Windows - A guide on works to windows in listed and other traditional buildings

September 2024

[1st Edition]

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Introduction

Windows are the eyes of a building – they let in light and give views out. They profoundly affect its appearance. Old windows will be a key element in the design and function of a historic building and contribute to its value and significance. Old windows are also evidence of the changing craft skills, technology and culture regarding light, health, wealth, design, and social status.

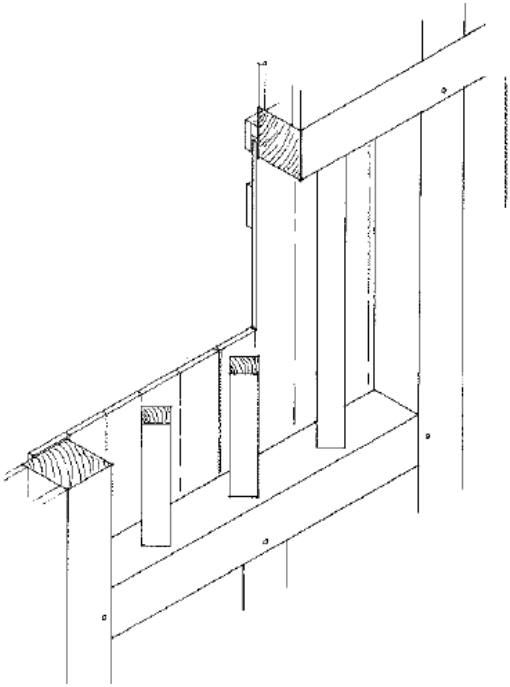
Historic features like windows are an irreplaceable resource and there is a strong presumption for keeping them. If replacement is unavoidable, then the new windows should be sympathetic to the building and match the existing. Modern windows embody the industrial materials and production that have largely superseded traditional craft skills, and for this reason are not considered to contribute to the heritage value of traditional buildings.

The thermal performance of historic windows can also be improved in several low-impact and low-cost ways including draught-proofing, curtains, blinds, internal shutters, and secondary glazing. Good maintenance will also improve the thermal efficiency of windows.

Types of historic windows

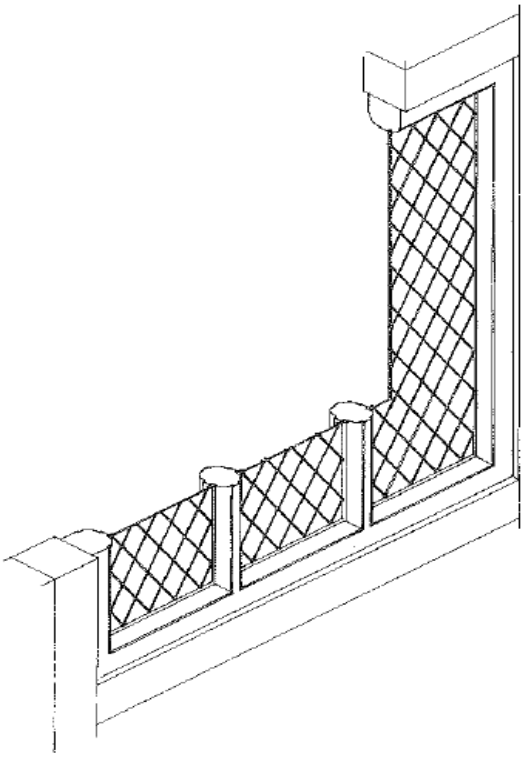
Mullion

In traditional timber-framed buildings in Suffolk window openings were created in the original frame with mullions built in. These were originally unglazed but were closed by hinged or sliding shutters. Many houses retain a groove or rebate over the opening where the shutter was fixed. Mullions were sometimes square in section, but were most often fixed on the cant as 'diamond mullions'. More fashionable windows might have mullions with rolled and hollow mouldings.



