

Managing  
Change  
in the Historic  
Environment

# Windows



Consultation draft  
August 2009

# Key Issues

- 1. The windows of a listed building form an important part of its character. Listed building consent is required for any works affecting that character.**
- 2. The size, shape and proportion of a window, the reflective sparkle and irregularities of old glass, the pattern of design, the materials and details of construction, the method of opening, the finish, and associated fixtures typically contribute to the interest of a historic window.**
- 3. Repair rather than replacement is usually the best means of safeguarding the historic character of a window. This also reduces the requirement for new raw materials and energy.**
- 4. Where a window cannot be repaired, replacements should match the original window design as closely as possible.**
- 5. Significant improvements in energy efficiency can be achieved by discreet draught-stripping, internal secondary glazing and use of shutters/curtains at night.**
- 6. Double-glazing is acceptable where the existing windows are beyond repair and the new windows will match the original joinery.**
- 7. Local authorities give advice on the requirement for listed building consent, conservation area consent and other permissions.**

## INTRODUCTION

This is one of a series of guidance notes on managing change in the historic environment. The series explains how to apply the policies contained in the *Scottish Historic Environment Policy* ([SHEP](#), PDF 312K) and *Scottish Planning Policy 23: Planning and the Historic Environment* ([SPP23](#), PDF 192K).

This note sets out the principles that apply to altering the windows of listed buildings. It replaces the equivalent guidance in *The Memorandum of Guidance on Listed Buildings & Conservation Areas* (1998) and should be afforded equal weight in drawing up planning policies and determining applications relating to the historic environment.

Monuments scheduled under the Ancient Monuments & Archaeological Areas Act 1979 require scheduled monument consent for any works. Where a structure is both scheduled and listed, the scheduling controls have precedence. Separate advice is available from Historic Scotland's website: [Scheduled Monuments: Guidance for Owners, Occupiers & Land Managers](#) (PDF 718K).

## WHY ARE HISTORIC WINDOWS IMPORTANT?

Windows make a substantial contribution to the character and physical integrity of most historic buildings and also to the character and interest of historic streets and places. They are an important element of a building's design and weatherproofing. Their style, detailing and materials help us to understand when a building was constructed or altered, its function and advances in related technology. In simple vernacular buildings a considerable amount of the character comes from the windows. Many historic windows are extremely durable, remaining in use for a century or more.

## IDENTIFYING THE INTEREST OF HISTORIC WINDOWS

The significance of a historic window is derived from a number of factors including its form or shape, the characteristics of historic glass, the pattern of design, the materials and details of construction, the method of opening, associated fixtures, and sometimes even the paint colour.

### Form

There are many shapes and sizes of historic window, from simple rectangular openings to arched or elaborately traceried windows. Sometimes window openings are randomly sized and located for purely functional purposes. However in most cases windows are carefully sized and located as part of a broader design for a building or group of buildings. Window proportions and spacing frequently relate to other elements of the building, such as the overall dimensions of an elevation or other features (e.g. doorways). Windows are often important components of an architectural design, perhaps expressing



*Fixed small-pane windows in the cupola of Robert Gordon's Hospital, Aberdeen, designed by William Adam in 1731–32. Thick astragals (glazing bars) and small panes of glass are typical of this period of design. © N Haynes.*



*Banff Castle, Aberdeenshire. Here the size of the windows at the first floor indicate that this was the principal storey where the public rooms were located. The symmetrical arrangement and careful proportioning of the windows is the main architectural feature of the building. © N Haynes.*



*A round-headed cylinder glass sash and case window with slim 'astragals', or glazing bars of circa 1810, Signet Library, Parliament Square, Edinburgh. Irregularities in the glass provide the variety and individuality of the reflective pattern. © N Haynes.*



*Egyptian Halls by Alexander 'Greek' Thomson in Union Street, Glasgow, 1871. Thomson's Graeco-Egyptian design emphasised the solid monumentality of the masonry against the void of the window openings. He used large sheets of plate glass and minimal dark-painted frames to achieve this effect. © N Haynes.*

different parts of a building through differences in size, positioning and design.

### **Glazing materials and patterns: general**

The different production methods of various types of historic glass resulted in a wide range of thicknesses, colours, and refractive and reflective qualities. The irregularities resulting from the historic glass-making processes can provide an attractive reflective sparkle, refractive variety and individual character to each window. By contrast, modern float-glass is flat and blemish-free to a high degree of standardisation. The way in which a window is divided up into panes by glazing bars or 'astragals' can also form a key part of its character.

