

## **MANAGING CHANGE IN THE HISTORIC ENVIRONMENT - WINDOWS**

MANAGING CHANGE IS A SERIES OF NON-STATUTORY GUIDANCE NOTES ABOUT MANAGING CHANGE IN THE HISTORIC ENVIRONMENT. THEY EXPLAIN HOW TO APPLY GOVERNMENT POLICIES

The aim of the series is to identify the main issues that can arise in different situations, to advise how best to deal with these, and to offer further sources of information. They are also intended to inform planning policies and the determination of applications relating to the historic environment.

### **Key Issues**

1. The windows of a building form an important element in defining its character. Listed building consent is required for any works affecting the character of a listed building and planning permission may be required in a conservation area.
2. The contribution of the windows in a historic building to its character must be understood before considering alteration.
3. 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 character of a historic window.
4. Maintenance and appropriate repair is the best means of safeguarding the character of a historic window.
5. Improvements in energy efficiency can be achieved by draught-proofing, internal secondary glazing and use of shutters and lined curtains at night.
6. Where a window is of limited interest or beyond repair, its replacement should be permitted. New double-glazed windows will be acceptable if they can closely match the original window design and details.
7. Some types of double-glazing can be incorporated within existing window joinery and may be acceptable where no historic glass remains.
8. Planning authorities give advice on the requirement for listed building consent, planning and other permissions, and will often have their own detailed guidance on windows.

### **Introduction**

This note sets out the principles that apply to altering the windows of historic buildings. It should inform planning policies and the determination of applications relating to the historic environment.

Whilst this guidance is best practice for historic buildings generally, local authorities as the decision-makers will have specific window policies for both listed buildings and unlisted buildings within conservation areas.

In this guidance note the term 'historic window' is used for both original and significant historic windows.

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. Further advice is available from Historic Scotland's website: (insert link)

## **1. WHY ARE HISTORIC WINDOWS IMPORTANT ?**

Windows make a substantial contribution to the character, authenticity 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. The size, shape and positioning of the openings are significant, as are the form and design of the framing and glazing. Their style, detailing and materials help us to understand the date when a building was constructed or altered, its function and advances in related technology and fashions. In simple vernacular or plainer buildings a considerable amount of the character and visual prominence of a building can derive from the windows.

## **2. 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 opening, the materials and details of construction, the method of opening, associated fixtures, and sometimes even the paint colour.

This guidance is focused on the most common type of traditional historic window, the double-hung vertically sliding timber sash and case window (the sash window). Other window types will be addressed later in the document.

### **Form and design**

There are many shapes and sizes of historic window, from simple rectangular openings to arched or elaborately traceried windows. Sometimes window openings are 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 important components of the hierarchy of an architectural design, perhaps expressing different parts of a building and principal rooms within through differences in size, positioning and design.

## **Historic glass**

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.

Early glass included cylinder or broad sheet glass, made by forming cylinders of molten glass that were then cut and flattened into thick panes. More common was Crown glass, where molten glass was hand-spun into a thinner circular disc which could then be cut into individual panes. Both these methods were expensive, had a restricted pane size, and produced distortions and bubbles in the glazing that add character, and identify the production process. Surviving examples of this hand-made glass should be retained.

Early plate glass was quite thick and expensive, made in a similar method to cylinder glass or by casting molten glass on a table and then grinding and polishing it flat. The cylinder sheet glazing process was greatly improved in the 1830s which is also when Patent plate glass was invented, allowing thinner low-tax glass to be produced with later mechanical polishing further reducing costs. The production methods of improved cylinder and plate glass retain varying levels of imperfections and irregularities in the glass that can add to the character of a window.