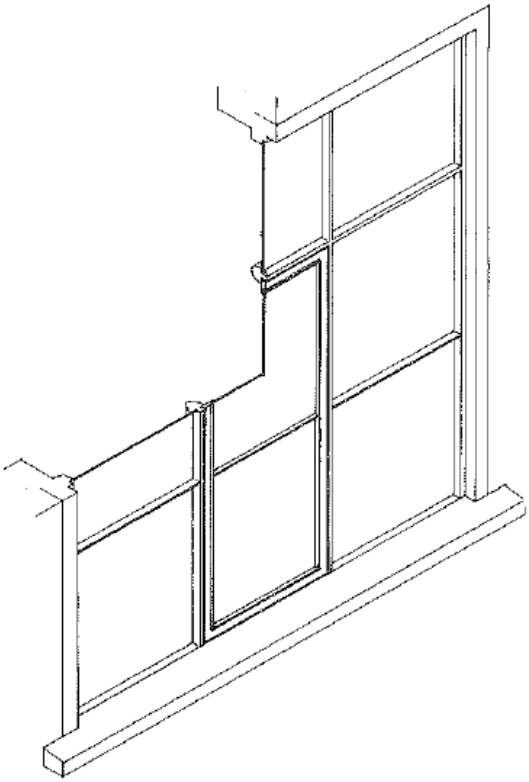
Quarries fixed in Lead Cames

By the late 1500s glazing was becoming more common. Small pieces of glass known as ‘quarries’ were fixed in lead cames within an iron sash frame which could be nailed into the timber frame and mullions. In the later 1600s mullions with ovolo mouldings to the insider and chamfers or ovolo mouldings to the outside became common. These incorporated small rebated suitable for attaching glazing or opening sashes.



Mullion and Transom

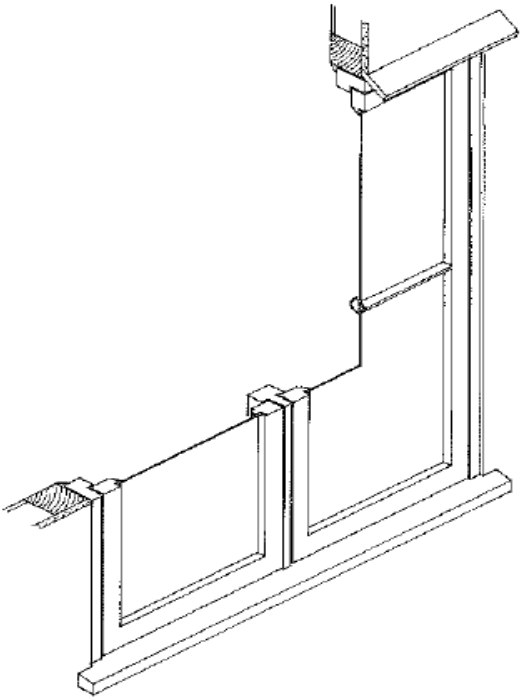
From the 1600s into the 1800s the most common type of window had horizontal transoms as well as mullions, often arranged in nine square panes of glazing fixed direct to the frame, but with an opener of two panes. Through the 1700s these began to be made in imported softwood instead of hardwood, and made as a separate item fixed to the building rather than built-in during construction.



Side Hung Casement

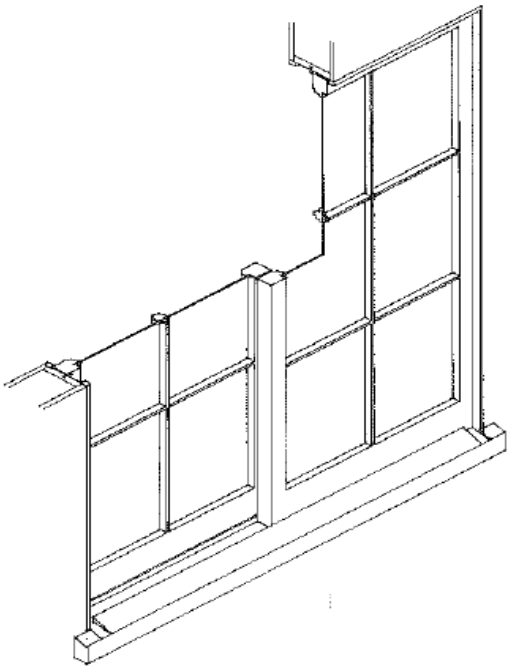
The most common historic window seen in traditional buildings is the side-hung casement with a central mullion forming two lights. One light will be an opening sash and the other direct glazed or a fixed sash; each light will have a single horizontal glazing bar.

This type of window remained in use from the later 1700s until well into the 1900s and is usually the last traditional window to be superseded by unsympathetic windows in modern materials. Where there is no other evidence of traditional windows in a house, this type of window will be the most appropriate design to follow as the exterior of the building will usually be characterised by features and fabric of the 1700s and 1800s. The arrangement can be varied to suit openings of different shapes and sizes.



