



The Specifiers' Guide to Timber Windows

The **Wood Window** Alliance



Welcome to the Specifiers' Guide to Timber Windows.

The Wood Window Alliance has published the guide to give professionals comprehensive and up to date information on how to get the best out of today's wood windows.

The quality and engineering of wood windows in the UK have undergone a revolution in the past few years. Full factory finishing, double or triple glazing, enhanced security and unrivalled warranties are now the norm.

But it is still a fragmented industry, with different companies offering different designs, technical specifications and quality. That's why we set up the Wood Window Alliance, representing some 40 of the leading wood window companies in the UK – to give specifiers the peace of mind that our windows meet a set of common quality criteria.

Windows bearing the Wood Window Alliance quality mark tick all the boxes:

- ✓ Energy-efficient (A ratings and low U-values available)
- ✓ Responsible purchasing (wood certified from sustainable sources) with chain of custody certification as proof
- ✓ Naturally renewable
- ✓ Sustainable (A+ in BRE Green Guide)
- ✓ Low climate change impact (A in BRE Green Guide)
- ✓ Low embodied CO₂ (Davis Langdon)
- ✓ 60 year minimum estimated service life (Imperial College London)
- ✓ Repairable (for an even longer life)
- ✓ Comprehensive warranties on service life, finishes, glass and hardware
- ✓ Independently verified performance and quality

Recently commissioned research, based on these common standards, has demonstrated that Wood Window Alliance windows have:

A minimum estimated service life of 60 years¹

A lower Whole Life Cost than comparable PVC-U windows²

Carbon negative frames²

'This research implies there is no reason why today's Wood Window Alliance windows shouldn't last as long as Edwardian and Victorian wood windows – a lifetime or beyond.'

Dr Richard Murphy, Imperial College London

To find the member company that's right for you, to view our gallery and case studies, or download technical guides, visit www.woodwindowalliance.com

For more information on the research, what goes into our windows and how to renovate or specify heritage windows, see our CPD modules at www.wwa-infocentre.com

¹ Wood Window Alliance Window Estimated Service Life – ISO 15686-8 (2008), Life Cycle Assessment research, Dr R Murphy, Imperial College London, 2010

² Comparison of Environmental Impact (CO₂e) of Timber and PVC-U Windows, Davis Langdon, 2010



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Sustainability

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**WOOD. AT THE HEART
OF A GOOD WINDOW**



The wood window industry can make a significant contribution to sustainable construction:

1. Wood is naturally renewable
2. It is independently certified to be sourced from sustainably managed forests
3. Forests and wood products play an important part in reducing climate change
4. Our frames are carbon negative
5. Our windows also save energy and CO₂
6. They have fewer environmental impacts than other materials.

To qualify for the Wood Window Alliance quality benchmark, windows must be made using timber that is independently certified as legal and sustainable by one of the schemes recognised by CPET (the government's Central Point of Expertise on Timber Procurement):

- FSC (Forest Stewardship Council)
- PEFC (Programme for the Endorsement of Forest Certification)
- SFI (Sustainable Forestry Initiative)
- CSA (Canadian Standards Association)

Naturally renewable

- Wood is the only naturally renewable mainstream building material
- Thanks to strictly enforced laws, Europe's forests are growing at a rate of around 661,000 ha a year¹ (the equivalent of three football pitches every hour of the day and night).

Certified sustainable

- Our members use wood that has been independently certified as legal and sustainable
- This provides an independent guarantee that the timber has been grown in accordance with a number of sustainability criteria, including the replacement of harvested trees
- Members also have Chain of Custody certification, which ensures an unbroken link from the forest to manufacturing.

Climate change

- Forests are second only to oceans as the world's most important carbon sinks
- Wood products maximise the forests' carbon sink effect
- As trees grow, they soak up CO₂ from the atmosphere at the rate of one tonne of CO₂ for every cubic metre's growth, storing it as carbon in the wood and releasing the oxygen we breathe²

- Harvesting mature trees is part of sustainable forest management. Trees sequester CO₂ from the atmosphere most efficiently while they are growing. When they reach maturity, typically after 80-100 years for a softwood tree, their CO₂ uptake slows and they begin to die and decay, releasing methane into the atmosphere
- Forests are managed to improve the carbon sink effect, so mature trees are harvested to make way for vigorous new trees
- The greater part of the stored carbon of the harvested tree is transferred to the wood product, while the forest's carbon sink continues to grow thanks to sustainable forest management
- This double benefit of carbon sink and the growing carbon store of wood products is why wood products are often described as carbon negative: they lock away more CO₂ than is produced throughout their lifecycle
- The product carbon store can be extended through re-use and recycling
- Further CO₂ gains can be made by recovering the energy from the wood at the end of its life as a biomass fuel. The EU Landfill Directive will lead to greater use of energy recovery from waste wood.

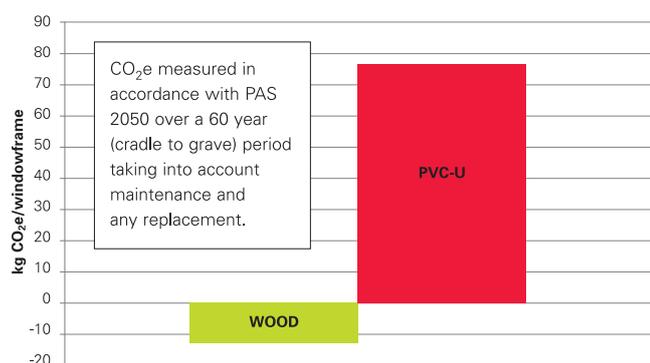
¹ UNECE/FAO, *State of the World's Forests, 2007*

² *Edinburgh Centre for Carbon Management*

Our windows have carbon negative frames

- We commissioned Davis Langdon to undertake research to compare the embodied carbon emissions of Wood Window Alliance windows with equivalent PVC-U units
- They conducted Life Cycle research, taking into account all phases of growth, production, transport, maintenance and disposal
- The research concluded that WWA frames were carbon negative across the overall life cycle
- Saving 89kgs CO₂e when used instead of a comparable PVC-U window
- That's a saving of around three-quarters of a tonne CO₂e per average house (the equivalent of driving around 6,500 kms in a small family car).

Carbon dioxide emissions (CO₂e) per window frame material over a 60 year life



Source: Davis Langdon, 2010

Saving energy

- A window's energy-efficiency is largely dictated by the glazing unit, rather than by the material the frame is made from
- However, wood's low thermal conductivity helps reduce cold-bridging
- And triple-glazing is easier with wood
- Members' windows have to meet or exceed the performance standards for wind and weather resistance of BS 6375 Part 1 and the minimum performance standards for operational aspects of BS 6375 Part 2, or equivalent standards from other countries

- The windows are supplied factory-glazed with double or triple glazed units
- They can deliver BFRC 'A'-standard window energy ratings
- And U-values as low as 1.0W/m²K.



Environmental impacts

- Wood windows score well in all Life Cycle Assessment (LCA) studies and are rated A+ (domestic) and A (commercial) in the Building Research Establishment (BRE) Green Guide
- BRE's Climate Change indicator rates wood windows A+/A compared to D for all other window material
- Planned maintenance prolongs the life of the window and its carbon store effect, reducing the impacts caused by new replacements
- At end-of-life, wood windows should be used as a biomass fuel.

Material	Climate change indication (BRE GG rating)	Overall rating
Softwood	A+	A+ (water based paint)
Hardwood	A+	A+
PVC-U	D	A
Aluminium (powder coated 0.88kg/m)	D	B
Steel	D	B
Aluminium composite (0.87kg/m = timber profile 2kg/m)	C	B