## **Modern glass**

Drawn flat sheet and float glass are both 20th mechanised processes, the latter having very little imperfection. More recently glazing technology has produced many different types of glazing, the major change being the advent of double-glazing with two panes separated by a vacuum, air or gas filled cavity. Standard double glazing has two panes, usually of 4-6mm glass, with a cavity of around 16-20mm. Slim-profile double-glazing has cavities of between 3mm and 10mm and vacuum glass has a 'cavity' between the panes of 0.2mm. The latter two are often used to replace historic glass within existing or new frames. Both double glazing, and specialist single glazing, are often fitted with low-emissivity coatings which can further improve their thermal efficiency.

## **Glazing patterns**

The vertically sliding sash and case window was introduced to Scotland in the latter seventeenth century. After some variation it commonly comprised two equally sized glazed sashes that slide vertically, on counterbalanced weights, in a sash-box set in a rebate in the wall for weather protection. Softwood timber, usually well-seasoned pine, was normally used with occasionally hardwoods such as oak for cills.

Early sash windows contained small thick panes, often square, held by thick glazing bars or 'astragals'. As the eighteenth century progressed an arrangement of two equally sized sashes containing six 'portrait' format panes each became the standard, although 'lying-pane' (landscape format) and margin panes were also used. Generally, over time, astragal sections and glass thicknesses reduced as window openings increased in size and glazing technology improved. The standard six-over-six 'Georgian' pattern was widely used until at least the mid-nineteenth century but the advent of improved cylinder and patent plate glass, and the removal of taxes, allowed larger panes of glass and fewer astragals. There was a gradual transition to larger panes with four-over-

four and two-over two panes frequently used, but by the latter nineteenth century the one-over-one pattern was common. Horns, added to the meeting rails of sash windows to address these heavier panes of glass, are not very common in Scotland and often do not appear until late in the C19th, if at all.

When larger pane sizes first became available often the astragals in existing sashes would be removed and retrofitted with single panes of glass. Again, due to expense, frequently only the front windows of properties would be re-glazed in this fashion. Likewise, in new buildings, sometimes the rear elevations continued to be designed with cheaper smaller panes.

Either side of 1900 saw experimentation with different sash sizes, often a lower large-paned sash with smaller multi-paned sash above, or sometimes decorative glass. The popular 'Queen Anne' style saw the reintroduction of smaller panes and multi-paned sashes were also popular in inter-war social and private housing developments.

It is important to carefully assess the glazing patterns in a building. They are a product of many competing elements, including the status of the building, architectural fashions, technological changes and local customs.

### **Other window types**

Besides the sash and case window there were other types of window used in Scotland, including timber and metal casements, often with leaded lights, associated with the 'cottage orne' style and with Arts & Crafts style housing.

Although timber windows continued to predominate as a framing material until the Second World War, the early C20th saw the introduction of steel casement windows, popularised by the Crittall Company. They allowed schools and industrial buildings to have large expanses of glazing and curtain walling, whilst also allowing 'picture windows' in housing. The use of steel windows was largely superseded in the post-war period by aluminium, and later still uPVC.

### **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 and 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 on a track or restrictor. Some C20th-century metal-framed windows use a pivot mechanism.

### **Finish**

Like most softwoods, window frames were traditionally painted. It is sometimes possible to sample underlying layers to establish the original colour. Whilst shades of white are now ubiquitous, many traditional colours were much darker, with green painted sashes still seen in unrestored buildings.

### **Associated fixtures**

A wide range of fixtures are often associated with historic windows, including sash boxes, cords, weights, sash lifts, catches, shutters (and their ironmongery), architraves and blinds. Surviving original ironmongery should be retained and reused. Many sashes in Scotland incorporate 'simplex' hinges that allow them to be hinged inwards for cleaning.

### **Illustration of a typical sash and case window**

The illustration below shows a typical sash and case window

## **3. PRINCIPLES FOR ALTERATIONS AND REPAIR**

### **Character and interest of the building**

Alterations and repairs to a historic building must protect its character. The contribution windows make to this character must therefore be understood before proceeding. In assessing the character it will frequently be important to determine whether the windows are original to the building or, if later, whether they are of historic significance in their own right e.g. part of a significant or important scheme of overall works or decoration to the building. Evidence from adjacent or similar buildings, especially planned set-pieces or terraces, will also be important.

