

# Retrofitting Historic Sash & Case Windows

*A Quick Start  
Guide for  
Homeowners*



THE UNIVERSITY  
of EDINBURGH



# Introduction

In this guide, **retrofitting** existing historic sash and case windows is the process of **improving their thermal performance** to save energy and reduce carbon emissions. There are many options that can be implemented, from **repairs to upgrades** to their elements. Even a single-glazed window can be improved at a relatively affordable cost.

We refer to **historic window** as a window that retains all or part of its **original elements** (e.g. timber parts, glass), or a **pre-1919 replacement** of an original window. However, this guidance is also applicable to any other sash and case window following the design principles of an original/pre-1919 replacement, detailed in page 10.

## Who is this guide for?

This guide is for owners of historic residential properties in Edinburgh and the Old and New Towns World Heritage Site. This guide applies to **listed properties**, unlisted properties in a **conservation area**, and any **traditional (generally pre-1919) buildings**. If you are a tenant in any of these properties, this guide can also be useful to you.

## Why use this guide?

The aim is to help you understand the retrofit process and to make informed decisions when dealing with tradespeople and professionals. This guide contains practical information on sash and case window retrofits, including considerations for heritage conservation, energy efficiency, and usability.

For additional guidance, visit  
<https://ewh.org.uk/>

What's best for your situation will depend on many different factors. Whilst this guide cannot provide you with definitive solutions, it will prompt you to consider those factors to make informed decisions.

## When to use this guide?

This guide can be a source of information at any stage of your retrofit journey. To get the most out of it, read the whole guide through at the beginning of your project then select the options that best fit your situation.

## What is a sash and case window?

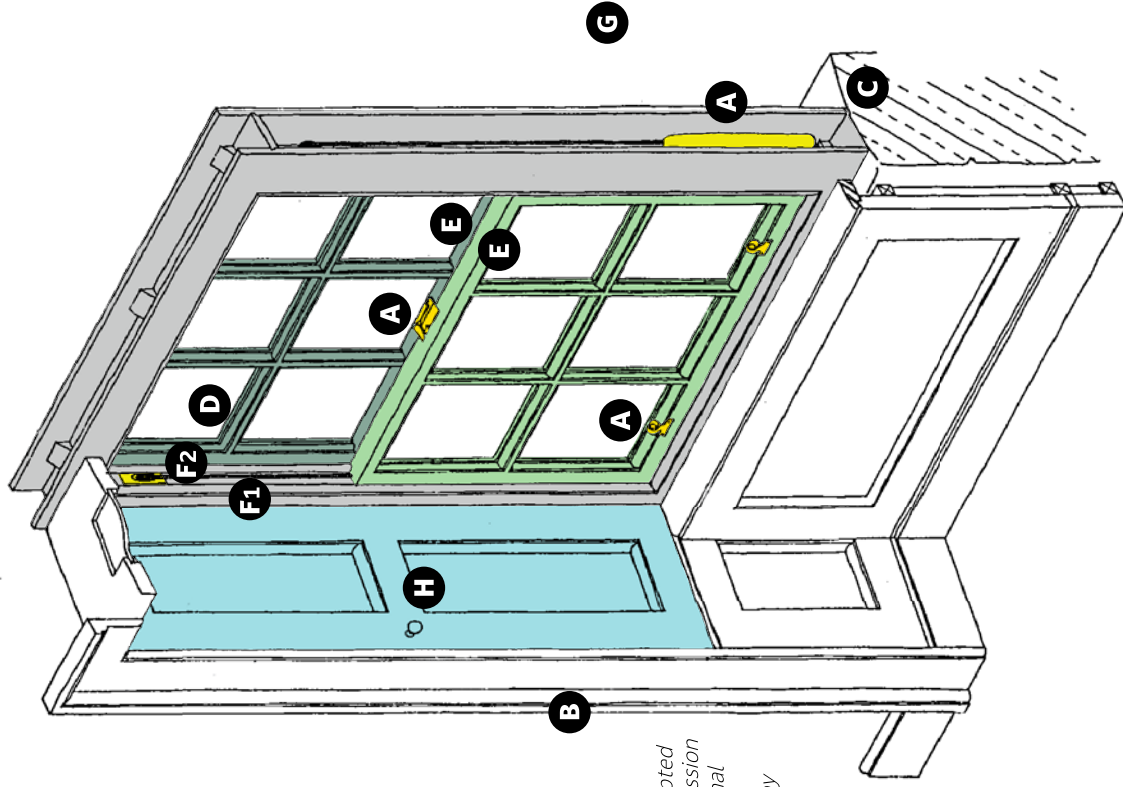
Sash and case windows (or simply 'sash windows') are a prominent feature of historic buildings in Edinburgh and the World Heritage Site. They open by sliding the top and bottom glazed timber frames (the **sashes**) vertically within the channels of a fixed timber frame (the **case**). Historic sash and case windows are usually painted and are made from good quality slow-grown wood (commonly pine), which should be retained.