### **Glazing materials and patterns: crown and cylinder glass**

Before the 17th century, glass was very expensive to produce, and could only be obtained in small panes which were set in lead. Decorative stained glass was used in this way in churches before the Reformation. By the end of the 17th century, larger pane sizes could be produced and timber sash and case windows were being used in prestigious domestic buildings. Timber glazing bars or 'astragals' allowed a number of panes of glass to be used in a single sash.

These types of window became predominant in all sorts of buildings throughout the 18th and 19th centuries. Much of the glass of this period was produced by spinning the molten glass to form thin sheets (crown glass), or by forming cylinders that were later flattened (cylinder or broad glass). The results of the spinning action or flattening of the cylinder often created irregularities in the glass that gave each type its own distinctive appearance.

The general trend was for decreasing thicknesses of glass and astragals, and increasing sizes of window opening. The standard arrangement was for two sashes containing six 'portrait' format panes each. Frequently the profile of the astragal related to local joinery traditions. A larger variety of glazing patterns became more widespread in the early 19th century with 'lying-pane' (landscape format) sashes becoming popular. Leaded diamond-pane windows and other forms of metal glazing bar were particularly associated with the 'cottage orné' style.

### **Glazing materials and patterns: patent plate glass**

Patent plate glass was invented in 1839, enabling much larger sizes. Ripples, bubbles, and other imperfections still characterise this type of glass. Although expensive, the new glass became very fashionable. Often owners re-glazed only the front windows of their properties, reusing the old sashes by removing the astragals and installing single panes of glass. 'Horns' were used to strengthen the lower joints of the top sashes. Decorative stained and painted glass began a revival that was to see its use in ecclesiastical, domestic, civic and commercial buildings.

### **Glazing materials and patterns: modern glass**

The development of structural iron and steel and reinforced concrete in

the late 19th century allowed increasing quantities and sizes of glazing in outer walls, eventually leading to fully glazed curtain walls in the early 20th century. The drawn flat sheet process increased the mechanised production of glass. Modern float glass, characterised by its uniform appearance and availability in very large sizes, was first developed in 1959.

### Framing materials

Timber, usually seasoned pine, continued to predominate as a framing material until the Second World War. Metal frames, allowing thin profiles and curved designs, were also used in domestic and industrial buildings, particularly from the 1920s to the 1950s.

### Method of opening

The way in which a window opens can contribute significantly to the authenticity and appearance of a historic building. All traditional sash and case windows open by sliding the sashes up or down in the same plane: in the open position they never project outwards from the building. Other common forms of opening method are casements, which are hinged at the side and open outwards (or more rarely inwards), and hoppers, which are hinged at the bottom and usually open outwards on a track or a restrictor. Some early 20th-century metal-framed windows pivot.

### Finish

Most timberwork associated with windows was traditionally painted. It is sometimes possible to sample underlying layers to establish the original colour. Whilst light colours were widespread in the 18th century and are now ubiquitous, many mid to late 19th-century timber windows were painted in dark colours including red, green, blue, brown, black and grey.

### Associated fixtures

A wide range of fixtures are often associated with historic windows, including sash boxes, cords, weights, sash lifts, catches, shutters, blinds, curtains and rails/pelmets, window guards, and balconies. Such fixtures can be purely functional or also decorative, contributing to the interest and character of the window.

## PRINCIPLES FOR REPAIR AND ALTERATIONS

### Character and interest of the building

Repairs and alterations to a historic building should protect its character. The contribution of the windows to that character should therefore be understood before considering how to alter the building. The form, glazing materials and pattern, framing materials, method of opening, finish and associated fixtures of the window are important considerations. A brief description of the interest of the windows and an explanation of the impact of the alterations are always helpful in assessing change.



*Former Niddrie Marischal School, Edinburgh. Designed in Art Deco style in 1935 by architects Reid & Forbes. The strips of blue-painted steel windows have two opening methods: horizontal pivots and small hoppers. The ground-floor windows are protected from vandalism by discreet metal mesh screens painted in the same colour. © N Haynes.*



*Detail of a timber sash and case window of circa 1890 showing the profile of the astragals, the irregularities of the glass, and a decorative sash fastener. © N Haynes.*



*Original timber sash windows of circa 1900 at the lower floor and poor replacement windows at the upper floor. The historic character of small-pane upper sashes and dark-painted frames is lost through use of modern plastic materials, a non-traditional opening method and clumsy profiles designed for double-gazing.*



*A new single-glazed window detailed to match the previous window, except that horns have been added to the top sash, not necessary where the astragals give rigidity, and a 'permavent' has been added. See page 7 for an alternative ventilation method.*

## Repair

In almost all cases, repair of components on a like-for-like basis is preferable to replacement of a whole unit, as this will best maintain the character and historic fabric of the window. More detailed advice on the repair of timber windows can be found in our Inform Guides: [Maintaining Sash and Case Windows](#) (553K PDF) and [Maintaining Traditional Plain Glass and Glazing](#) (498K PDF).