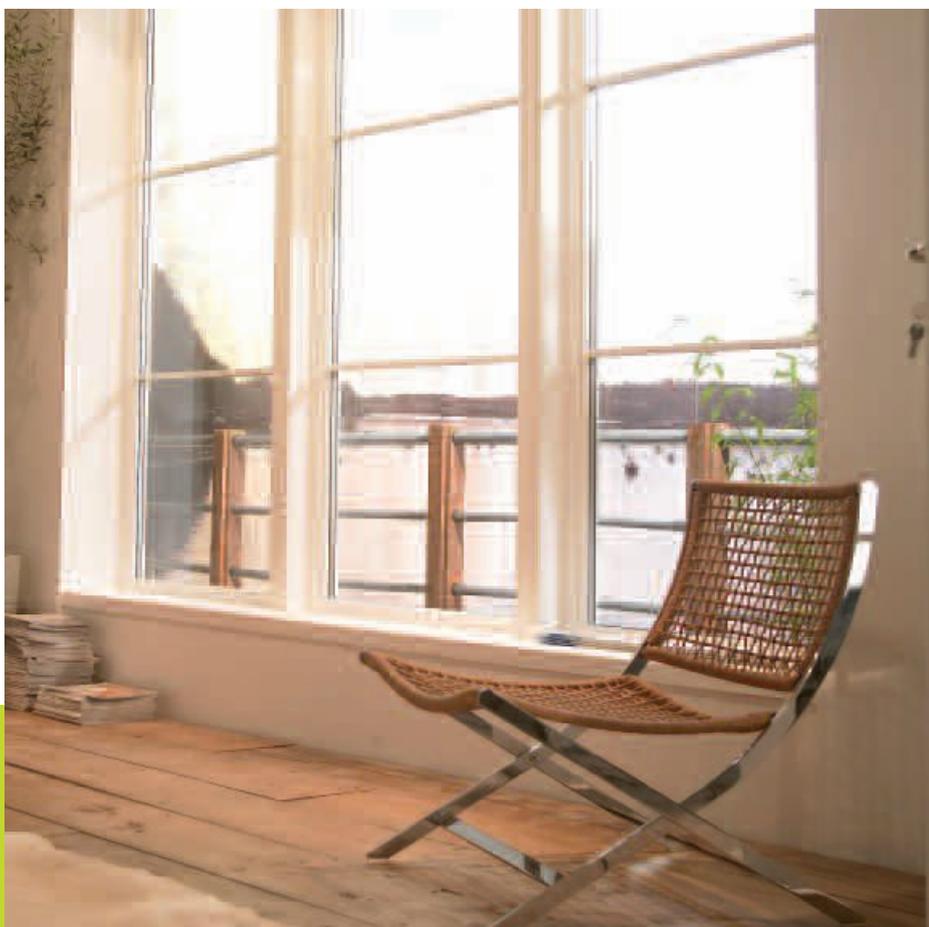
The Code for Sustainable Homes

- Wood products can make a significant contribution to the credits required to meet the different levels of The Code for Sustainable Homes. This is because of good Green Guide ratings and responsible sourcing policies
- The code is significant because:
 - It replaces the EcoHomes scheme, developed by the BRE
 - It sets minimum standards for energy and water use within England, encouraging the use of more sustainable materials and the development of more sustainable housing
 - It provides homebuyers with information about the environmental impact and running costs of their new home, and builders with evidence of meeting sustainability targets
 - Level 3 is mandatory for developments and government funding through the Housing Corporation or on land held by the government or government agencies, like English Partnerships and the Olympics Development Agency
 - Level 6 is deliberately ambitious and represents the 'zero carbon house' that the Government is to make mandatory by 2016. The thermal requirements of the Building Regulations are being made progressively more demanding towards this target.

Download the code:

www.communities.gov.uk/documents/planningandbuilding/pdf/codesustainhomesstandard.pdf





Performance

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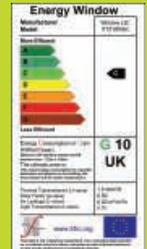
**WOOD. AT THE HEART
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Windows made by Wood Window Alliance members are able to meet the following criteria:

- U-values as low as 1.0W/m²K
- WER ratings as high as A
- Weather performance to BS 6375 part 1 and 2
- Excellent acoustic performance
- Secured by Design

The Window Energy Rating (WER) – a way of showing a window’s energy rating in a similar way to white goods etc, uses a combination of three factors:

1. Thermal transmittance of the window frame and glass unit
2. Air leakage of the window
3. Solar gain factor



Thermal performance

- Energy efficient windows are a Building Regulations requirement – (Approved Document L or Part L) for all buildings, with the exception of listed buildings
- All windows carrying the Wood Window Alliance quality mark come double or triple-glazed, and are effectively designed and sealed to be weather-proof
- Because of timber’s inherent strength, triple-glazing is more practical and cost-effective with wood windows than with other materials
- The most efficient size of glass-to-air gap to produce a double glazing unit (IGU) is 4mm glass – 16mm air gap – 4 mm glass, thus forming a 24mm IGU (4-16-4)
- Overall U-values of IGUs can be improved further by altering the internal and external transfer of heat by conduction, convection and radiation of the glass and the gas medium (air):
 - Conducted and convected heat, by replacing the air with a gas with lower thermal conductivity (argon or krypton)
 - Radiated heat, by using glass with a low-emissivity coating (Low-E glass)

Glazing unit	Thermal conductivity W/m ² K
Single glass	5.8
Standard double glazing (4-16-4)	2.7
Double glazing with Low E glass – air filled	1.3
Double glazing with Low E glass – argon filled	1.1
Double glazing with low E glass – krypton filled	1.0
Triple glazed units	<1.0

Simulated U-values for the whole window will differ from the above because they take the frame dimensions into account.

Frame material	Thermal conductivity W/m ² K
Softwood	0.13
Hardwood	0.18
Rigid PVC	0.17
Aluminium	160.0
Steel	50
GRP	0.40

ISO 10077 – 2 : 2003: Thermal Performance of windows, doors and shutters. Calculation of thermal transmittance.

- WER is not the only way of assessing the energy efficiency of a window
- There is little or no difference between the thermal performance of wood and PVC-U windows when each are glazed with the same double glazing units
- In assessing the thermal performance of windows, the weather performance, or weather tightness, of the window should always be considered in addition to the U-value of the glass units
- Wood windows can be manufactured using IGUs with a variety of U-values to suit the specifier’s or client’s requirements
- Centre pane values – the U-value of the IGU only – help in establishing the starting point for assessing the overall U-value of the window. Other factors, such as the efficiency of the frame spacer-bar material and seals, should also be considered
- Establishing a high solar gain from the window requires a reduction in frame section and may affect the aesthetic appearance of the window
- Specifiers can decide to compromise on the U-value in favour of the aesthetic appearance of the window, or to maximise solar gain while compromising on the aesthetic appearance.

Weather performance

A window's ability to combat all aspects of the weather is essential and increasingly important as climate change leads to stronger winds and more extreme rainfall.

- There are performance standards for basic weather and mechanical performance of all types of window, whatever the frame material
- In the UK the standard for this performance is BS 6375, which is divided into Part 1 for basic weather resistance and Part 2 for the window's operation and strength characteristics
- Weather performance test evidence relevant to the window type should be requested by the client or specifier before making a final selection
- It is important to ensure that the client understands how the type of window selected will perform
- Check that any test evidence is verified by a third party accreditation body. This is particularly important when small, local manufacturers are involved in the supply process.



Acoustic performance

- The current Building Regulations Approved Document E, Resistance to the Passage of Sound, demands that the issue of noise is addressed in the construction of new homes and the refurbishment of existing properties
- Acoustic performance is now an important part of planning and building design. Residents are also more aware of the problems of noise and less tolerant of noise pollution
- Single-glazing and even standard doubled-glazed units are not good sound insulators. Further improvements can be achieved by the use of thicker glass in the IGUs or more specialised glass
- For extreme situations, triple-glazing or the use of 'double windows', where a second glazed window or secondary glazing is introduced, should be considered
- It is important to specify the amount of sound reduction required and state the relevant frequency level. A sound engineer can help in determining the type of window required.

Security performance

- Most insurance companies demand ground floor window locks as a standard requirement
- Secure wood windows are available to meet all requirements
- Laminated glass can be used to enhance the security of ground floor windows and those adjacent to entrance doors
- Members of the Wood Window Alliance offer windows which comply with BS: 7950: 1997 specification for enhanced security performance of casement and tilt/turn windows for domestic applications
- Although this standard does not include certain window types, such as vertical sliding sash or fully reversible windows, these types have also been shown to meet the criteria required by the test.

Secured by Design

- Secured by Design (SBD) is the UK police initiative supporting the principles of designing out crime through effective crime prevention and security standards for a range of applications. It is managed by ACPO, the Association of Chief Police Officers
- The Secured by Design scheme functions on two levels:
 - An award to developers who build developments to Secured by Design standards
 - A licensing scheme for products which meet police preferred specifications
- In order to achieve Secured by Design license status, wood windows must comply to the standard BS 644, or the BWF Timber Window Accreditation Scheme and have 3rd part accreditation to demonstrate compliance with BS 7950 : 1997.





Service life, Whole Life Cost,
maintenance and durability

The **Wood Window** Alliance



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Service life, Whole Life Cost, maintenance and durability

Specifying or using Wood Window Alliance windows will give an expected service life of at least 60 years. By following manufacturers' recommendations, you can extend this to 80 years or more.

Effective maintenance of a window will extend its service life and:

- Reduce Whole Life Costs
- Reduce the environmental impacts associated with replacement and disposal costs
- Prolong the carbon store effect.

