

# The Specifier's Guide to Timber Windows

2016 edition

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- 1 Specifying the right material
- 2 Specifying the right window type
- 3 Specifying window performance
- 4 Meeting BREEAM requirements
- 5 Specifying sustainable windows
- 6 Life Cycle Assessment
- 7 Service Life Planning and Whole Life Costs
- 8 Specifying for period buildings and Conservation areas
- 9 Tips for window and door detailing
- 10 Detailed specification for high performance timber windows

This guide was produced by the Wood Window Alliance to help architects with the selection and specification of window frames that meet modern performance standards and offer durability to match a typical 60-year building design life.

[Click here for more details of the Wood Window Alliance and its manufacturing membership.](#)

## 1. Specifying the right material

The choice of window material depends on a number of factors, including:

### Type of project

- PVC-U and wood are most suitable for general housing
- Aluminium or aluminium-clad windows for large retail and office developments
- Aluminium-clad windows are increasingly used for contemporary style domestic homes and multi-storey apartments, as they combine a modern profile, low maintenance exterior with the look and feel of wood for the interior
- If access for maintenance is costly, as with multi-storey buildings, low maintenance solutions, such as modified timber or aluminium-clad timber should be considered.

### Budget

- If initial cost is the sole criterion, PVC-U is the cheapest short-term solution
- High quality softwood provides the lowest Whole Life Cost in most conditions
- 'Wood plus' materials, such as modified timber or aluminium-clad timber are more expensive but offer extended service life and maintenance intervals
- Hardwoods are generally chosen for aesthetic reasons.

### Exposure

- For most housing, in most exposure conditions in the UK, high quality softwood will provide a 60-year service life with regular maintenance - typically on an 8-year cycle
- For multi-storey buildings or severe exposure conditions, 'wood plus' materials, such as modified timber or aluminium-clad timber should be considered.

### Softwood

- The most common softwood for windows and doors is Scandinavian redwood, although some use larch
- There are good supplies of high quality timber from certified sustainably managed European forests
- The timber should be engineered and laminated to remove knots and defects and increase stability
- Most softwood used in the UK is preservative-treated to ensure a long life; some achieve similar durability by using a high proportion of heartwood.

### Hardwood

- Generally hardwoods are more naturally durable than softwoods, but not necessarily than preservative treated softwoods
- Some, such as oak, are used for aesthetic reasons, others, such as Sapele and Idigbo, are used for their stability
- Always ensure the timber comes from a legal and sustainable source.

### Modified timber

- Manufacturers can modify wood's chemistry to increase its stability, maintenance intervals and durability
- One method is acetylation (such as Accoya®); this provides similar performance to the best hardwoods. Care should be taken to use high quality stainless steel hardware.

### Aluminium-clad timber

- Combines the environmental and aesthetic benefits of wood with the durability and low maintenance of an external aluminium skin
- The clip-on cladding can be replaced or refurbished and will typically remain maintenance-free for 30 years or more
- In Europe, most aluminium is manufactured and recycled using hydro-electric energy, enhancing its appeal.

## 2. Specifying the right window type

The term 'window type' describes the opening arrangement (not to be confused with window styles, which may vary within a window type).

### Side hung casement windows

- Outward opening
- The sash is made tighter against the weather seals in the frame by increased wind pressure
- Traditionally, the sash closes flush into the frame (correct for period buildings); often modern sashes close onto the frame, known as 'storm' casements
- Typical maximum width 600mm
- Typical maximum height 1,500mm
- Available with different hinge systems
- The simplest (left) has hinges attaching the sash directly to the frame
- Projecting side-hung casements (right) use a hinge mechanism that allows cleaning and decorating 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
- Multi-point locking security is available
- An alternative 'sideswing' version is also available (see below).



### Projecting top hung casement windows

- Also known as 'reversible', these are increasingly popular in flats or medium to high-rise developments
- Outward opening, using a 'topswing' or 'H-type' mechanism allowing full rotation on the outside
- Can be reversed for cleaning or decorating without disturbing curtains or blinds
- The mechanism often incorporates an 'espagnolette' locking system & child locks to restrict opening to 100mm
- A 'sideswing' version of the hinge allows a side-hung casement window to be reversed in the same way.