### **Repair**

Where windows are of historic interest, repair of their components on a like-for-like basis will be preferable to replacement. This approach not only retains historically important fabric and character but is sustainable. Historic timber windows often used high quality close-grained softwood, and with maintenance, have frequently lasted hundreds of years.

In some cases there will be cosmetic damage to windows with sashes painted shut or peeling paint. There may also be individually decayed elements, such as rotten cills, which can normally be repaired or replaced. However, there will be situations when a window is in such poor condition, damaged or rotten to an extent that it is not possible or practicable to repair it. More detailed advice on the repair of timber windows can be found in our Inform and Short Guides (*details at the end of this leaflet*).

Steel windows can also suffer from rust and distortion and sometimes their repair will not be possible or practicable.

### **Reinstatement**

An assessment of character will be important when changes to the window's design are envisaged. Often there is a desire to restore an earlier or original glazing pattern to a building. If clear evidence for the earlier pattern exists, this should be acceptable, unless the later windows are of interest in their own right, for example, if they relate to significant alterations and additions.

In other cases the windows may be modern replacements, either inexact copies of the original examples, or using inappropriate sections or materials. In such cases it should be acceptable to replace the windows with an aim to better the existing situation.

### **Ventilation**

Sometimes additional controlled ventilation is required, especially in conversion works. It is preferable to provide this by means of discreet vents inserted in the head, meeting rail or sides of the window rather than by the addition of prominent trickle vents. Further information on providing alternative methods of ventilation is available in our *Short Guide to Sash and Case Windows*.

### **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 colour or early paint schemes can be established by analysis, reinstatement is often encouraged, although individual changes to set-piece designs or terraces will be unwelcome. 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. In addition some areas have developed a custom of using specific colours e.g. black-painted frames in the West End of Glasgow and white frames in Edinburgh New Town.

### **New window openings**

Location and design are key considerations in proposals for new window openings. New openings must 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 precedent and cumulative effect if similar work was undertaken on every building. Where the location is appropriate in principle, the design of the new window must take account of the size, proportion, material and detailing of surrounding nearby windows.

### **Blocking up windows**

Permanent blocking of windows by building up the opening should only occur where the window makes very little contribution to the character of the building. If the window is of any interest evidence of the opening, such as the window surrounds, cill, lintol or relieving arch should often be retained, preferably with the window kept in-situ with blocking materials set behind or with the blocking recessed to the face of the former window. If the window being blocked is of no interest or detrimental to the building it can be blocked without any evidence being kept, using materials compatible with the surrounding materials.

### **Converting windows to doors**

Secondary elevations are 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 may 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. Doors are also sometimes converted to windows. Here, if the door is an important part of the character of the building, it will be easier to provide a glazed or part glazed door rather than blocking up the opening to insert a window.

### **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 originally 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'. They are often faced in large stone slabs designed to resemble the sashes. Often fireplaces, chimneys, or other internal features prevented the creation of working windows in some locations. Windows specifically blocked for tax reasons are rarer.

## **4. UPGRADING AND REPLACING WINDOWS**

### **Energy efficiency and heat loss**

Energy conservation is necessary in addressing climate change. In many cases effective and sustainable improvements to the energy efficiency of historic buildings are possible and can be achieved without damage to the character of the building.

When looking at windows it is important to consider heat loss throughout the entire envelope of a building and, in most cases, less invasive approaches than double-glazing or replacement will be more cost-effective in the short and longer term. However, single-glazed windows are often the worst-thermally performing element in a building and a readily identifiable route for heat loss, especially in buildings with large window-to-wall ratios.