Simple rules apply:

- Check handles are working correctly and lubricate or adjust where necessary
- Check locks and latches are functional
- Check that seals around glazing units are undamaged and replace if necessary
- Check seals round opening casements and sashes are undamaged and replace if necessary
- Ensure external frames are cleaned regularly and re-decorated within the manufacturer's recommended schedule
- Check external frames for damage and repair if necessary.

60 year minimum service life

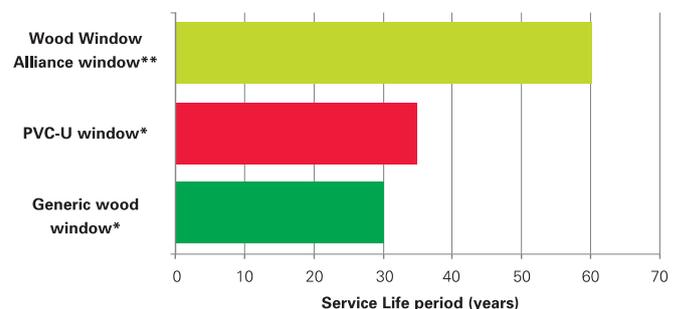
- We commissioned new service life research by Imperial College London
- They used ISO 15686-8 (2006) methodology to build a model based on the latest design and paint finishing technology used in Wood Window Alliance windows
- These factors were applied to Imperial's own existing service life data, as well as BRE's
- The results show that windows manufactured to Wood Window Alliance standards have a minimum service life of 60 years, even under a low maintenance regime
- And a service life of 80 years or beyond in more sheltered conditions.

'This research implies there is no reason why today's Wood Window Alliance windows shouldn't last as long as Edwardian and Victorian wood windows – a lifetime or beyond.'

Dr R Murphy, Imperial College London



Service Life of Wood Window Alliance windows compared to generic wood and PVC-U



Source: Imperial College, 2010

*Service Life - BRE Green Guide **Service Life - ISO 15686-8:2008, Imperial College London



Service life, Whole Life Cost, maintenance and durability

How manufacturing standards influence service life

The following measures, undertaken by members of the Wood Window Alliance, improve service life to a minimum 60 years.

- Improvements to the timber used in the windows
 - Using specially selected slow-growth timber grown in cold climates
 - Using a higher proportion of heartwood
 - Using engineered sections, such as laminated or finger-jointed timber, increasing stability and reducing knots and resin exudation
 - Improved machining processes result in a smoother timber surface and a better paint surface
- Improved component design, using a slight slope - especially to the horizontal sections of the window – to prevent standing rainwater, water ingress and rot in vulnerable areas
- Rounded corners, rather than sharp edges, to improve paint adhesion
- End-grain sealants, to prevent water ingress to vulnerable sections
- Better timber treatment systems, to extend durability
- Minimum paint or stain applications applied in the factory, providing better protection than paint-brush applied finishes
- Improved drained and vented glazing systems, increasing glazing unit service life.

How architects and clients can improve service life beyond 60 years

Each of the following factors can be undertaken by clients and will increase the service life of the window beyond 60 years

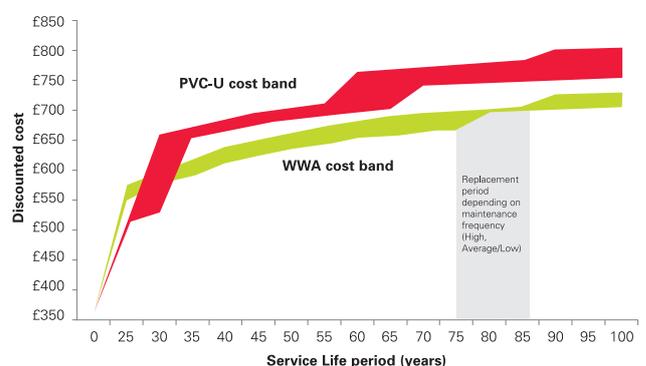
- Correct storage on-site
- The use of qualified contractors for the installation
- Shelter or partial shelter from driving rain or particulates
 - Some urban environments are defined as sheltered
 - Some suburban situations may be classed as sheltered or partially sheltered, depending on the proximity of other buildings
 - Providing some shelter to the window may simply involve recessing into the brickwork.

- Avoid the use of window cills over 70mm
- Position the window on stone, concrete or brick cills
- Follow the manufacturers' maintenance recommendations
 - Wash down / wipe the frames annually
 - Apply the following redecoration levels:
 - Every 3 to 5 years – **HIGH** – increases life significantly
 - Every 5 to 7 years – **EXPECTED** – increases life by 10%
 - Every 7 to 10 years – **LOW** – increases life to some degree.

Whole Life Cost

- With an expected service life which exceeds today's building service life expectancy, a Wood Window Alliance window is better long-term value, as it won't need to be replaced for over 60 years
- When taking maintenance into account, a Wood Window Alliance window has a lower Whole Life Cost over 60, 80 or 100 years, than a comparable PVC-U window
- Over an 80 year life, a Wood Window Alliance window will remain in service whereas a PVC-U window may have been replaced twice. No new window installation costs, no disposal costs.

Whole Life Cost of Wood Window Alliance windows vs PVC-U
High/average/low maintenance levels
Suburban conditions*



*Part sheltered
NPV cost discounted at 3.5% real
Base Service Life source: BRE Green Guide – 35 years

Source: Estimated Service Life - ISO 15686-8:2008, Imperial College London



Service life, Whole Life Cost, maintenance and durability

Typical warranties:

- 30 years on the frame
- 8 years on the paint finish
- 6 years on stain finish
- 10 years on seals and ironmongery
- 10 years on IGUs

Performance for higher quality

- Buy timber windows fully finished and glazed by the manufacturer
- Advances in factory-applied paint or stain finishing techniques provide finishing conditions which cannot be replicated by on-site painting
- Unlike on-site painting, factory-applied coatings provide a consistent coating to all areas of the window
- The manufacturer is able to offer service life, paint-life and glazing unit warranties if these are performed in a factory-controlled environment
- Buying unfinished or unglazed windows and painting on-site can invalidate preservative warranties, lead to moisture ingress, timber movement, premature breakdown of the glazing units, premature frame decay, and ruin the overall aesthetic qualities of the window.

Initial treatment of a quality wood window

- Coating manufacturers recommend that base stains and primers are applied by a method of saturation, whether dipping, saturate spraying or flow coating
- This provides better absorption, leading to superior adhesion of the first coating layer
- Cut outs, vents and v-joints are all reached by such coating methods, giving better overall protection.

Types of finish

- Coatings may be solvent or water-based. The latter are more commonly used by window manufacturers and have lower environmental impact
- Coatings are applied in controlled conditions indoors,

ensuring wet weather and high outdoor humidity do not lead to high moisture contents which hinder the absorption and adhesion of coatings

- Coatings are applied to all concealed surfaces, which cannot be achieved once windows are installed
- Coating operatives are easier to monitor and audit in factories than on-site
- Spray-applied factory finishes give smooth coatings with high film builds that are very difficult to replicate with site-applied finishes
- Higher build factory applied coatings offer better durability and a longer service life.

Opaque finishes (paints) give a solid colour.

- Some grain texture will show through, providing a natural wood character, unlike a plastic window
- The heavier pigmentation of opaque paints protects the surface from UV light damage and provides long lifespans
- White, or paler colours, provide the most effective UV protection
- The darker the finish, the greater the solar heat gain and risk of resin exudation and timber movement.

Translucent stains will show the grain structure of the timber underneath.

- Lighter shades will have a more pleasing, clear appearance but require more frequent re-coating because they are susceptible to damage from UV light
- Colourless coatings are very susceptible to damage from UV light and are not recommended.



Designing for low maintenance

Building designers can extend maintenance intervals for wood windows by:

- Considering the aspect of the window in relation to the sun and prevailing weather
- Providing some protection, such as roof or other overhangs
- Setting the windows back into the window reveal

For upper storeys or less accessible windows, consider designs that allow cleaning and decoration from inside the building:

- Reversible windows
- Projecting hinge, or 'easy clean' casements.

Aluminium composites, or aluminium clad timber windows, are a good option for medium rise buildings, and offer longer paint service life and reduced maintenance periods.

Different aspects of the building will require differing maintenance schedules:

- North-facing windows will suffer less damage from UV light, and coatings can last more than twice as long as south-facing windows
- Coastal and high altitude climates are the most challenging because of prevailing winds and the impact of salt, sand, wind and rain
- Windows in inner cities will suffer from dirt and pollution and require more frequent cleaning to ensure a longer lifespan
- Good quality coating manufacturers will recommend different maintenance regimes depending on the aspect of the window and its environment.