### Tilt and Turn windows

- Tilt and Turn has been popular in mainland Europe for years
- Inward opening
- 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 and decorating from the inside, it can interfere with curtains or blinds.



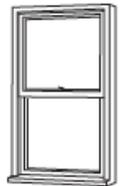
### Pivot hung windows

- Popular in medium and high-rise flats in the '60s and '70s, these 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.



### Vertical sliding sash windows

- Vertical sliding sash, or 'box sash', windows have top and bottom sashes that slide
- The weight of both opening sashes can be counter-balanced by lead weights hidden in the sash box
- Some modern windows use a spiral balance, allowing slimmer frame profiles
- Modern windows can achieve A ratings and U-values from 1.4W/m<sup>2</sup>k with double glazing, or as low as 0.8 W/m<sup>2</sup>k with triple glazing
- Period glazing bars of the correct thickness and detail can be achieved by using applied bars and spacers
- A horizontally sliding window, often known as a Yorkshire sash, is also used in certain parts of the UK.



### 3. Specifying window performance

Windows are an important part of the fabric of a building and must be tested to ensure they perform in accordance with their specification. They should be manufactured to comply with BS 644: 2012 *Timber windows and doorsets. Fully finished factory-assembled windows and doorsets of various types.*

#### Energy performance

- There are two ways of measuring energy performance, U-values and WERs (Window Energy Ratings)
- U-values are a direct measure of thermal transmittance. 'Whole window' values give a better indication of performance than 'centre pane'
- WER gives an A to E rating based on a combination of U-value, air leakage and solar gain, where an A+ is the best
- Energy performance can be improved by increasing the cavity between the glazing; filling the cavity with argon, or krypton gas, rather than air; using low emissivity glass; using triple-glazing
- The design of the window is important, with the avoidance of cold bridges and use of special seals and warm edge spacers in the glazing unit
- You should specify a C rated (or higher) window, roughly equivalent to a whole window U-value of 1.6W/m<sup>2</sup>k
- Double-glazed windows of any frame material can meet A ratings (roughly equivalent to a U-value of 1.4W/m<sup>2</sup>k)
- Triple glazing can achieve whole window U-values of 1.0W/m<sup>2</sup>k or lower
- Timber and aluminium-clad timber windows are available with U-values as low as 0.7W/m<sup>2</sup>k, suitable for Passivhaus designs.

#### Weather performance

- Specify windows tested to BS 6375-1 for air permeability, water-tightness and wind resistance.

#### Operational performance

- Specify windows tested to BS 6375-2, which specifies performance requirements for the operation and strength of manually operated windows and internal/external pedestrian doorsets.

#### Acoustic performance

- Specify windows that meet BS EN ISO 717-1
- Standard double-glazed windows give good acoustic performance
- If additional sound attenuation is required, specify acoustic glass, which can give performance up to 38Rw+Ctr
- Good acoustic performance is more difficult to achieve with sliding sashes.

#### Safety performance

- Specify windows with child safety locks to restrict opening to 100mm
- To comply with the Building Regulations, 'Critical Locations' such as doors, door side panels, low windows and low level glass in walls and glass partitions must have safety glass or safety guards
- Safety glass should be fitted when closer than 800mm to the floor level
- Glass panels <250mm wide can be fitted with 6mm or laminated glass instead of toughened glass
- To ensure doors and windows can be operated safely by people in wheelchairs, specify 'Lifetime Homes' compliance.

#### Security performance

- Specify windows with locking system security in accordance with BS 6375 Part 3: 2009+A1 2013 Annex A
- For increased security, specify windows and doors with enhanced security to PAS 24 and certified Secured By Design.

## 4. Meeting BREEAM requirements

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 the windows they choose provide the best solution to an array of needs. The new harmonized European Standard for windows and pedestrian doorsets is EN 14351.