There are several methods of improving the energy efficiency of windows. Low key improvements include applying window films onto or behind the glass. At night considerable improvements to heat loss can be obtained by lined curtains, insulated blinds or reusing historic shutters, which can also be insulated. A combination of the above measures can be particularly effective.

### **Draught-proofing**

Sash windows were designed to allow some air flow but not to be draughty. Draught-proofing can reduce air-leakage and the feeling of cold within a building. It is relatively simple to draught-proof a window using foam-backed strips or by inserting brush strips into the baton rods and meeting rails. This approach should not be underestimated, as it can lead on to reductions in the heating required. It can also be helpful in reducing dust and noise.

### **Secondary glazing**

Internal secondary glazing can reduce heat loss by over 60% and has the advantage of leaving the original windows untouched, a suitable approach where the window retains historic glass, or where

adaptation for double-glazing is complicated. It can also be cheaper than replacing a timber sash or steel window. Secondary glazing is also better at reducing noise transmission than double-glazing.

Systems are normally glass in thin aluminium or timber frames set on the internal window framing or staff beads, and can be designed to allow historic shutters to operate. Secondary double-glazing is rarer, but has also been used in some cases. Care should be taken to keep frame sections minimal and match up internal meeting rails or frames with outside sashes. Painting the external frame face black can further disguise units from external view.

Lower-cost 'temporary' secondary glazing solutions are also available, utilising rigid acrylic or polycarbonate sheets. These can be fitted (often on velcro or magnetic strips) for winter and removed and stored in summer. Again, they can significantly reduce heat loss.

### **Replacement windows and double-glazing**

Where existing windows are either inappropriate for a new use, beyond repair, or of little historic interest, it should be acceptable to replace them. This can involve replacing either the individual sashes or the sash case as well. Where a new sash case is fitted it should be set wholly within the wall's rebate, with minimal protrusion of the facing plate, unless exposed sash-boxes are a feature of the original design.

Generally, replacement windows should seek to match the original windows in design, form, fixing, method of opening and materials. Materials other than timber will rarely be acceptable in replacing traditional sash windows. This is also true of steel windows, although replacement double-glazed metal windows that closely replicate original patterns are available.

Like-for-like replacement of single-glazed windows is relatively straightforward. However, in most cases new windows will be double-glazed so care is required to adapt the detailed design of new timber windows to incorporate double-glazed units.

Advances in glazing technology have resulted in products such as slim-profile glazing specifically developed or adapted to allow more accurate replication of historic window patterns. This in turn has directly led to double-glazing becoming more generally acceptable in historic buildings, with consequent improvements in energy efficiency.

The success of a replacement window will depend on its detailed design, and how well the new replicates the old. Features to consider in the design of new windows may include the correct placing of the case within the wall and its method of operation with vertically sliding sashes. Sections of sash meeting rails and astragal profiles should attempt to match the original, and horns should not be provided unless there is evidence for their use. The fixing of glazing will be important, as can the smaller details such as the colour of internal spacer bars in unit cavities e.g. white can better replicate the glazing bar colour.

Slim-profile double-glazed units can normally replicate historic patterns successfully and are often used to retrofit double-glazing within existing sashes. Although the units are not optimised for thermal performance they do give significant improvements to single glazing.

Standard double-glazing may be acceptable for some replacement windows e.g. one-over-one sashes. However, the thicker astragals required by standard units, and the edge-sealing of units, mean they may not be able to successfully replicate historic multi-pane patterns, especially those with thinner astragals. This issue has often led to patterns which use a single double-glazed unit with applied or integral astragals, or more recently a combination of both.

True or through astragals should be provided. Astragals, sandwiched between panes, will not be acceptable. Applied or 'stick-on' astragals will not normally be appropriate for listed buildings, but may, in some circumstances, be deemed appropriate by local authorities for use in unlisted buildings in conservation areas and/or in cases where a replacement window will better the current situation.