Each sash is typically divided into 6 individual panes of glass (**glazing**) by thin timber bars called **astragals**. This pattern is known as '6 over 6' or 'Georgian' (see diagram on page 4). Other patterns, such as '2 over 2' or '1 over 1' are also common.

**Historic glass**, such as crown glass, cylinder glass, or drawn sheet, often has imperfections due to the historic manufacturing process and may appear 'wavy' or 'wobbly'. Such glass has heritage significance and should be retained.

For cleaning, historic sash and case windows may have a mechanism known as a '**simplex**' or '**easy-clean**' system, which allows the bottom sash to swing inward.

## Diagram of a typical 6 over 6 sash and case window



*Image adapted with permission from original drawing prepared by Simpson & Brown.*



## Key technical terms

- A. Ironmongery** refers to the handles, locks, and other metal fittings to the window, as well as the whole system of weights and cords running over pulleys to counterbalance the sashes.
- B. Architrave** is the timber moulding or facing around the interior side of the window. Depending on how your window fits in the wall, you may not have an architrave.
- C. Sand Mastic** is traditionally made of burnt sand and linseed oil. It is applied from the outside to seal the gap between the case and the surrounding stonework and to prevent draught and water ingress.
- D.** Traditional linseed-oil **putty** is applied from the outside to hold the panes of glass in place between the astragals. Putty from the past, or old paint covering it, may have lead mixed in.
- E. Meeting rails** are the horizontal timber bars that form the bottom of the top sash and the top of the bottom sash. When the window is closed, the two meeting rails should align and close tightly to form a weather-tight joint between the two sashes.
- F1. Baton rods** and **F2. parting beads** are vertical and horizontal timber strips fitted to the inside edge of the case. Together with the case they form the channels in which the sashes slide.
- G.** What can be seen of the frame from the outside (including astragals) is known as the **sightline**. Historic sash and case windows have narrow sightlines (i.e. have thin frames).
- H. Shutters** are generally foldable timber panels used to block out light, provide privacy, and reduce heat loss through the window.



## Self-assessment: a 3-step process

Begin your retrofit journey by assessing your window's condition using these checklists. Thinking through these issues will also help you have a more informed discussion with any professionals and tradespeople you hire.

### Pre-requisites: Overall condition of your property

Start from the *exterior* of your property and observe the general condition of the building around your window, then proceed to the interior and check the inside of the window surrounds.

If you answer 'yes' to any of the questions below, you may want to consult a qualified stonemason or roofer to rectify the issue(s) before you proceed with the retrofit.

#### Click to check boxes

- Are there any loose stones or cracks in the stone lintel above your window or the surrounding masonry of the exterior wall?
- Are there any cracks or missing mortar in the masonry joints?
- Are the eaves and gutters above your window leaking or in bad condition?
- Is there any significant standing (pooling) water and/or organic growth (moss) on the outside window sill?
- Do you notice any water ingress (seeping in) from the outside when it rains?
- Do you notice any damp spots on the inside walls around the window?

**Ignoring these issues may compromise the efficacy of the retrofit.**

## Current window problems

Now take a good look at your window and its many parts. Use the checklist below to identify issues that need to be considered.

### Poor physical condition

- Do you have any cracks, rot, or mould around any part of your window (including behind the shutters)?
- Is any mastic or putty falling off?
- Are there any visible gaps between the sashes, or the sashes and case?

### Poor energy efficiency

- Do you have a draught problem? Where is the draught coming from? Around the edges or from the glazing (downdraughts)?
- Do you have condensation on the glass? How severe is the issue (dripping wet or clears on its own)?
- Does the window whistle and rattle when it's windy?

### Usability issues

- Is the top or bottom sash painted/nailed shut?
- Is it difficult to slide the top and/or bottom sash open? Can you reach the top sash easily and safely?
- Is it difficult to keep the sashes open or do they slide out of position?
- Do you have any issue securing/locking the window?
- Are the shutters missing or painted shut?
- Do the shutters 'catch' on anything when you use them?
- Do you have light leaking in even when the shutters are closed?
- Are you bothered by outside traffic or other noise when the window is closed?

# Retrofit key principles

## Consider the big picture

Your home is a **system of interacting parts**. How you decide to retrofit your window may impact other parts of your home. For instance, whilst draughtproofing your window can improve its energy efficiency by reducing heat loss associated with air leakage, you may need to ventilate the room more frequently by opening the window, especially when you cook or dry the laundry, to avoid build-up of condensation and mould. These **unintended consequences** can be prevented by having the 'bigger picture' in mind and taking a '**holistic approach**' when doing any retrofits.