### WWA windows have top ratings in BRE's Green Guide to Specifications

Wood Window Alliance windows are now recognized as a separate standard in BRE's Green Guide to Specification.

- All WWA timber windows are rated A+
- All WWA aluminium-clad timber windows with a clear internal finish are rated A+
- WWA alu-clad timber windows with an opaque internal finish are rated A
- These ratings are the best available in each category and provide specifiers with the confidence that they are choosing windows and doors that will help them meet BREEAM or other sustainability standards.

### Modern factory-finished timber, modified timber and alu-clad timber windows have

- Lower environmental impacts than any other window material
- A longer Service Life than PVC-U
- And lower Whole Life Costs than PVC-U.

### They add value to a property

- Discerning clients value the look and feel, inside and out
- They can be repaired and recoated to continue looking good throughout their lifetime
- They are the most environmentally-friendly option.

### They help you meet BREEAM requirements

- Thermal efficiency U-values as low as 0.7W/m<sup>2</sup>K available

### Additional credits for:

- **ENE 1 and 2** Thermal envelope performance
- **MAT 1** Environmental impact of materials. WWA windows rated A+ in BRE's Green Guide
- **MAT 3** Responsible sourcing of materials; finishing elements - Chain of Custody certification to CPET requirements
- **HEA 1** Health and Wellbeing – daylighting
- **HEA 2** Health and Wellbeing – sound insulation
- **HEA 4** Health and Wellbeing – Lifetime Homes (windows available with specialist ironmongery suited to wheelchair access)
- **MAN 4** Management; Security - Specification to Secured by Design standards.

## 5. Specifying sustainable windows

Wood-based windows 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 CO<sub>2</sub>
6. They have fewer environmental impacts than other materials.

### Naturally renewable

- Wood is the only naturally renewable mainstream building material
- European legislation ensures harvested timber is replaced through planting and natural regrowth
- Europe's forests, the source of most of the timber used in construction, have grown by roughly twice the area of Ireland in the past 20 years.<sup>1</sup>

### Certified sustainable

- Our members use wood that is legally sourced in accordance with the European Timber Regulations and covered by chain of custody certification.

### Coatings

- Our members use wood that is legally sourced in accordance with the European Timber Regulations and covered by chain of custody certification.

### Climate change

- Trees soak up 1t CO<sub>2</sub> for every cubic metre's growth, releasing 0.7t O<sub>2</sub><sup>2</sup>
- When they reach maturity, their CO<sub>2</sub> uptake slows and they begin to die and decay, releasing methane
- Mature trees are harvested to make way for vigorous new trees and turned into products that continue to store CO<sub>2</sub>
- The forest's carbon sink continues to grow thanks to sustainable forest management
- This double benefit is why wood products are often described as 'carbon negative'
- The product carbon store can be extended through re-use and recycling
- Further CO<sub>2</sub> gains can be made by recovering the energy from the wood at the end of its life as a biomass fuel.

<sup>1</sup>MCPFE/UNECE-FAO State of Europe's Forests 2011

<sup>2</sup>Edinburgh Centre for Carbon Management

## 6. Life Cycle Assessment

In 2013, Heriot Watt University, Edinburgh published an LCA study on WWA specification timber, modified timber and alu-clad timber windows, comparing them to PVC-U. Using SimaPro 7.3.2 software and the Ecoinvent 2.2 database, the study sets a new standard for the Life Cycle Assessment of windows and concludes that all timber-based window frame materials have a lower impact than PVC-U alternatives on all measures other than ozone layer depletion in every end-of-life scenario considered.