## Replacement

Where there is no alternative to the replacement of historic windows or elements of their joinery or glazing, the new elements should match the original in all respects. This should include exact replication of the opening method, astragal dimensions and profiles, fixing of the glass (e.g. putty) and the reuse of historic glass where this contributes to a building's character.

Changes in framing materials or types of glazing (e.g. from clear glass to wired glass), the adoption of different opening methods, the insertion of extractor fans and other similar features, or the use of planted-on or sandwiched astragals should normally be avoided.

## New window openings

Location and design are key considerations in proposals for new window openings. New openings should be carefully located to avoid disruption to the characteristics of the surrounding external and internal context. For example, subsidiary elevations with no formal symmetry or rooms with few internal features are likely to be more suitable for new window openings than principal elevations or rooms.

In cases where the building forms part of a larger grouping, it may be necessary to consider the wider context of the group and the potential for a cumulative effect if similar work was undertaken on every building. Where the location is appropriate in principle, the design of the new window should take account of the size, proportion and detailing of surrounding or nearby windows.

## Blocking up windows

Permanent blocking of windows by building up the opening should only occur where the window makes little contribution to the character of the building. Evidence of the opening, such as the window surrounds or relieving arch, should be retained. The blocking materials should be appropriate to the surrounding materials. If possible the window itself should remain in situ with the blocking materials set behind.

## Converting windows to doors

Subsidiary elevations are usually more suitable for work of this type. Wherever possible the existing width of the window should be maintained and the opening expanded downwards to ground level. Depending on the circumstances it might be appropriate to match any external window surround detailing at the lower level. Where windows contribute to the character of an elevation or internal space, the replacement door should be solid to cill level and glazed above to

match the pattern of surrounding windows. Any internal joinery, such as shutters or panelling, should be retained and matched at the lower level of the new opening.

### Reinstatement

Some windows may have been replaced in the past using inappropriate designs or materials. Any new replacement proposals should seek to improve the situation through designs and materials that are sympathetic to the character of the building.

Generally restoration of a window to a particular period should only be considered when the proposed style is appropriate to the building in question, it matches a documented earlier pattern, and it does not result in the loss of existing historic fabric that contributes to the character of the building. For example, it is not always appropriate to reinstate astragals to sashes that once contained small panes of glass but now contain a single sheet of polished plate glass. The existence of the plate glass may shed an interesting light on the 19th-century technological advances in glass production and the accompanying shifts in style and taste, and may form part of a high-quality decorative scheme or alteration.

### Ventilation

Sometimes additional controlled ventilation is required. It is preferable to provide this by means of discreet vents or by 'blocking down' top sashes, rather than by the addition of prominent trickle vents. Historic Scotland's [Looking After your Sash & Case Windows](#) (PDF 721K) provides further guidance on alternative methods of ventilation.

In exceptional circumstances, such as some conversions, there may be grounds for the removal of existing windows and their replacement with new, more thermally efficient ones. Normally this will only be considered where the existing windows are inappropriate or incapable of repair and the new windows can match the detailed design of the historic or original ones.

### Security

Additional window security measures can normally be achieved discreetly without damage to the historic character of the building. Use of traditional internal shutters, or if necessary internal retractable grilles, is likely to be less disruptive to the historic appearance of a building than external shutters. Where external measures are unavoidable, removable grilles are preferable to permanent fixtures (including roller shutters).

### Colour

Where original or early paint schemes can be established, reinstatement is encouraged. Some local authorities control the palette of window paint colours to maintain the unified design of a conservation area or groups of listed buildings in multiple ownership/occupation.



*This original window/door of the 1730s at Chatelherault, Hamilton, illustrates the principle of converting a window to a door. In order to maintain the consistency of architectural treatment in the room, the upper part of the door is treated as a window, and the lower section is solid.*



*A view of the underside of the meeting rail of a new timber sash and case window at Castlemilk Stables, Glasgow. A discreet slot ventilator in the meeting rail allows ventilation without the need for obtrusive external fixtures.*



South Charlotte Street, Edinburgh. The blind openings are detailed with sills and a 'meeting rail' to maintain the symmetry of the architectural elevation. The chimney flues pass behind the blind windows.  
© N Haynes.