Maintenance and repairs

Modern paint and stain systems do not need the same maintenance programmes and methods as older brush painted windows:

- Planned maintenance programmes are recommended as they reduce whole life costs and prolong the life of the windows
- 'Burning off' is a thing of the past; a simple rub-down and brush application is often all that is required
- Any knocks and abrasions can easily be repaired with fillers and coatings



- Hot waxes are quick to apply and can give near invisible repairs
- Coatings manufacturers can advise on which window manufacturers participate in planned maintenance schemes
- Refer to coatings manufacturers' advice sheets or websites.

Upgrading wood windows

It may often be better to retain the old wood windows within a building rather than replace them. In many cases, architectural or historic features may have to be retained and replacement windows may not be appropriate.

- Upgrading wood windows can be more cost-effective than replacement
- 'Repair and renew' is often a better environmental option than replacement and prolongs the carbon store effect
- Improvements to seals, ironmongery and other mechanisms will lead to improved weather performance
- Secondary glazing may be an alternative to double-glazing where this is not an acceptable option
- Wood is easily repairable. Sections of timber can be replaced and the window 'made good'.



Maintaining windows in conservation areas Repair, Replicate, Replace

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Maintaining windows in conservation areas

The visual character of our conservation areas is under threat from unsympathetic replacement windows and doors.

Although local authorities have the powers available to prevent this degradation, they appear to lack the resources or political will to use them. This is despite good evidence that maintaining the character of an area has a direct relationship with increasing its prosperity.

There is also an apparent conflict between the aims of government policies, with conservation officers and building inspectors at odds over authenticity versus energy-efficiency.

This conflict can be simply resolved by fitting a replacement window that combines modern levels of energy-efficiency with authentic materials, period detailing and value for money.

Windows and the character of a building

Windows are one of the most important design features of a building. Even small changes have a significant effect on its appearance. The position of the window in the opening, the proportions of the sashes, the arrangement of the opening lights, the thickness and profile of glazing bars and rails, the joints, the frame material, even the glass itself, all have an effect on the appearance of the window and its appropriateness.

We've all seen the damage unsympathetic replacement windows can make to buildings. English Heritage recently carried out a survey among 360 local authorities of the state of conservation areas. One in seven were deemed to be 'at risk', meaning it has deteriorated over the last three years or is expected to do so over the next three years. The biggest single threat was seen as 'unsympathetic replacement doors and windows' (in 83% of conservation areas).

But it's not only conservation areas that have suffered. Walk down almost any street in the country and you will see the damage done.

Windows and the value of a building

A well-presented home is worth more than one that shows signs of neglect or an inappropriate 'make-over'. A national survey of Estate Agents carried out by English Heritage found that 'Unsympathetic replacement windows and doors, particularly plastic/PVC-U, are the single biggest threat to property values in conservation areas'.

Claims of energy-efficient double glazing and maintenance-free frames might look tempting. And the initial price might look right. But maintaining the authenticity of a building's windows is a much better long-term investment.



Conservation areas and what they mean

Since being introduced by the 1967 Civic Amenities Act, some 9,300 conservation areas have been designated across England to preserve the special character of places, not just in historic cities and market towns, but in the suburbs, former industrial quarters and villages.

Within a conservation area, the local authority has extra controls over:

- demolition
- minor developments
- the protection of trees

Minor developments

If you live in a conservation area, you have to obtain permission before making changes which would normally be permitted elsewhere, to ensure that any alterations do not detract from the area's appearance. These changes include certain types of cladding, inserting dormer windows and putting up satellite dishes which are visible from the street.

Article 4 Directions

Under legislation introduced in 1995, local authorities can make further restrictions on the kind of alterations allowed, depending on how these might affect the key elements of buildings in the conservation area. Examples include putting up porches, painting a house a different colour, or changing distinctive doors, windows or other architectural details. The local authority has to have good reason for making these restrictions, and must take account of public views before doing so. These restrictions are called Article 4 Directions.

The English Heritage survey found that:

- Only 13% of conservation areas have an Article 4 Direction which can prevent plastic windows and doors and other small-scale but damaging changes
- Only 54% of conservation areas have an Appraisal, or one in the making. These identify what is special and needs protecting and help in the area's management
- Only 36% of conservation areas had seen enforcement action within the last three years requiring unauthorised works to be rectified.

Yet the survey also shows that conservation areas with Appraisals or Article 4 Directions are almost twice as likely to improve in the next three years as those without.

What's wrong with the existing windows?

Most timber windows have been replaced because the homeowner has wanted to reduce energy bills by installing double glazing and thought that the only solution was to use PVC-U replacements. They also believe that the so called maintenance-free benefits of the material will negate the need for any future work to keep the windows in good condition.

In doing so, they will have altered the overall character of the building and are likely to have reduced its value. It is rarely the case that timber windows have deteriorated beyond economic repair, although some frames manufactured from poor quality sapwood in the decades after the war may well need replacing. Many Victorian and Edwardian windows are still in good condition today.

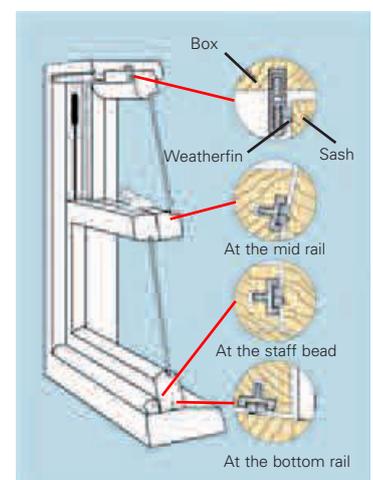
Whether it's because of energy-efficiency, draughts, poor decorative condition, inoperative sashes, or general disrepair, it's important to follow the three 'Rs'.

In the first instance, consider repair. If repair is not feasible, it will be necessary to replicate the existing windows in historic or listed buildings. In conservation areas, it is possible to replace existing windows with modern energy-efficient timber equivalents which mimic the original and maintain the character and value of the building. And with modern paint systems, any maintenance of the window need not be required for 7 to 10 years after installation.

Repair

Repair is the first option to consider when seeking to maintain the character of a building, particularly as the original glass can be retained.

Sections of the frame which are no longer sound can be cut out and replaced. Sashes can be freed, cords replaced and draught-proofing materials added discreetly.



Maintaining windows in conservation areas

Simple energy-efficiency measures, such as draught-proofing, shutters or curtains can make a significant improvement to the energy performance of old windows. Secondary glazing is also possible, but cleaning is often difficult and care must be taken to ensure glazing bars match the windows' bars. Secondary glazing also affects the appearance of the inside of the window.

English Heritage has released the findings of a study into the thermal performance of traditional sash windows using a 2 x 2 timber sliding sash window dating from the 1880s which had been rescued from a skip. The results showed that even the simplest repair and basic improvements will bring significant reduction of draughts and heat loss, and that using a combination of these methods will upgrade a window to meet Building Regulations targets.

The key findings are:

- Simple repairs to mend cracks and eliminate gaps can significantly reduce the amount of air infiltration or draughts
- Air infiltration through a sash window in good condition can be reduced by as much as 86% by adding draught proofing
- Heat loss through contact with the glass and frames can be significantly reduced by adopting simple measures like closing thick curtains and plain roller blinds. In the study, heat loss was reduced by 41% and 38% respectively
- In a test with good quality secondary glazing, this value was 1.7. Well-fitted, closed shutters, also produce similarly good results.

Replicate

If repair is impractical, the best option for historic or listed buildings is to replicate the exact design of the existing windows. This isn't cheap, as it involves real craftsmanship, and will probably (but not necessarily) involve losing the character of the original glass.

Members of the Wood Window Alliance have the expertise necessary for this speciality and are able to supply exact replicas, even down to the customary putty glazing or the specification of hand drawn or crown glass.

Particular care is given to the detailing of traditional sightlines and elegance of glazing bars and beads which can only be achieved in wood. Sliding or box sash windows are produced using conventional cords and weights with brass pulleys and ironmongery.

Replace

For houses in conservation areas, where repair is impractical, replacement with a Wood Window Alliance factory-made timber window is the best alternative.

PVC-U windows should never be considered.

It is important to replace like with like, whether a steel window in an Art Deco semi, or a timber window in most period dwellings. Other materials don't have an authentic appearance, or feel; the finish won't be the same, the profiles, the joints, the hinges – the small details which end up making all the difference.

The right replacement window will combine all the performance benefits of a modern window with the authentic look and feel of a traditional window. And, because they are factory-made, with factory-applied paints and glazing systems, they offer a long service life of over 60 years, with simple maintenance, providing excellent value for money.