### Timber frames save 160kgs CO<sub>2</sub>e

- The report finds all the timber-based frame materials considered have a negative Global Warming Potential over 60 years
- Using a timber window frame instead of PVC-U saves roughly 160kgs CO<sub>2</sub>e over 60 years in average conditions

### Environmental impact measures

Abiotic depletion

Acidification

Eutrophication

Global warming potential

Ozone layer depletion

Human toxicity

Fresh water aquatic ecotoxicity

Marine aquatic ecotoxicity

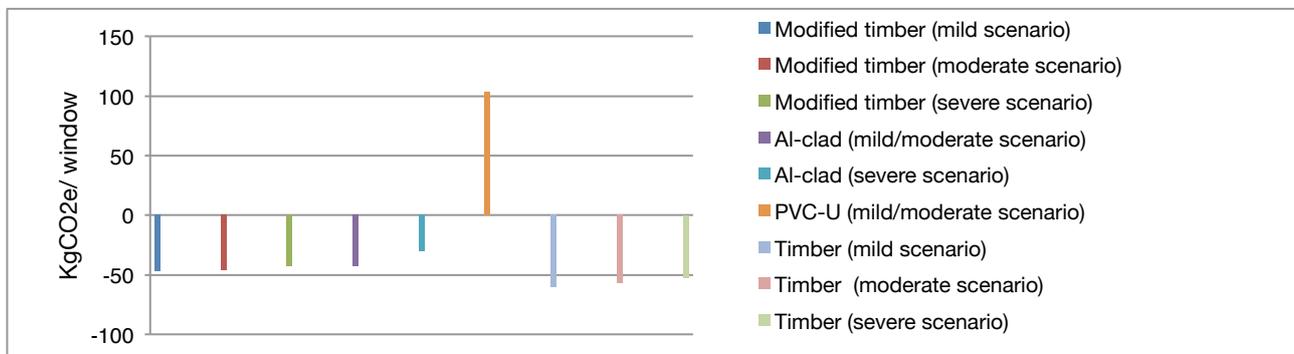
Terrestrial ecotoxicity

Photochemical oxidation

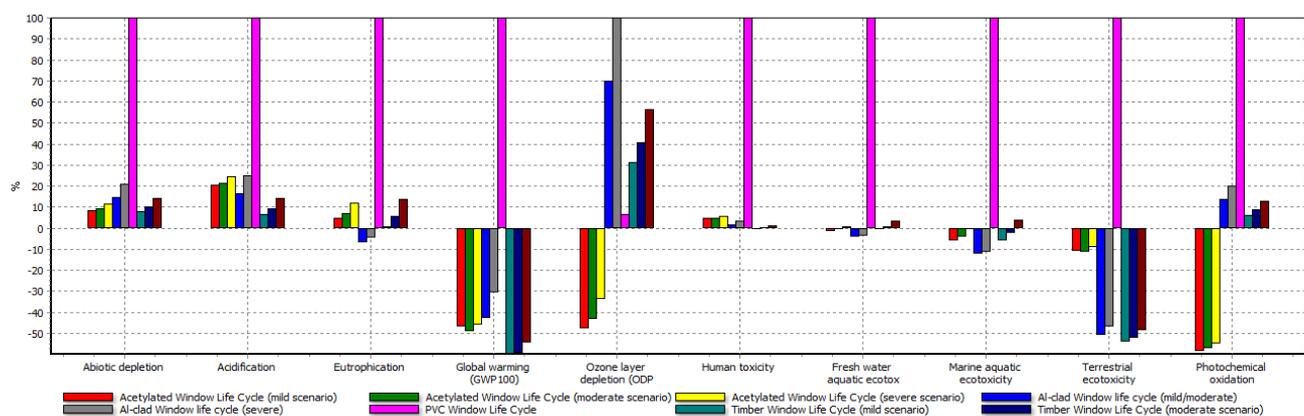
### Alu-clad and modified timber frames save almost as much

- For aluminium-clad timber frames the saving is roughly 140kgs CO<sub>2</sub>e per window over 60 years
- In a 10-window house, that's 1.4t CO<sub>2</sub>e

### Global Warming Potential of various window frames



### Timber-based frames have significantly lower environmental impacts than PVC-U



Comparing product stages:  
Method: CML 2 baseline 2000 V2.05 / World, 1990 / Characterisation

## 7. Service Life Planning and Whole Life Cost

Heriot Watt's Service Life Planning (SLP) and Whole Life Cost (WLC) studies on WWA specification timber, modified and alu-clad timber windows, compared with a PVC-U equivalent, confirm earlier work by Imperial College London, and derive results by applying design, manufacturing and maintenance factors to an established Reference Service Life in accordance with ISO 15686-8.