## Maintain, repair, then improve

**Regular maintenance** will keep a historic window working properly and save you the cost and hassle of having to replace the whole window. A well-looked-after window will likely only need minor repairs to replace individual elements (e.g. rotten windowsill, cracked sand mastic). **Keeping as much of the original window as possible** will preserve the cultural significance of your property, as well as reducing the carbon emissions from the fabrication of a new window (**embodied carbon**).

Because some retrofit options depend on the window's physical condition, you want to **make sure that your window is in good condition** and can open and close properly before considering any improvement options. For instance, if the top sash does not close properly, draughtproofing the window will not improve its energy efficiency as heat will continue to escape from the gap at the top.

## Make the most of your windows

A valuable feature of historic windows is the **internal shutters**. When used alone or with **blinds or curtains**, they can reduce the amount of heat escaping through your window. A properly working sash and case window can also have two simultaneous openings – one at the top and one at the bottom, which maximise airflow to provide better **ventilation** than just one big opening. Capitalising on these features of your sash and case window – before or in combination with any retrofit interventions – is an affordable way to save energy and improve your comfort and indoor air quality.

## Your needs & requirements

Last but not least, think about your experience operating the window and your comfort in the room where this window is located. These considerations may influence the retrofit options you choose.

- How often do you open the window? How long do you leave it open? How wide is the opening? Is there a seasonal difference?
- Does your window have trickle vents or exhaust fans required for health and safety reasons? Will you still need them after the retrofit?
- Do you often sit close to the window area (e.g. sofa next to the window)?
- Do you use your window sill for storage or display?
- Is the room on the ground floor? Any concerns about security, mice/pests, privacy, and safety of children/pets?
- How often do you use the shutters, curtains or blinds? Consider all seasons.
- Is having a clear view out of your window important?
- Do you have glare issues (bright reflected light that causes discomfort)?
- Is your floor or furniture fading due to direct sunlight?
- Does the room overheat in the summer?
- Is the window difficult to clean by yourself?

**Taking care of maintenance and repair first will also maximise the benefit of retrofit and reduce the likelihood of any new issues.**

# Choosing suitable retrofit options

Can the window be repaired? Check with a professional.

Most common

Yes

**Repair or maintain** your existing window (see p. 11)

+

Very unlikely

No

**A. Draughtproof** your window (see p. 12)

+

**B. Improve glazing** thermal performance

Do you have original glass?

Yes

**B1.** Keep original glass and install **secondary glazing** (see p. 12)

Repair/ add appropriate ironmongery

No

**B2.** Replace existing glass with **more efficient glazing** but keep existing sashes and astragals (see p. 13)\*

\* even if no original glass remains, secondary glazing can still be an option

+

**Install whole new window** (sashes, case, and glazing) in the same design as the original window (or pre-1919 replacement) but with more efficient glazing (see p. 13), draughtproofing, and appropriate ironmongery.

Same design includes material (i.e. timber), number and arrangement of glass panes and astragals (e.g. 6 over 6), and opening mechanism. Consult a conservation professional if you are unsure.

+

**Refurbish or reinstate shutters** (of appropriate style) see p. 13

Note: some of the above options require planning permissions, see p. 14

Paint is a protective layer for the timber and should be checked regularly and repainted every few years (depending on window orientation and exposure).

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## Maintenance and repair options

To restore the window's physical condition and structural integrity:

- Replace any rotten timber (on sashes, case, or sill)
- Replace broken glass panes with similar glass
- Replace cracked sand mastic between exterior wall and window case
- Replace any dried-out putty between astragals and glass panes
- Strip cracked paints and repaint timber elements as required (sashes, case, and sill)
- To ensure the window can open easily and close properly
- Repair or replace defective ironmongery
- Replace old or broken sash cord
- Counter-balance sash weights
- Release sashes that are stuck or painted shut
- Realign sashes to ensure they sit and slide well

## Improvements options

### A. Draughtproofing

This involves inserting brushes or seals into the sash frames or the parting beads/baton rods on the window case. Different types of draughtproofing have different efficiency and compatibility depending on where on the window draughtproofing is installed (e.g. at the sides or the meeting rail). The aim is to **reduce draughts to an acceptable level** and not to create an airtight seal, which could compromise the indoor air quality of the room.

### B1. Secondary glazing

This fully reversible option is installed on or in front of your existing (primary) window on the inside. There are three main systems:

- 1. Tile-sized transparent plastic panels inserted between the astragals** (e.g. a 6 x 6 window requires 6 x 6 tiles) or **larger panels inserted into each sash timber frames** for 1 x 1 windows. These relatively affordable panels don't affect the way your primary window opens but may be limited in how much they can improve your window's energy efficiency. The way the panels fit may also make the astragals appear thicker when viewed from the outside.
- 2. Large transparent rigid plastic panels fixed to the whole window case or to each sash.** These can have different opening mechanisms depending on how the panels are attached (e.g. velcro, magnetic strips). Some can be easily removed in the summer but require storage.