### **Retrofitting double-glazing**

Where the existing windows are in good condition and of historic interest and no historic glass survives, it will often be possible to insert double-glazed units within the existing frames. Normally, due to the design and construction of historic windows, only slim-profile double glazing will be able to be accommodated.

Care should also be exercised with any routing of sashes or other alterations to accommodate the glazing. These should not weaken the window or lead to avenues for exacerbating decay.

### **Fitting glazing**

Double glazed units can be fitted with putty, or a synthetic glazing compound (linseed oil putty may damage unit seals). It may be possible to use timber fixing beads, but only if the beads replicate the 45 degree section of traditional putty.

## **5. 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. Minor works such as draught-proofing will rarely require consent. The installation of secondary glazing may sometimes require consent, often according to its design. More intensive works e.g. retrofitting double glazing are almost always likely to require consent, as will replacement.

Where listed building consent is required, an application is made to the local authority. This should include accurate scale drawings showing both the existing windows and the proposed works in context. It is normally helpful to provide detailed technical information and photographs. A brief description of the interest of the windows and an explanation of the impact of the alterations are always helpful in assessing change. Where an application proposes the replacement of a window or windows in poor condition a condition survey by an appropriately skilled tradesman is often useful.

Historic Environment Scotland will be consulted on listed building consent cases for works to A and B listed buildings.

Replacement of windows within a conservation area will require planning permission. This process is undertaken solely by planning authorities who will have specific guidance for windows within their own area reflecting local character and circumstances, and following their assessment of the contribution an individual building makes to a conservation area.

Consent may also be required under the Building (Scotland) Regulations 2004. Works requiring Building Warrant may have implications for windows e.g. window guards. Historic Environment

Scotland's guide for Practitioners 6 – Conservation of Traditional buildings – application of the Scottish Building Standards provides further guidance.

## **6. FURTHER INFORMATION AND ADVICE**

Historic Environment Scotland is charged with ensuring our historic environment provides a strong foundation in building a successful future for Scotland. One of its roles is to provide advice about managing change in the historic environment.

Legislation and policy

*Building (Scotland) Act 2003*

*Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*

*Ancient Monuments and Archaeological Areas Act*

*Scottish Planning Policy (2014)*

*Historic Environment Scotland Policy (HESPS) 2015*

### **Other selected Historic Environment Scotland publications and links. (Draft)**

All publications are available at Historic Environment Scotland's Technical Conservation website.

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)

Technical Paper 9: Slim profile double glazing, thermal performance and embodied energy (2010) (with Changeworks, Glasgow Caledonian University and Heriot-Watt University)  
& Technical Paper 20: Slim profile double glazing – Remeasuring the thermal performance

Technical Paper 1 - Thermal Performance of Traditional Windows

Technical Paper 23 - Thermal assessment of internal shutters and window film applied to traditional single glazed sash and case windows

Refurbishment Case Studies – various.

Technical paper 16 for costs ?

*Inform Guide: Energy Efficiency in Traditional Homes (2008)*

*Inform Guide: Maintaining Sash & Case Windows (2007)*

*Inform Guide: Maintaining Traditional Plain Glass and Glazing (2007)*

*Inform Guide: Decorative Domestic Glass (2007)*

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)

Changeworks – Double Glazing in Listed Buildings – Project Report – 2010

[http://www.changeworks.org.uk/sites/default/files/Double\\_Glazing\\_in\\_Listed\\_Building.pdf](http://www.changeworks.org.uk/sites/default/files/Double_Glazing_in_Listed_Building.pdf)

Changeworks -Energy Heritage (2008)

<http://www.changeworks.org.uk/resources/energy-heritage-a-guide-to-improving-energy-efficiency-in-traditional-and-historic-homes>

### **Grant assistance.**

In some cases grants and loans are available for energy efficiency improvements. Home Energy Scotland provide free, impartial advice. On 0808 808 2282 or [www.energysavingtrust.org.uk/scotland/grants-loans](http://www.energysavingtrust.org.uk/scotland/grants-loans)