### Timber-based frames last at least twice as long as PVC-U

- The study finds timber frames can be expected to last c. 60 years - twice as long as comparable PVC-U frames
- Modified timber and aluminium-clad timber frames can be expected to last significantly longer.

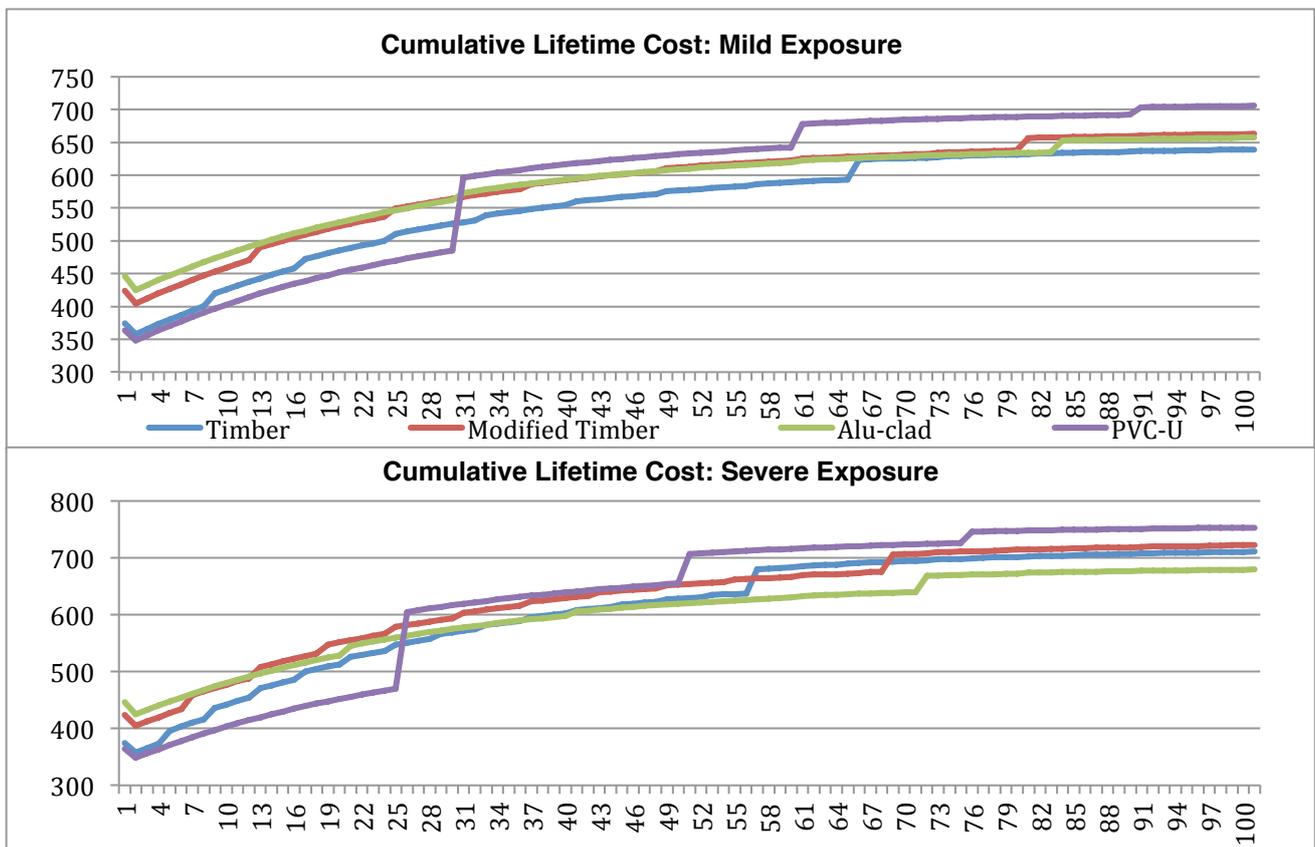
Timber frames	56-65 years
Modified timber	68-80
Alu-clad timber	71-83
PVC-U	25-35