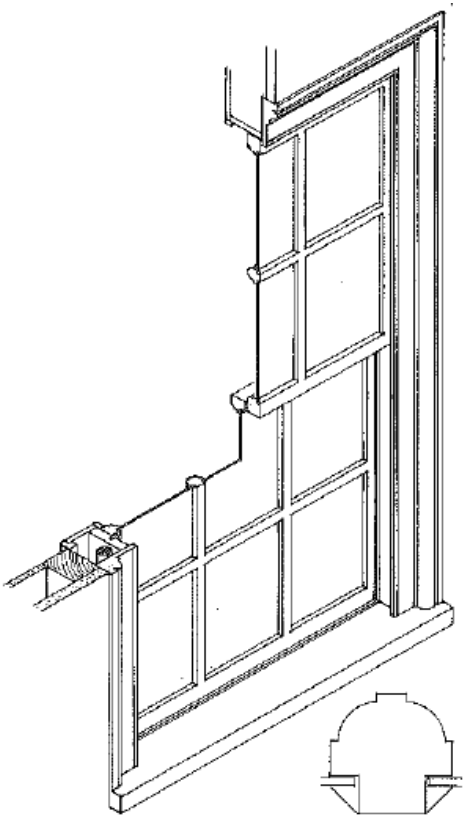
Yorkshire Sash

Another more domestic type of window form is the 'Yorkshire sash', a horizontally sliding version of the norm, which did not require the elaborate counterweight system of vertical sashes. This, as its name suggests, was more prevalent in the north of England.



Late-Seventeenth Century Sash

From the late 1700s, the double hung vertical sliding sash was increasingly used, usually in painted softwood. This presented a more vertically orientated opening in keeping with the fashionable classical proportions being adopted for buildings. Early examples have quite thick ovolo moulded glazing bars and exposed sash boxes containing the counterweights, set flush with the outer face of the wall. Sometimes only one of the sashes were hung.

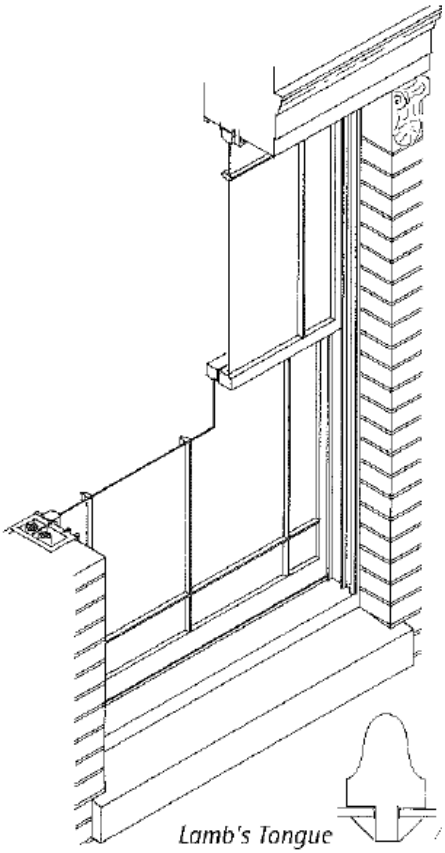


Glazing Bars: Ovolo

Eighteenth Century Sash

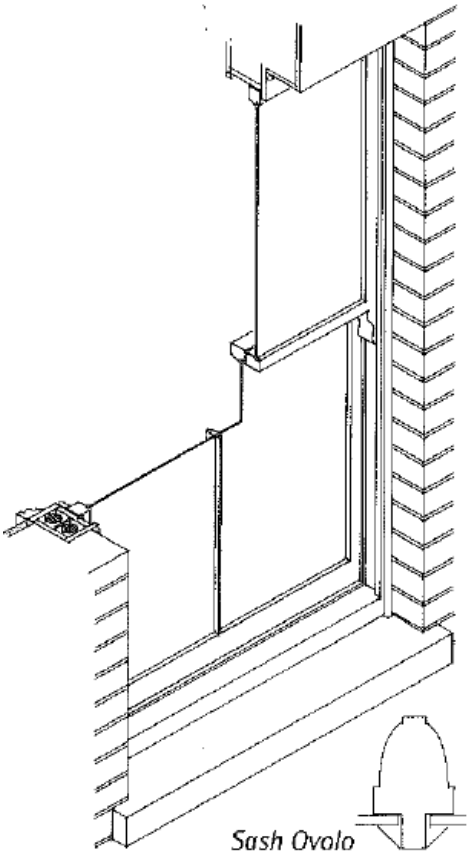
The London Buildings Act of 1709 and 1774 required firstly that sashes be set back 4 inches from the wall face and secondly rebated behind the wall face as a fire precaution. These styles of sash boxes both spread as fashions to the provinces some 20 years later. Gradually through the eighteenth century panes of glass became bigger and glazing bars thinner, using lamb's tongue or ogee mouldings.

