Is it through the cames from the outside to the inside? Is it through cracked glass or through faulty frames or frame settings?

- Are the tie wires sound and firmly connected to the support bars?
- Are the support bars loose or corroding?
- Is the window framing defective? Are the frame settings sound?

**Cleaning:** No cleaning should be done on site or during restoration until the condition of the glass paint is known. Overzealous cleaning may remove glass paints. Expert advice is essential. On site cleaning should be limited to light dusting, or, if it is firmly established that the glass paints are sound, washing with a soft cloth and de-ionised water. Studio cleaning should be assessed, trialled and reported upon before work is carried out.

**Removal:** Removal requires attention to the window condition and its setting. The window's condition will determine the most appropriate measures to put in place to ensure that no damage occurs. These measures should be determined and discussed beforehand. Do not tape the glass.

**Stabilisation:** If an inspection indicates that permanent loss of glass is imminent but it is not possible to carry out repair work, a stabilisation program is appropriate.

- Panels that are in danger of falling out should be removed to storage if too far gone to stabilise on site.
- Individual glass pieces in danger of falling out should be removed to storage.
- Install storm panels to weakened areas to relieve wind loads.
- Do not use tape to reinforce the glass.
- Do not use silicone, glues, cements or any caulking compounds.
- Do not think that because the window has been that way for years that it will remain that way. Once a window is gone it is too late.

**Releading:** Relead with a lead containing antimony, copper, tin, silver and lead as prescribed by the international standards.

- Consider altering the came profile to a stronger one.
- Flatten all bulges.

- Reputty with a traditional linseed oil putty mix. Do not use cement or silicone.

**Reinforcing:** Attach reinforcement system as needed to make good the defects of the original. This may include copper wires, copper bars, stainless steel bars or copper, lead or stainless steel fins set into the comes.

**Protective glazing:** This is often needed to avoid vandalism or other mechanical damage or to provide weather protection. When incorrectly installed it may not only detract from the visual appearance of the building and window but also set up conditions which may cause deterioration.

The interspace between the stained glass and the protector must always be vented. Clear toughened or laminated glass provides the clearest and longest lasting protection and has the least impact on light passing through the window. All sheet installations require attention to avoid condensation which will cause deterioration of both lead and glass. All installations require attention to loss or change of light transmission.

Polycarbonate, acrylic, glass and metal screens have all been used, however the heat expansion, bowing, UV degradation and scratching of plastics requires consideration.

## Approvals

Works to a place entered on the Heritage Register require the approval of the Heritage Council. This includes repairs to significant stained glass windows.

To gain an understanding of the importance of your window, you should contact the Heritage Council and arrange for a site visit.

If the window is of low heritage significance, the Heritage Council may provide a certificate of exemption from the approvals process.

If the window is of high heritage significance, a discretionary permit application will generally be required and should be lodged with the local planning authority. It will then be referred to the Heritage Council. The application should describe the heritage significance of the window, provide a

condition report, describe the proposed repairs and list the artisans to be employed in the work (if known at this stage).

The process of window repair requires progressive decision making as the works proceed. For proposed works to highly significant windows, the Heritage Council may condition its approval.