### All timber-based frames offer better long-term value than PVC-U

- The Whole Life Cost study was prepared using SLP data and standard discounting techniques (Net Present Value) for a standard window at commercial contract prices
- All capital, installation and maintenance events are accounted for
- A 25-35 year SLP has been assumed for PVC-U, with in-service maintenance treated as zero.

### The study shows that

- PVC-U has the lowest initial cost
- Timber frames have the lowest lifetime cost for urban/suburban properties (mild exposure)
- Aluminium-clad timber frames have the lowest lifetime cost for multi-storey buildings or severe exposure conditions.



## 8. Specifying for period buildings and Conservation areas

The conflict between the Conservation Officer's requirement for authenticity and the Building Inspector's concern for energy-efficiency can be resolved by specifying traditionally detailed, high performance timber replacement windows that meet the current Building Regulations while incorporating traditional detailing and sightlines.

### Listed or historic buildings - repair

- Most changes to windows in listed buildings, including 'like for like' replacement, require Listed Building Consent. For more information visit [www.planning-applications.co.uk](http://www.planning-applications.co.uk)
- Repair should be considered first for historic or listed buildings
- Sections of the frame can be replaced, sashes freed, cords renewed and draught-proofing materials added
- Energy-efficiency measures, such as shutters or curtains, can only limit the impact of the thermal deficiencies of the windows (especially during the day)
- Although secondary glazing is also possible, cleaning is often difficult and care must be taken to ensure glazing bars match the secondary windows' bars.

### Listed or historic buildings – replicate

- In historic or listed buildings where the window has deteriorated beyond repair, it will be necessary to replicate the existing windows
- Specify single (putty) glazing, matched mouldings and historic glass.

### Conservation areas and period buildings

- Specify modern factory-finished energy efficient, high performance timber windows with authentic glazing bars and detailing
- Discuss any reservations your Conservation Officer may have about double-glazing with a manufacturer who has experience in this sector
- For further information visit the website.

### Replacement windows

- Replace like with like, whether a steel window in an Art Deco semi, or a timber window in most period dwellings
- Other materials do not have an authentic appearance, or character; the finish won't be the same, the profiles, the joints, the hinges – the small details that end up making all the difference
- Modern replacement double-glazed wooden window frames combine authenticity with high performance - energy-efficiency, security, acoustic performance and low maintenance
- Because they are factory-made, with factory applied coatings and glazing systems, they offer a 60-year service and long maintenance intervals.

### Glazing

- Modern, defect-free glass will always look different from old glass and can increase reflection
- But the alternative of fitting secondary glazing to existing windows will also affect the reflection, as well as making cleaning more difficult, encouraging condensation and creating a potential fire hazard
- Period glass can now be incorporated in double-glazed units and some Wood Window Alliance members offer a Victorian sheet option that creates the authentic wavy reflection of traditional hand blown crown and cylinder glass
- Narrow cavity glazing units should be CE marked and meet the durability requirements set out in BS EN 1279 (see our Guidance on Narrow Cavity Insulated Glazing Units)
- Wood Window Alliance members can produce double-glazed windows with a range of different glazing bars, from a width of just 17mm.

## 9. Tips for window detailing

### Protection for the frame

- Set the windows back into the reveal to protect the frame from the worst of the elements
- Set the window on a stone, tile, aluminium or concrete cill - do not use extended timber cills
- Angle the cill to ensure good water run-off
- Always specify factory-finished windows and doors; this ensures an accurate coating application and special attention to vulnerable areas such as joints and end-grain
- Specify water-based, rather than solvent-based, coatings, as they have a lower environmental impact
- Specify solid colours, rather than clear or translucent finishes, as the heavier pigmentation of opaque paints protects the surface from UV light damage and gives longer maintenance intervals
- White, or paler colours, provide the most effective UV protection
- Darker colours absorb solar heat, which can increase the risk of resin exudation and timber movement on some timber species.