By the end of the 1700s sash windows were also produced with rounded gothic heads, whilst by the 1830s margin lights became fashionable.



Nineteenth Century Sash

In the 1800s sash windows generally had fewer but larger panes of glass, due to the improved methods of manufacture, together with even thinner glazing bars. This left the sash frame vulnerable to stress and rot, particularly at the corners, and saw the introduction of horned sashes with a stronger through tenon joint from the mid nineteenth century onwards.



Metal Windows

Timber frames are the most common form of historic windows, particularly in domestic buildings. However, metal windows could be found throughout all periods, particularly in more utilitarian settings.

Improved methods of casting in the eighteenth century made metal casements and fixed lights more precise and accurate, making them cheaper to produce. Cast iron was also more fire resistant than timber, making it a popular choice for industrial buildings.

The development of hot rolled steel in 1856 meant that inexpensive window frames could be produced in mild steel rather than wrought iron. By the late nineteenth century larger sheet glass allowed for its use for large openings such as shop fronts.

After the First World War firms such as W F Crittall revolutionised the worldwide use of the metal casement. Crittall was responsible for the development of the 'universal suite' of hot-rolled steel sections that formed the basis of what is now regarded the 'classic' metal window.

Plain Glass

Most domestic windows have 'plain' clear glass panes, but their method of manufacture can result in different finishes and inclusions which add to their character.

Slab glass

Slab glass is the earliest form of window glass and was produced by casting molten glass into moulds on a flat surface.

Broad glass

A method widely used by the twelfth century to produce sheet glass. The glassmaker swung a bubble of molten glass back and forth whilst blowing to produce an elongated balloon. This was then laid on a very smooth surface and the two ends were cut off to leave a tube. This tube was sliced along its length with a pair of shears and flattened to form a small rectangular sheet of glass.

Crown glass

A method of producing sheet glass in which a bubble of molten glass was transferred onto a metal 'punty rod' or 'pontil rod' which can be spun between the hands of the glass- blower. The spinning causes the molten glass to blow open into a disc.

The earliest known crown glass in England dates from the 1440s; crown glass was widely used for windows until the mid-nineteenth century, when taxation by weight ceased and cylinder glass became cheaper. Crown glass has not been manufactured since the early twentieth century.

Cylinder glass

A later and more developed form of broad-glass manufacture. Early examples are small, but by the end of the nineteenth century the cylindrical bubbles could be as much as 1.5m long.

As with broad glass, the rounded ends were cut off and the glass was cut and flattened. Also known as 'muff glass' and 'castle glass'.

Polished plate glass

The glass was cast onto a highly polished table of copper or cast iron. It was then ground and polished until flat and crystal clear. Developed in France, the process was used in England from the late-eighteenth century until mechanisation in the mid-nineteenth century made large sheets of plate glass less expensive.

Drawn flat sheet glass

Produced from the early-twentieth century, molten glass was drawn through a die into a flat continuous sheet rather than a slab or cylinder.

Float glass

Float glass was invented in the late 1950s and involves flowing the molten material over a bath of molten tin. It is completely flat and therefore lacks the varied surface interest of earlier glass.

Decorative Glass

Stained glass windows in Britain can be traced back to as early as the seventh century, with some early examples found in churches and monasteries. The use of decorative glass in domestic buildings became more widespread from the nineteenth century onwards.

Coloured Glass

Glass can be coloured as part of the manufacturing process by adding chemicals, sometimes known as 'pot metal glass'. For example, Cobalt produces blue, and Manganese produces purple. For more expensive colours 'flashed glass' was sometimes used, where a thin coating of coloured glass was fused to colourless glass.