Modern replacement wood windows will combine authenticity with modern demands such as high energy-efficiency, security, low maintenance and a reassurance that they will last 60 years or more.



The Wood Window Alliance

Not all replacement timber windows will have the right appearance or performance. But members of the Wood Window Alliance can supply sash or casement windows which retain the proportions and details of most historic windows.

Glazing bars are available in traditional profiles for both single and double glazed units. Even standard double glazing can be easily achieved without compromising the slim glazing bars and sightlines of Georgian sash windows by using surface applied bars. These, together with internal spacing bars, give the appearance of individual panes without a 'heavy' timber appearance. Sash windows can be supplied with traditional sash cords and lead weights, or with springs. They can also be hinged, or tilt-operated for easy cleaning and maintenance. Casement, fully-reversible and pivot types can also be supplied.

Windows are available factory-finished, in most RAL colours, fully glazed and ready fitted with ironmongery and high security locks.

Members of the Wood Window Alliance have to meet tough performance, quality and sustainability criteria which must be accredited by an independent third party. They also offer class-leading warranties: typically 30 years on the frame, 8 years on the paint finish, and 10 years on the glass and ironmongery.

Not all windows manufactured by a member will meet these criteria – single-glazed conservation windows, or putty-glazed windows are two of the exceptions, for example - but all will be made to high quality, design and manufacturing standards.

Energy-efficiency

Wood Window Alliance windows meet or exceed current building regulations. Depending on the glazing. In the case of double glazing units, they can achieve the highest Window Energy Ratings (A) and U-values as low as 1.0W/m²K.

Low carbon footprint

Independent research by Davis Langdon shows that Wood Window Alliance windows have a negative carbon footprint.

Sustainability

BRE gives domestic wood windows made to the standards of the Wood Window Alliance the highest possible LCA rating of A+ in the Green Guide. All wood used in Wood Window Alliance windows is certified to be sourced from sustainably managed forests, and all members have Chain of Custody certification.

Long service life

BRE expects the minimum service life of a good quality wood window to be 35 years. The evidence of the many surviving Victorian and Edwardian examples suggests that well made softwood windows will last very much longer. Research by Imperial College concludes that windows made to the WWA standard will last for 60 years or more when appropriately maintained.

Value for money

Evidence from Whole Life Costing analyses by Davis Langdon demonstrates that the longer service life of a typical Wood Window Alliance window makes it excellent long-term value in comparison to an equivalent PVC-U window. Conservation, or more specialist wood windows may be more expensive on initial outlay, but will last a lifetime, with appropriate maintenance and add extra value to a home.

The reassurance of the quality mark

Windows which bear the Wood Window Alliance quality mark must:

- Meet BS 644, the main British Standard for wood windows, or equivalent standards from other countries
- Meet the performance standards for wind and weather resistance of BS 6375 Part 1
- Meet the minimum performance standards for operational aspects of BS 6375 Part 2, or equivalent standards from other countries
- Be accredited by an independent UK or European body to prove compliance with those standards
- Be manufactured from timber sourced legally from sustainably managed forests and with chain of custody certification
- Offer service life warranties for durability (typically 30 years), paint life (typically 8 years), ironmongery and insulated glass units (typically 10 years)
- Meet or exceed the UK Building Regulations' recommendations for energy efficiency.

For more information

For more information on new wood windows, refurbishing existing windows, and to find a supplier to discuss your needs with, visit www.woodwindowalliance.com

For more information on conservation areas, historic and listed buildings, visit www.english-heritage.org.uk



Types of windows

The **Wood Window** Alliance



**WOOD. AT THE HEART
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The term 'window type' usually describes the opening arrangement and should not be confused with window styles, which may vary within a window type.

Wood windows included in this section:

- Standard side hung casements, including side-swing casements
- Projecting top-hung casements, such as fully reversible and H-windows
- Tilt and turn
- Vertical sliding sash, traditional and spiral balance
- Pivot-hung, including bulls-eye and circular
- Multi-light or combination types
- Other styles and combination frames.

Why window types are important

Window type has a considerable effect on:

- The size, shape and proportion of the window
 - Window type can have a major impact on the overall appearance of a building
- The range of sizes available for each window type represents those which are most commonly used and are functionally and ergonomically most satisfactory
- The percentage of 'openable area'
 - This varies from 100%, in the case of side-hung casement windows, to less than 50% in vertical or horizontal sliding types. This difference can affect the size or number of windows required and has implications for daylighting, energy-efficiency and cost
- The method of cleaning
- Suitable types of security fittings.

Casement windows

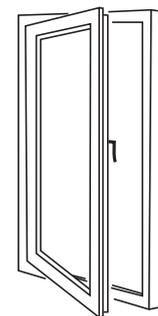
Traditionally, casement windows in the UK and in most parts of Northern Europe open on the outside of the building. Outward opening windows have a weather performance advantage as the sash is made tighter against the weather gaskets in the frame by increased wind pressure.



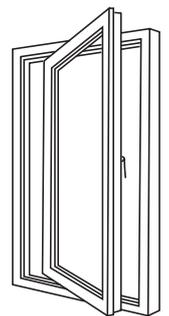
Side hung casement windows

Side hung casement windows are:

- The most common type of window
- They normally have a maximum casement width of 600mm, with a maximum height of 1500mm
- Available with different hinge mechanisms. The simplest (A) has hinges which attach the sash directly to the frame



A. Side hung casement



B. Projecting side hung casement

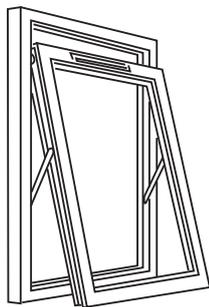
- Projecting side-hung casements (B) operate using a different hinge mechanism to allow cleaning from the inside; hinges (often referred to as easy-clean or projecting hinges) are fitted to the top and bottom of the sash and frame rather than the side
- An alternative 'sideswing' version is also available from some window manufacturers.



Projecting top hung casements

These window types, also known as “reversible windows”, are increasingly popular especially in flats or any medium to high-rise developments. They can prevent curtains and blinds being disturbed when the window is reversed.

- The mechanism, sometimes known as ‘topswing’ or ‘H-type’, allows the outside of the window sash to fully reverse into the room by rotating on the outside of the frame, making cleaning from the inside possible
- The mechanism often incorporates an ‘espagnolette’ locking system and child safety locks which restrict opening to 100mm; these can be overridden for cleaning
- A ‘sideswing’ version of the mechanism allows a side-hung casement window to be reversed in the same way.

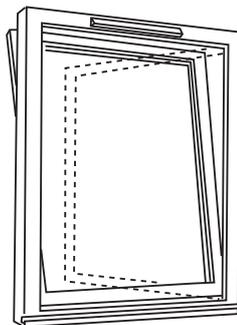


C. Projecting top hung casement

Tilt and turn windows

Tilt and turn windows have been popular in mainland Europe for many years.

- The mechanism tilts the window from the bottom allowing secure ventilation at the top. Turning the handle in the opposite direction allows the window to fully open inside the room
- Although this allows cleaning from inside, the opening sash can interfere with any curtains or blinds around the window.

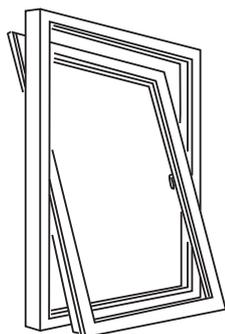


D. Tilt and turn windows

Pivot hung windows

These were popular in medium-rise and high-rise flats in the 1960s and ‘70s and are still used today in roof windows and ‘bull’s eye’ or circular windows.

- The mechanism is simple and allows the sash to turn through 180° pivoted around the centre of the frame.