### Installation

- For detailed information see our Installation Guidelines for Timber Windows.

### Maintenance

- For detailed information see our Maintenance Guidelines for Timber Windows
- Wash frames and lubricate hardware annually; this is especially important in urban areas, coastal locations or where high levels of atmospheric pollutants are present
- Make good any surface defects as they arise
- When recoating, wash the frame, sand lightly, prime any bare areas of wood and brush apply one or two topcoats to restore the original paint finish
- When planning maintenance, take into account the effects of weathering and exposure. South facing and exposed elevations will need more frequent maintenance
- Expect to refresh the window 10 years after fitting, depending on exposure; and at roughly 7 year intervals thereafter
- WWA windows typically carry an 8 or 10-year warranty on opaque coatings.

### Optimising solar gain

- Consider the aspect of the window in relation to the sun
- South-facing windows may need external protection from the sun to avoid over-heating in the summer (solar shading).

## 10. Detailed specification for high performance timber windows

### Manufacturing

- Windows to be factory-assembled, fully finished and glazed to meet or exceed BS 644:2012 or equivalent national standards

### Frames

- All visible surfaces to be J2 class in accordance with BS EN 942:2007. Clear-faced sashes and components, defect-free and manufactured from clear, finger-jointed or laminated timber
- Timber should meet durability class 3 as a minimum, as defined in BS EN 350-2:1994, or be treated with a preservative that meets the requirements given in table 3a or 3b of BS EN 599-1:2009+A1:2013
- All weathered edges to be rounded
- All joints to be fully coated with thermoplastic or thermosetting adhesive (BS EN 204:2001 and BS EN 12765:2001), filled as necessary; exposed end-grain sealed.

### Coatings

- Coatings to be selected in accordance with BS EN 927-1 Paints and Varnishes - Coating Materials and Coating Systems for Exterior Wood - Part 1: Classification and Selection as appropriate for their intended end use, their appearance and the level of exposure they are likely to experience
- All surfaces to be coated in accordance with BS 644:2012. Dry film thickness to be in accordance with the coating manufacturer's recommendations, or otherwise a minimum of 120µm on exposed or semi-exposed surfaces and 60µm on concealed surfaces.

### Glazing

- Factory fitted double or triple-glazing units (removable for safe site installation where required)
- Fitted to fully coated, drained and vented up-stands for extended unit life
- All units to be CE marked in accordance with BS EN 1279-5.

### Sustainability

- Timber to be legally sourced in accordance with the European Timber Regulations and covered by chain of custody certification
- Factory-applied coatings to be water-based, no heavy metal additives, with Volatile Organic Content below 50g/l.

### Performance standards

- Windows to meet the performance requirements defined in BS 6375 Parts 1 and 2, relating to weather tightness, operation and strength characteristics.
- Windows to meet the energy requirements for the devolved building regulations for England, Scotland, Wales and Northern Ireland
- Energy performance to be given by Window Energy Ratings of band C or better, and whole window U-values.
- Locking system security to be in accordance with BS 6375 Part 3: 2009+A1 2013 Annex A
- Enhanced security to PAS 24 and Secured By Design where required.

### Warranties and service life

- To cover timber preservation treatment, paint coating applications and maintenance, ironmongery, double and triple glazing units, endorsed by credible suppliers
- To provide credible third-party evidence that window frames will have a Service Planning Life of 60 years.

### Auditing

- Factory Production Control System in accordance with BS EN 14351-1 and the Construction Products Regulation
- Additionally, third party certification schemes such as TRADA Q-Mark, BSI, TWAS, equivalent European scheme or WWA accreditation as appropriate
- Test evidence, in support of performance specifications from approved suppliers.