Stained Glass

Stained glass has a coloured material applied to its surface and is usually fired in a kiln. Silver stain (silver sulphides and nitrates) was used since the fourteenth century to give yellow and orange colours. Enamels were also used as early as the sixth century and by the sixteenth century a wider range of metal oxides gave a much broader colour palette.

Etched Glass

Introduced in the late nineteenth century, this technique is still used. An abrasive material is blasted against the surface of the glass through a stencil, leaving behind a design of more opaque 'frosted' glass. Hydrofluoric acid is also sometimes used.

Engraved Glass

Popular from the late nineteenth century, especially alongside etching methods, engravers used rotary grinding wheels to carve a range of designs.

Rolled Glass

Introduced at very end of the nineteenth century, also known as 'rolled plate glass', this technique runs hot glass through shaped rollers creating a variety of regular patterns to be formed on the surface. This allows for many geometric forms, as well as natural motifs of leaves and plants, to be easily created and mass produced. This technique is still very popular today and is used to texture float glass.

Do I need Listed Building Consent for works to my windows?

You will need to obtain Listed Building Consent before replacing any window in any part of a Listed Building – this includes modern windows. You may also need Listed Building Consent if window repairs involve losing substantial amounts of old material. Replacing plain panes of modern float glass is unlikely to require Listed Building Consent.

Any application should identify which windows are to be replaced and should show (through drawings) any changes in the size or shape of the window opening, and any changes to the window design.

Detailed section drawings of the joinery will also be needed, at a scale of 1:2 for horizontal and vertical sections, and 1:10 for elevations. The sections should show the fabric adjacent to the window as well, so that we can properly understand how the window will appear. The details should include how the window opens, how the glass is fixed, and what finish is applied, including colour. These details can be included in the application itself, but are otherwise required through a Condition attached to the Listed Building Consent.

If the existing window is historic then the only acceptable replacement is an exact replica, matching the design,

construction, materials, details, and finish of the existing. Old, surviving glass should be carefully removed and reused.

If the existing window is an inappropriate modern window, the replacement window will need to enhance the building's heritage value by emulating the design, materials and finish of a suitable historic example. Slimline double-glazed units can be used in a window of traditional design to replace a modern window.

Seeking Advice

It is advised to consult the Heritage and/or Development Management (Planning) Departments to determine if Listed Building Consent and/or Planning Permission are needed to address such issues, at:

- heritage@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3
- planning@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3

For more specific guidance on the acceptability of works requiring any form of permission, formal pre-application advice can be sought - for more information please see https://www.babergh.gov.uk/planning/pre-application-advice/ or https://www.midsuffolk.gov.uk/pre-application-advice.

Maintenance and Repairs

With all work to windows it is important to assess what you are dealing with historically before you start. The following pages of this leaflet will hopefully provide a useful overview of this, whilst the publications listed at the end give more detailed further guidance.

Windows themselves are composite structures of timber, glass and metal, each part of which can be repaired as a separate element when required. Whenever possible the original fixtures and fittings of historic windows (hinges, catches, pulleys, handles, stays etc) should be kept for refurbishment and re-use on the window being repaired.

Glass

When carrying out repairs to historic windows it is important to save for re-use any old glass, which can be carefully removed from old frames by a skilled joiner. This has irreplaceable qualities of unevenness due to the original process of manufacture: 'cylinder glass' was produced by opening out a large blown cylinder of glass whilst 'crown glass' was produced by spinning a large disk. The centre of this disc, where the pontil was attached, is the bullseye which was generally used in an out of sight location or recycled rather than used as a fake picturesque 'add on' as it is today. The flaws in historic glass

catch the light and show off defects which cannot be found in modern glass.

Horticultural glass is a modern substitute that exhibits such defects to some degree and can be used in repairs. When reglazing sash windows, care should be taken to adjust the sash weights for any change in the balance of weights caused by different thickness of glass. In general, upper sashes should be slightly lighter than the weights, whilst lower sashes should be slightly heavier. Any glazing should be undertaken using a traditional linseed oil putty rather than modern compounds. Timber beading, which increases the apparent thickness of glazing bars, is particularly unwelcome.

Timber Frames

Careful repairs to timberwork, maintaining the maximum amount of historic fabric, are preferable to new work. New sections of framing can be pieced in to match, and glazing bars replaced, using existing parts as a pattern. It should be noted that casement frames were traditionally inset within their overall frames, rather than projecting proud of their surrounds as in the 'weathered' casements so popular amongst modern window manufacturers.