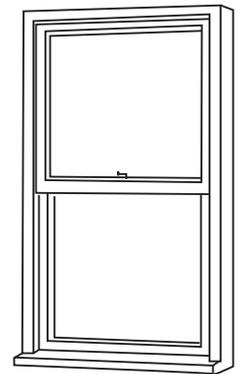


E. Pivot hung casement

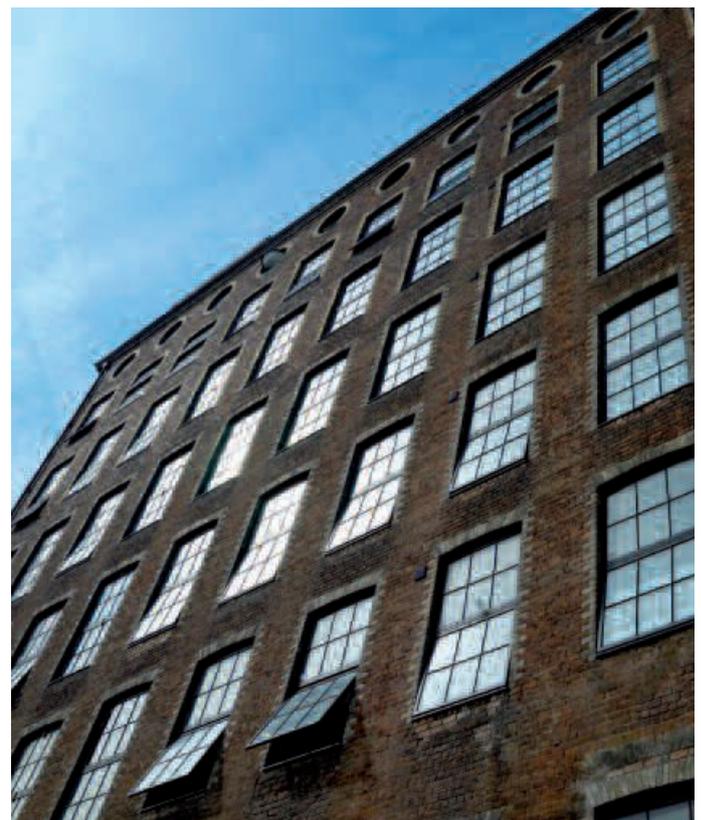
Vertical sliding sash windows

Vertical sliding sash windows or ‘box sash windows’ were the most popular type of window during the Victorian period. Their elegant proportions were also an important visual element in the Georgian period of 18th and 19th Century buildings.

- Both top and bottom sashes may be opened by sliding them up or down
- Traditionally, the heavy weight of both opening sashes was counterbalanced by two equally heavy lead weights, linked via a rope and pulley mechanism, and hidden in the sash box within the wall surrounding the window opening
- Modern mechanisms generally employ a spiral balance system which acts as a counterweight for the sliding sash, thus allowing slimmer frame profiles without the need to hide the mechanism in the wall
- This window type has gained some popularity in the refurbishment of Georgian, Victorian and Edwardian properties, and in new developments based on these housing styles
- A horizontally sliding window, often known as a Yorkshire sash, is also used in certain parts of the UK.



F. Vertical sliding sash





Multi-light frames

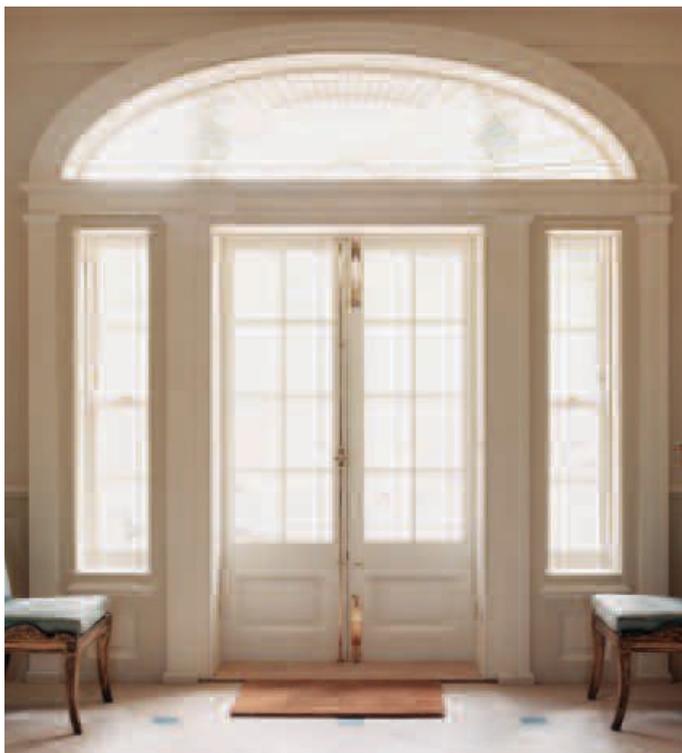
These window types are a combination of varying styles within the same frame and are commonplace in most domestic and some commercial applications.

- The adjacent photograph shows a french door in a combination frame and direct glazed (fixed) lights and reversible casements
- Other combination types may include projecting casement and fixed light, or tilt and turn and fixed light
- In some cases the direct glazing or fixed light may take the form of a 'dummy' or 'fixed' sash in order to provide an aesthetically balanced window.

Other window types

Window types and combinations of windows are usually based on those described above.

- More often than not, any variation in design is usually brought about by a particular glazing feature of the house or building, or the need to add more daylight, for example at the side of a door
- The 'head' or top of a window often allows for a change in design, for example, fixed or opening arches, or some other form of head design.





Types of windows

Summary

- Maximum sizes may vary depending on glazing weights and the strength of the hinge mechanism.

Window type	Openable area	Other features
Side hung casement	100%	Can be projecting to allow cleaning from inside
Projecting top hung casement	100%	Fully reversible, allowing cleaning from the inside
Tilt and turn	100%	Opens inwards to allow cleaning from the inside
Pivot	~ 90%	Pivots around centre of frame
Vertical sliding	50%	Top and bottom halves slide up & down



Traditional glazing bars

Timber glazing bars, to the outside and inside of windows, provide classic traditional styles which are not easily replicated by other materials, especially when fitted within the glazing unit.

- Modern methods of fixing glazing bars which avoid the need for thick glazing beads, allow double glazing units to be used without compromising the aesthetic features of traditional windows
- This can be particularly important in some Grade II listed buildings and in conservation areas where local planning departments, or building control, often insist on the need for single glazing sightlines
- Most wood window manufacturers are able to replicate exact glazing bars and incorporate energy-efficient double glazed windows without any impact on the aesthetics or traditional sightlines of single glazing.



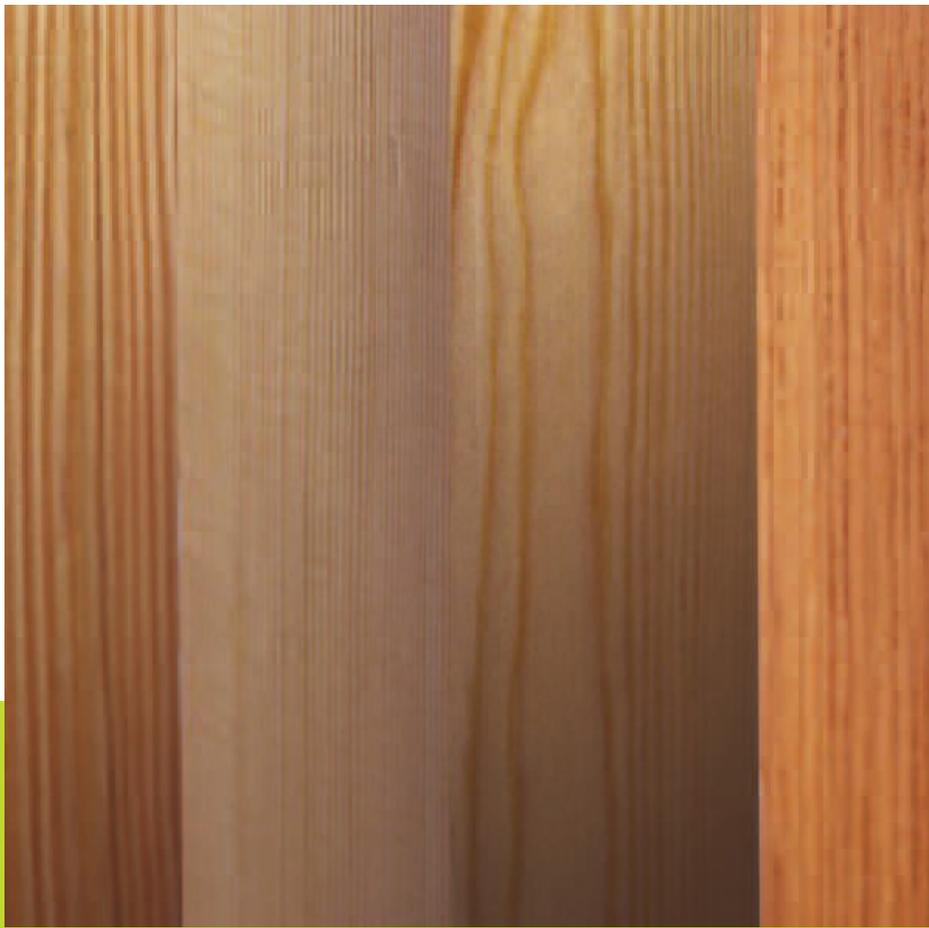
Window styles

Further variations on the above windows are often brought about by the addition of glazing bars. In some cases, these are 'mimicked' within the insulated glazing unit.