Webster Theatre, Arbroath. Large clear sheets of internal secondary glazing were installed here during recent refurbishment.

### Blind windows

Original blind or 'dummy' windows form an important part of the interest of a historic building and should not normally be opened up. Such features were traditionally designed to maintain the pattern of window openings in the external elevations of a building, or sometimes to provide a visual trick or 'trompe l'oeuil'. Often fireplaces, chimneys, or other internal features prevented the creation of working windows in some locations.

## ENERGY EFFICIENCY AND SUSTAINABILITY

Energy conservation is necessary in addressing climate change. In many cases cost-effective and sustainable improvements to the energy efficiency of traditional buildings can be achieved without damage to their character. Heat loss typically occurs in various parts of a building. It is important to take an overall view of energy efficiency measures.

### Thermal efficiency and sound insulation

It is normally possible to upgrade the performance of traditional windows by the introduction of discreet draught-proofing brushes around the sashes and by the use of well-fitting shutters at night. Further improvements to draught and sound insulation can be achieved by carefully designed internal secondary glazing.

### Double-glazing

Double-glazing may be used where it can be demonstrated that there will be no loss of serviceable historic materials, and that the new windows will match the originals as closely as possible. These circumstances are likely to occur where the original or early windows have already been replaced, or where the new sashes will contain large single sheets of glass. It is usually difficult or impossible to install multiple small panes of double-glazing in a sash window without increasing the thickness and profile of the astragals to a damaging degree.

### Sustainable repair

Historic windows contain much 'embodied energy' – the energy used in their original manufacture and installation. It is always important to consider the total energy cost of any particular proposal. The embodied energy lost in completely replacing a window, rather than repairing or upgrading its performance, will often be greater than the benefits. This is especially the case when replacement windows are manufactured from non-renewable materials, or are produced remotely and transported significant distances, or when the old units need to be disposed of in landfill.

Further information is available in Historic Scotland's [Inform Guide: Energy Efficiency in Traditional Homes](#) (PDF 715K).