Sashes can be easily removed from their frames by removing the staff beads on the inside. Sashcords can easily be replaced; access being gained to the sash weights via the removable pockets at the bottom of the pulley stiles. Replacement cords

can be in jute, cotton or nylon. The stiles of sashes should not be painted but lubricated with wax, and not eased after a building has remained empty for some time as heat and ventilation can often do the trick.

The appropriate finish for historic windows after the seventeenth century is generally paint, most often white, and certainly not a modern stain. For complete authenticity on a Grade I or Grade II* listed building, permission can be obtained to use a traditional lead based paint if appropriate.

Metal Frames

For metal windows, it is important to first identify the type of metal used to establish the correct approach. Ferrous metals such as iron and steel are magnetic, whereas non-ferrous such as bronze and aluminium or not. It may also be important to consider the method of manufacture as wrought and cast iron also have different properties.

Ferrous metal windows can suffer from surface rust, distortion, excessive build-up of paint and failed hinges and fittings. Rust and paint can be removed by acid pickling or flame cleaning. Any necessary repairs to wrought iron or steel windows, including welding in replacement sections, can be made by a professional metalworker.

Cast iron windows cannot generally be welded because they tend to crack when heated, but they can be repaired using a

technique known as 'cold stitching'. Non-ferrous frames can be repaired by brazing, soldering and welding.

Window surrounds

When renovating a window by repair it is important to remedy at the same time any defects in the surrounding fabric that may have initiated the original decay in the window. In this way the repaired material can be guaranteed a longer life. It is thus important to detail the surrounds to replacement or repaired windows properly.

On rendered walls a lay board (or pentice) is often fixed above the window head to throw off the rain and give a pleasing shadow line. Moulded surrounds should be carefully repaired or reinstated using the original as a pattern.

Cill details are also important to maintain, their projection varying with different window types. Timber cills are particularly vulnerable to rot and if replaced should be of oak or other durable native hardwood.

Replacing Windows

The complete replacement of windows should only be a last resort and in a listed building this will require consent. If this is done, particular attention should be paid to use the original mouldings and accurate setting out to the original pattern.

With replacement casements the inclusion of additional night vents unbalances a window's elevation and is inappropriate. Most historic windows have already survived periods measured in hundreds of years, although only constructed of deal, a slow grown pine. If properly repaired and reasonably maintained, they can be expected to last at least as long again.

Additional or redesigned windows in a listed building should always be based on authentic historic precedents. Whilst it is desirable to increase the energy efficiency of any building, historic buildings are given special consideration under Building Regulations. For further information, please see our Energy Efficiency Guidance.

Useful Resources

Emails

- heritage@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3
- planning@baberghmidsuffolk.gov.uk / 0300 123 4000 Option 5, Option 3

Websites

- Legislation for Designated Heritage Assets – HM Government. *Planning (Listed Buildings and Conservation Areas) Act 1990.* - Planning (Listed Buildings and Conservation Areas) Act 1990 (legislation.gov.uk)
- National Planning Policy – HM Government. *National Planning Policy Framework* - National Planning Policy Framework (publishing.service.gov.uk)

- Heritage Asset Search – Historic England, 2024. *Search The List* - https://historicengland.org.uk/listing/the-list/
- Babergh and Mid Suffolk Conservation Area Appraisals – Babergh and Mid Suffolk District Councils, 2024. *Conservation Areas.* - https://www.babergh.gov.uk/conservation-areas / https://www.midsuffolk.gov.uk/conservation-areas
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- Guidance on Planning Permission Requirements – Planning Portal, 2024. - https://interactive.planningportal.co.uk/

- Traditional Windows: their care, repair and upgrading – Historic England, 2017. - https://historicengland.org.uk/images-books/publications/traditional-windows-care-repair-upgrading/heag039-traditional-windows-revfeb17/
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- Further Ecology Advice – Bat Conservation Trust, 2024. *Getting Personalised Advice.* - https://www.bats.org.uk/advice/im-working-on-a-building-with-bats/getting-personalised-advice
- Archaeology Advice – Suffolk County Council, 2024. *Suffolk Archaeological Service.* - https://www.suffolk.gov.uk/culture-heritage-and-leisure/suffolk-archaeological-service