- Some typical styles include:
 - Georgian bar styles, where a matrix of glazing bars provide smaller panes to the window
 - 'Marginal bar', where glazing bars run vertically at the edges of the glazing
 - Cottage or horizontal style, where a horizontal glazing bar divides the sash and glazed area in two equal halves.



Double glazed sliding sash windows in a Grade II house



Timber species for windows

The **Wood Window** Alliance



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Wood is a natural material sourced from many different tree species.

Choosing the right timber for windows is important because:

- Each species produces timber with different colour, character, density and performance properties which will influence its suitability for a particular application
- There are an estimated 100,000 different species of tree in the world, some of which are almost extinct and need protection
- Others grow in forests which have a major impact on the earth's climate and have to be carefully managed.

Softwoods and hardwoods

Tree species are broadly divided into two main groups – softwoods and hardwoods.

- Softwood trees are coniferous, or cone-bearing, mostly evergreen, and with needle-like leaves
- Hardwood trees are deciduous, shedding their leaves at the end of the growing season or during a dry season
- In the UK, over 90% of the wood we use in construction is softwood from European forests
- Most of our hardwood is European too
- The majority of commercially produced wood windows are manufactured from softwood (redwood) grown in Scandinavia. This material is slow growing, high quality, and has relatively small knots.

BS.EN 942 : 2007
defines the standard
for Timber in Joinery and
provides details of quality
appearance, timber quality
grades, permissible defects,
knot sizes and moisture
contents which help in
the selection of the
right species

Softwoods for windows

Softwoods are more commonly used because they are generally less expensive than hardwoods, are readily available, easy to work with and less dense than most hardwoods.

Softwoods are not always as durable as hardwoods, although many advances have been made in improving the durability and service life of softwood windows.

- Of the 650 species of softwoods throughout the world, 50 are in commercial use
- The UK is one of the largest importers of wood in the world. Over 90% of this is softwood and comes from five European countries: Sweden, Finland, Latvia, Germany and Russia
- An increasing amount of softwood is called 'home grown' timber and comes from UK forests in Scotland, England, Ireland and Wales. Although poorer in quality than slower grown Scandinavian timber, UK home grown timber is widely used for fencing, pallet-making, general construction, and in panel board manufacture such as OSB and chipboard. It is not regarded as suitable for use in windows and joinery
- In most cases preservative treatment is required to make softwood more durable. Species such as larch, western red cedar and douglas fir are often used in windows without treatment
- Windows made from Scandinavian softwood with a high proportion of heartwood achieve excellent durability without preservative treatment.



Hardwoods for windows

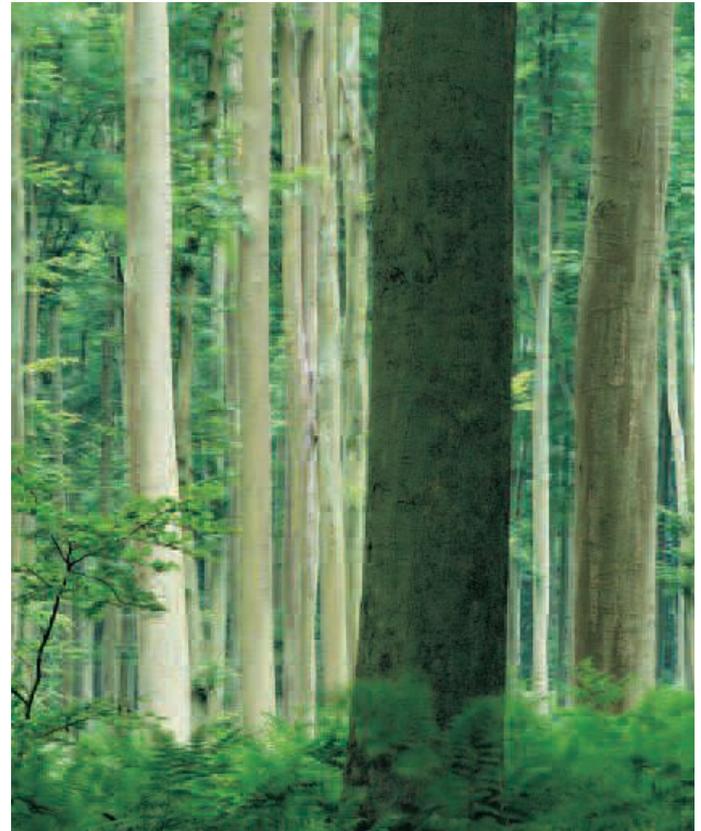
Hardwoods, used for their strength, durability and decorative appearance, are divided into two groups, tropical and temperate, depending on where they grow.

- Some 20,000 different species are grown commercially
- Although hardwoods are generally more durable and stronger than softwoods, they can still warp, twist or split if used in the wrong environment or not conditioned correctly
- Hardwoods tend to be deeper in colour and are often used for their decorative appeal
- Hardwoods grow at a slower rate than softwoods and are usually denser due to their cellular structure
- Hardwoods are usually supplied in random lengths and widths but in standard thicknesses
- Many hardwoods are used as veneers on softwood panel products.



Picture courtesy of AHEC

- **Temperate hardwoods** are found in temperate areas of the world such as Europe, North America, South America, Asia, Australia and New Zealand. Most temperate hardwoods, such as the oak, birch or beech used in the UK, come from Europe or North America
- **Tropical hardwoods** are found in tropical areas such as Central and South America, West and Central Africa and South East Asia. Tropical deforestation is a very significant issue and a major contributor to climate change. It is essential that any tropical timber used is from a managed forest source and has credible certification to prove it. Consult a specialist merchant.



Typical species suitable for windows

Choosing the wrong species can compromise a window's functionality, safety, strength and durability. The tables on the following pages provide an indication of some of the more common species of softwood and hardwoods suitable for windows.

Sustainable timber

Timber is the most sustainable building product available. It is naturally renewable – over 97% of softwood timber used in the UK comes from Europe,¹ where the forest area is increasing by the equivalent of three football pitches every hour of the day and night.² For reassurance look for certification labels like FSC (Forest Stewardship Council) or PEFC (Programme for the Endorsement of Forest Certification).

¹ International Institute for Environment and Development and Edinburgh Centre for Carbon Management, *Using Wood to Mitigate Climate Change*, 2004

² UN Food and Agriculture Organization, *State of the World's Forests*, 2007

Softwoods

The most commonly used softwoods are imported from Scandinavia or Eastern Europe.

Species	Alternative name	Source	Durability Treatability	Comments
European redwood	<i>Pinus sylvestris</i> Scots pine, red deal	Scandinavia Latvia Russia	Moderate Good	Easily machined. Widely used for windows and doors. Clear laminated timber available which improves stability.
Larch	<i>Larix occidentalis</i>	Europe	Moderate Not required	Used for windows and doors.
Western red cedar	<i>Thuja plicata</i>	N. America Canada	Durable	Soft for windows and doors, used in conservatories.
Douglas fir	<i>Pseudotsuga menziesii</i> Columbian, Oregon pine	Europe N. America Canada	Slight to Moderate Fair	Used for windows and doors.