- 3. Large pane(s) of glass within a thin aluminium or timber frame fixed to the window case or installed on the inside window sill** (creating a cavity with the primary window). These secondary windows can be opened in a variety of ways, including horizontal or vertical sliding, or hinged casement.

Note that systems 2 and 3 would require you to first remove the panels or open the glazed frame before you can open your primary window. Depending on the configuration of your window, systems 2 and 3 may also

prevent you from using your shutters. However, all three systems can reduce noise and condensation on your primary window glazing.

### B2. More energy efficient glazing

This is when you replace your existing single glazing with a more energy efficient (more insulating) glazing but retain the window's original design and astragals. There are mainly two types of glazing suitable for historic sash and case windows: **thin double-glazing** (also called slim or narrow-profile double-glazing) with 6mm cavity gap; and **vacuum glazing**.

Your window should be in good condition. A joiner should also check the **technical compatibility** of the existing window sashes and astragal dimensions to determine which type of glazing can be installed and how. Otherwise, there may be a risk of **premature failure**, such as condensation forming within the cavity of thin double-glazing, or **weakening of the sashes** due to the weight of glazing. After installation, it is important to **rebalance the sash weights** so the windows can operate easily with the heavier glazing.

Vacuum glazing is more energy efficient than thin double-glazing but also costs more and may take longer to order. The spacers keeping the two panes apart in vacuum glazing may also appear as tiny dots on the glass. Ask your joiner to show you samples and advise on what is suitable in your particular situation. Also check whether the proposed glazing complies with the **industry standard** and if there's any **guarantee** and for how long. Other double-glazing options with larger cavity gaps may be available depending on your windows and property.

**This option should only be considered if the existing glazing has no heritage value.**

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### Refurbish or reinstate shutters

Historic sash and case windows are usually accompanied by shutters. If you don't currently have any and the design of your window suggests there may have been shutters in the past, you may consider reinstating them (in the style of the same period as your window). Even if you already have them, you may wish to refurbish them to make sure they can close properly and operate with ease.



## Getting retrofits done

You can choose to carry out the relevant works all at once or split them into two or more phases, depending on your needs, finances, and which works make sense to be done together. For instance, if your window needs to be removed for maintenance and repair, it would be convenient to carry out draughtproofing before the window is put back.

### Choosing the right professional

It is highly recommended that for your retrofit work you hire a contractor or joiner who has experience of working with traditional buildings. You may also wish to hire an architect depending on the scale or complexity of the works. Use the following questions to help you decide who to appoint and get at least two estimates:

- How many years of experience do they have working on traditional buildings, especially on windows?
- Do they come highly recommended by a trusted friend or neighbour?
- Can they show you work they have done elsewhere, either using photos or in person?
- Do they have any government-approved qualification or accreditation in conservation or energy retrofitting? (e.g. **conservation accreditation for architects**, level 3 award in energy efficiency measures for older and traditional buildings for joiners, contractors, and consultants)

### Planning requirements

Depending on what retrofit options you've chosen, you may need to apply for a **listed building consent** if your property is listed, or a **planning permission** if your property is unlisted but is located in a **conservation area**. The City of Edinburgh Council has produced a **flowchart** that helps you work out your planning requirements based on your property type and the retrofit work you plan to have done.

Generally, works that consist of only draughtproofing do not require any consent/permission. Repairs that match the existing, use traditional materials and methods, and do not affect the character of the building also normally do not require any consent/permission (e.g. replacing a timber element, repainting in the same colour, releasing shutters that have been painted shut). If your property is listed, a listed building consent is required when you want to replace the entire window, change single to double or vacuum glazing, or install internal shutters where there aren't any originally. If your property is unlisted but in a conservation area outside of the World Heritage Site, planning permission is not needed where the window replacement or alteration meets specific requirements. You can find out more from the Council's **Guidance for Listed Building and Conservation Areas**.

### Prepping for the works

No matter what combination of options you choose, getting your window retrofitted will likely create some disruption to your normal routine in your home. Ask your contractors the following questions to get prepared:

- When can the work start and how long will it last?
- How many tradespeople are expected on the premises?
- What level of disruption can you expect? Consider noise, dust, fumes, and construction debris. If the work is done inside and involves noise and dust, you may wish to alert your neighbours.
- How much space around the window is required? What furniture and items need to be relocated or covered?
- Many of the retrofit options require at least the window sashes to be removed, worked on, then reinstalled. If this is the case, will the exposed opening be boarded up and for how long?
- If the room cannot be closed off completely, can the work be done during the warmer months to avoid rain and cold?
- Original paint and putty may contain lead, a toxic material. What precaution is taken when sanding?
- Any other questions or logistical concerns you may have.



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