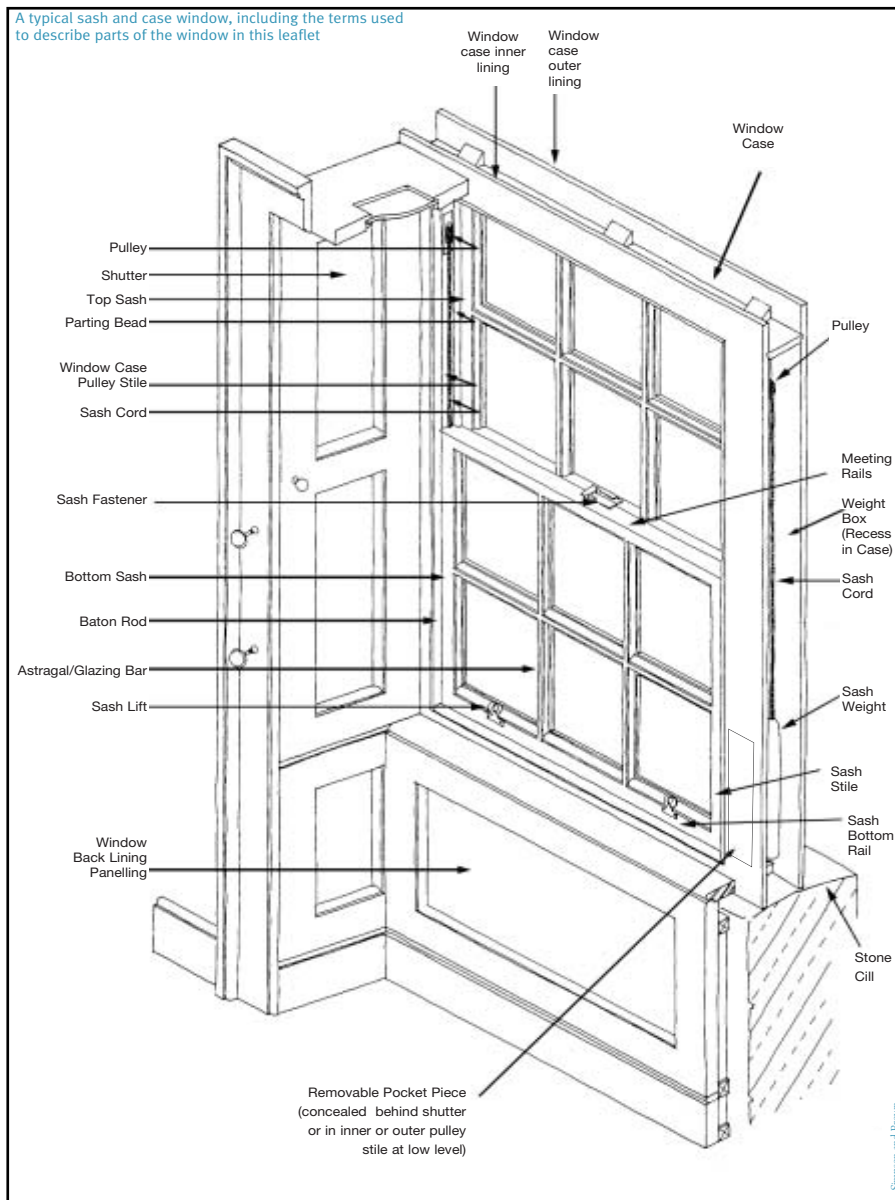
## CONSENTS

Listed building consent is required for any work to a listed building that affects its character. The local authority determines the need for consent.

Where listed building consent is required, an application is made to the local authority. This should include accurate scale drawings showing both the existing situation and proposed works in context. It is normally helpful to provide detailed technical information and photographs.



*Details of proposed replacement windows should be checked against the originals where possible. In this case the astragal profiles of the sample replacement window are too thick and flat, and would not be an appropriate match for this situation.*



*Repairing the sash cords of a timber sash and case window. Most components of a traditional window can be repaired without the waste of replacing the whole unit.*

## Other selected Historic Scotland publications and links

[Inform Guide: Energy Efficiency in Traditional Homes](#) (2008) (PDF 715K)

[Inform Guide: Maintaining Sash & Case Windows](#) (2007) (PDF 553K)

[Inform Guide: Maintaining Traditional Plain Glass and Glazing](#) (2007) (PDF 498K)

[Inform Guide: Decorative Domestic Glass](#) (2007) (PDF 424K)

[Looking After your Sash & Case Windows](#) (2003) (PDF 721K)

[Guide for Practitioners: Conservation of Timber Sash & Case Windows](#) (2002) (available for purchase)

[Research Report: The Historical & Technical Development of Sash & Case Windows in Scotland](#) (2001) (available for purchase)

For the full range of Inform Guides, Practitioner Guides, Technical Advice Notes and Research Reports please see the Publications section of the Historic Scotland website.

## Other selected publications and links

[Report by Glasgow Caledonian University for Historic Scotland: Improving the Thermal Performance of Traditional Windows](#) (2008) (PDF 1.4Mb)

## FURTHER INFORMATION AND ADVICE

Details of all individual scheduled monuments, listed buildings, designated gardens and designed landscapes, and designated wrecks can be obtained from Historic Scotland (see contact details below) or at: [www.pastmap.org.uk](http://www.pastmap.org.uk). Details of listed buildings can also be obtained from the relevant local authority for the area.

Advice on the requirement for listed building consent, conservation area consent, building warrants, and other permissions/consents should be sought from local authorities.

Historic Scotland Inspectorate  
Longmore House  
Salisbury Place  
EDINBURGH  
EH9 1SH

Tel: 0131 668 8981 or 8717 Fax: 0131 668 8765  
E-mail: [hs.inspectorate@scotland.gsi.gov.uk](mailto:hs.inspectorate@scotland.gsi.gov.uk)  
Web: [www.historic-scotland.gov.uk](http://www.historic-scotland.gov.uk)

Advice on technical issues is available from Historic Scotland's Technical Conservation Group at the above address and website or at the following:

Tel: 0131 668 8715 or Fax: 0131 668 8669  
E-mail: [hs.technicalconservationgroup@scotland.gsi.gov.uk](mailto:hs.technicalconservationgroup@scotland.gsi.gov.uk)

Text: Crown copyright, Historic Scotland, 2009.  
Images: Crown copyright, Historic Scotland, unless otherwise credited.  
[www.historicscotlandimages.gov.uk](http://www.historicscotlandimages.gov.uk)

### Cover images

*Latticed casement windows, Luss, Loch Lomond & The Trossachs National Park.*  
© N Haynes.

*Painted glass window, Café Royal, City of Edinburgh.* © N Haynes.

*Timber sash and case window, Edinburgh, showing varied reflections provided by different kinds of crown, cylinder and plate glass.*