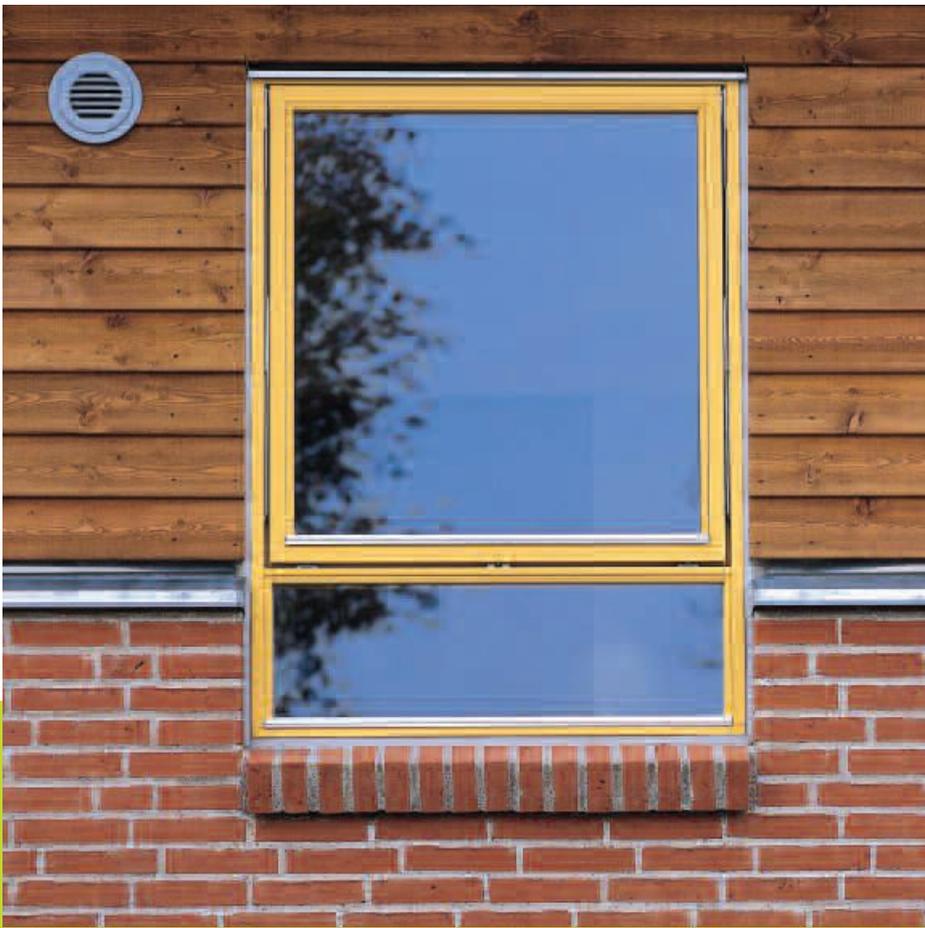
Temperate hardwoods

Species	Alternative name	Source	Durability Treatability	Comments
Oak	<i>Quercus spp.</i> European oak American white oak	UK Europe North America	Depends on type No treatment required Moderate	Used for windows and doors. Decorative timber but high wastage.
Sweet chestnut	<i>Castania Sativa</i> Spanish or European chestnut	UK, Europe North America	No treatment required	Used for windows. Acidic timber, can corrode ferrous fixings.

Tropical Hardwoods – check certification

Species	Alternative name / type	Source	Durability	Comments
Idigbo	<i>Terminalia ivorensis</i> Emeri, Framire	Africa	Durable	Used for windows. Finishes well, can corrode fixings.
Iroko	<i>Chlorophora excelsa</i> Odum, mvule, kambala, abang	West Africa	Very durable	Very strong and durable.
Massaranduba	Manilkara Spp - Sapotaceae	Africa	Durable	Structural, joinery, flooring, furniture, external joinery.
Red louro	<i>Ocotea rubra</i>	UK, Europe, North America	Moderate	Joinery, flooring, furniture, external joinery.
Mahogany	<i>Swietenia macrophilia</i> African mahogany / Brazilian mahogany	West Africa Brazil	Moderate to durable	Used for windows and doors.
Meranti	Shorea Light Red (Seraya / White Luan) Dark red (Nemesu)	Asia	Moderately durable to non-durable	Light and dark red often supplied in mixed consignments, can lead to wide colour variation. Often incorrectly described as Philippine mahogany.
Sapele	<i>Entandrophragma cylindricum</i>	West Africa	Durable	Doors and windows.
Utile	<i>Entandrophragma utile</i> Sipo, assie	West Africa	Durable	Used for windows and doors. Similar to sapele but finishes better.
Teak	<i>Tectona grandis</i>	Far East, Africa	Durable	Oily timber, needs care in finishing.

* Source: WCMC Species Database, data available at <http://wcmc.org/uk>



The benefits of building with wood windows

The **Wood Window** Alliance



**WOOD. AT THE HEART
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The benefits of building with wood windows

If you specify windows carrying the Wood Window Alliance quality mark you can be sure they will deliver the benefits you need.

Increased Government and EU legislation, changes to UK Building Regulations, new building codes and increased emphasis on sustainability mean that specifiers and buyers need to ensure that the windows they choose provide the best solution to a huge array of needs.

Modern factory finished and glazed wood windows have:

- The lowest environmental impact of any window material
 - Top BRE Green Guide 'A+' rating
- Responsible sourcing with chain-of-custody certification back to the forest source
- Low embodied carbon
 - Top BRE Green Guide Climate Change impact 'A' rating
- Energy efficiency with a wide selection of insulated glazing units
 - Overall U-values down to 1.0 W/m²K or lower
 - A-rated window energy ratings
 - Triple-glazed if required
- Excellent weather performance even in extreme exposure conditions
- Long service life with minimum maintenance
 - With service life warranties for the timber frames, paint, glazing units and ironmongery
 - Factory-applied paint systems, no on-site painting
 - Ease of maintenance and repair
 - Minimum service life expectation of 60 years
 - Extended service life achievable when correctly maintained
- High security features to Secured by Design requirements

- Triple-glazing gives good acoustic performance with improved noise reduction
- Aesthetics suitable for all building types
- Large selection of window types and styles.

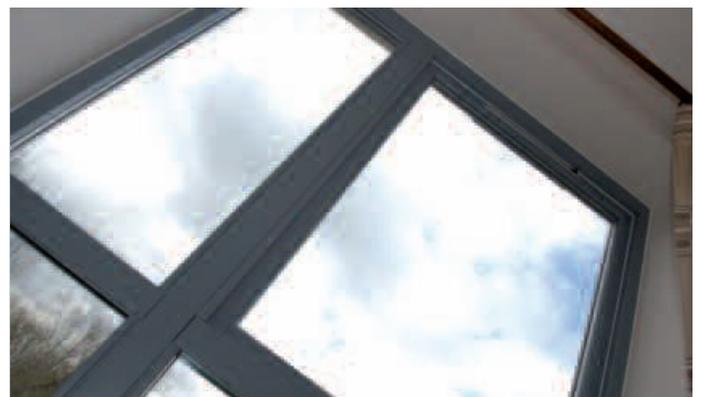
Benefits in BREEAM and Code for Sustainable Homes, PassivHouse and Super 'E' requirements

Thermal efficiency

- U-values down to 1.0W/m²K or better for PassivHouse developments

Additional credits for

- **ENE 1 and 2** – Thermal envelope performance
- **MAT 1** – Environmental impact of materials – BRE Green Guide
 - Wood windows painted with water-based paints score A+
- **MAT 3** – Responsible sourcing of materials – finishing elements
 - Chain of custody certification to Government CPET requirements
- **HEA 1** – Health and Wellbeing – daylighting
- **HEA 2** – Health and Wellbeing – sound insulation
- **HEA 4** – Health and Wellbeing – Lifetime homes
 - Wood windows readily available with specialist ironmongery suited to wheelchair access requirements
- **MAN 4** – Management – Security
 - Specification to Secured by Design standards.



The benefits of building with wood windows

England and Wales Building Regulation Approved Documents (See Scottish Building Standards for equivalent requirements)

- App Doc B – Fire Safety
- App Doc C – Resistance to moisture – Joints between walls and windows
- App Doc E – Resistance to Sound
- App Doc F – Ventilation
- App Doc K – Protection from falling
- App Doc L – Conservation of fuel and power
- App Doc M – Access to and use of buildings
- App Doc N – Glazing

Benefits in commercial applications

Wood windows are ideally suited for many non-domestic buildings such as offices, schools, health centres or other commercial developments.

- Available in a wide range of styles
- Meet BREEAM requirements
- The lowest environmental impact of any window material
 - Top BRE Green Guide 'A+' rating
- Low embodied carbon
 - Carbon negative frames
 - Top BRE Green Guide Climate Change impact 'A' rating
- Often required in conservation area commercial developments.

Benefits in Building Regulations requirements

- Wood windows present no difficulties in meeting any of the Approved Documents
- In many cases, they can offer a more cost-effective option
- Windows made from all materials may have to meet or exceed some or all of the Regulations below.

A window carrying the WWA quality mark ticks all the boxes:

- ✓ Energy-efficient (A ratings; low U-values)
- ✓ Responsible purchasing (wood certified from sustainable sources)
- ✓ Naturally renewable
- ✓ Sustainable (A+ in BRE Green Guide)
- ✓ Low climate change impact (A in BRE Green Guide)
- ✓ Carbon negative frames
- ✓ 60 year minimum estimated service life
- ✓ Repairable (for an even longer life)
- ✓ Comprehensive warranties on service life, finishes, glass and hardware
- ✓ Independently verified performance and quality

Information relating to the relative performance of wood windows against these standards is shown in **Section 2 – Performance**.



Benefits in conservation areas and listed buildings

- Wood windows remain the only choice of frame material in conservation areas and in listed building refurbishment where single-glazed sightlines are important in retaining the character of the building
- Repairability and upgrading of wood windows can easily be achieved to retain existing frames.

Benefits in 'period' housing

Unsuitable replacement windows have spoiled the looks of many period homes and when it comes to selling, many owners find they have reduced their property's desirability and value. Wood windows are a traditional quality investment that will enhance a home and its value.