

Timber – Durability, Sustainability & Coatings

Timber windows and doors have long been used in historic buildings and timber remains highly prized for its natural beauty and environmental credentials as a low carbon material. However, product performance and longevity of the joinery can vary greatly depending of species of timber, coating used and maintenance cycle.

When it comes to the upgrade or replacement of original timber joinery in a Listed Property or Conservation Area, making the right choice about specification of timber is important to ensure that, where possible, it is replaced 'like-for-like' and performs as intended.

Historically (pre 1900's), external joinery in the UK was largely made from hardwoods such as English Oak or Chestnut or Deal (softwoods such as pine & Douglas Fir). As international trade grew, making the procurement of exotic timbers more widely available, other species of timber such as Mahogany (sourced from Africa and South America) were commonly starting to be used in external joinery.

When planning an upgrade or replacement of Listed Building or Conservation Area joinery it is desirable to replace 'like for like', however this can raise issues for the customer as some of the timbers that were widely used in original windows are no longer available as sustainably sourced materials. In addition, some timbers such as Honduran Mahogany are now listed in Appendix II of Convention on International Trade in Endangered Species (CITES) and are no longer legally available <http://www.cites.org/eng/disc/what.php>

So what should you look for when selecting the species of timber for repair or upgrade of listed building or conservation area timber joinery?

Durability is one of the key performance factors used to assess the suitability of a timber species for a specific application. The chart below contains 5 classes of timber, with each class determining the natural durability to wood destroying fungi as described in BS EN 350-2:1994 – Durability of wood and wood-based products. The durability rating of a species is based on the natural ability of the heartwood to resist fungal decay. Sapwood is usually Class 5, not durable.

CLASS	DURABILITY
1	Very Durable
2	Durable
3	Moderately Durable
4	Slightly Durable
5	Not Durable

Durability is affected by many different factors such as:

- Speed at which the timber has been grown.
- Fungus attack.
- Use of coatings (paints and varnishes) to extend the durability of the timber.
- Additional preservative treatment
- Maintenance cycle

Sustainable Timber

Use Sustainable timber sourced from responsibly managed forests. Wood is the only naturally renewable mainstream building material. Over 90% of the wood used in the UK joinery industry comes from Europe's forests which are growing by 661,000 hectares every year.

For added reassurance, Customers should look for Certified timber. The Forestry Stewardship Council (FSC) <http://www.fsc-uk.org/en-uk>, Programme for the Endorsement of Forest Certification (PEFC) <http://www.pefc.co.uk/>, SFI or CSA are the schemes recognized by the government's Central Point of Expertise on Timber (CPET) <https://www.gov.uk/government/groups/central-point-of-expertise-on-timber> as evidence of sustainability and legality. CPET also recognizes MTCC (Malaysian Timber Certification Council) as evidence of legality

Timber – The Zero Carbon Material.

Using wood from sustainably managed forests reduces CO₂ emissions, as the CO₂ stored by the forest and in the timber product outweighs any CO₂ created during the production of the product.



Each tonne of timber used instead of other building materials (like steel, or brick and concrete block) saves around a tonne of CO₂.

The UK joinery industry manufactures in a wide range of timber species; the guide below provides information about some of the more commonly used timbers.

Softwoods

European Redwood is one of the most commonly used timbers in the UK window and door industry, however, due to its durability class, it must be preservative treated as defined in BS EN 335-1 'Use Class 3'. The preservation of timber is covered in BS 8417.

Manufacturers commonly adopt factory finished preservative and coating systems to improve durability. European Redwood is suitable for both translucent and opaque coating systems, although with opaque finishes, suitable knotting solution should be used over knots and other resinous areas.

Western Red Cedar is a durable softwood from North America with good natural weathering properties. Left untreated the surface will go to a silvery grey colour.

Hardwoods

Iroko is a durable African Hardwood with good weathering properties. Untreated, the surface turns silvery grey colour. Iroko has high durability characteristics and often used for external joinery.

Idigbo has a moderately durable, high strength, African Hardwood used in the manufacture of external joinery. Note – Idigbo is listed as 'Vulnerable' in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Sapele and **Utile** are common hardwoods used in the manufacture of UK joinery. They have good strength and durability characteristics.

Oak (European) is a durable timber widely used for high end external joinery. Although naturally durable, oak is sensitive to moisture and UV discolouration and special consideration to the coating system is advised to ensure adhesion and compatibility with this timber species. Stainless steel fixings should also be used. Note, American White Oak is not suitable for external use.

Red Grandis suitable for internal and external application is classed as durable to moderately durable. Can be stained or painted to look similar to other species of timber such as Oak or Sapele. Only available in engineered sections or up to 50mm thick in sawn timber

Note - Durability of above hardwoods applies to heartwood only.

Engineered timber – Laminated and finger jointed



Many manufacturers use engineered or laminated timber sections to minimise defects within the substrate. External joinery product commonly uses engineered timber for stability and in addition, this material utilises much timber that would otherwise be discarded by removing the defects and only using the quality grades. Engineered timber is available in softwoods and many of the commonly used hardwoods.

Modified timber

Wood modification is split into three main categories: thermal; chemical and impregnation. Wood is modified to improve resistance to decay of low durability timber. This process may also improve dimensional stability, mechanical properties & appearance. Check with the product supplier for how the modified wood products could be expected to perform and whether it is suitable for its intended use.

Heat treatment involves heating wood to temperatures of more than 200°C without the presence of oxygen, causing the chemical makeup of the wood to alter. Products include ThermoWood® Redwood and Thermowood® Radiata Pine.

Chemical modification involves the impregnation of permeable species of wood with chemicals that react with water binding cells. Products include Accoya®, Tricoya® and Kebony®. Accoya® uses a process known as acetylation, which alters the cell structure of the wood, reducing its ability to absorb water. This results in good dimensional stability and 'Class 1' durability. Corrosion-proof, good quality stainless steel fastenings should be used with these products and the timber properly sealed as per the manufacturer's instructions.

Impregnation. Wood is impregnated with chemicals under pressure. These compounds bind together and fill the voids that are usually filled with air in the dry wood. This results in an increase in both the density and hardness of the treated timber by introducing small molecular compounds into the wood structure. Products include Lignia™, Lignia™XD and Keywood™.

Preservative and coating systems

Joinery manufacturers should always check with their coatings suppliers to ensure that they use a compatible preservative and coating system in regarding to their selection of timber species and should include relevant advice in their 'Care and Maintenance' instructions for their customers, ensuring that any maintenance work done to the timber joinery throughout its lifespan is of a compatible and suitable specification.

New joinery should ideally be supplied to site fully factory finished & glazed. Some factory finished, opaque coatings can provide 8-10 years of durability depending on process employed, timber species, profile design, elimination of sharp edges and also subject to exposure conditions and frequency of maintenance.



Where putty glazing is required (single glass panes) site decoration may be necessary in order to allow the putty to cure.

Timber selection has a significant impact on durability. Species with good dimensional stability, resistance to cupping and to surface checking will have an extended service life and require less maintenance.

Translucent coatings (stains) have a reduced service life (typically 3 to 5 years) due to UV (sunlight) degradation. The lower (lighter) the pigment the quicker the coating is likely to breakdown.

Dark colour coatings (i.e. blacks) will have high heat absorption in direct sunlight. This can cause resin to bleed and surface checking problems.

Oil and wax finishes require a high level and frequent maintenance.

Moisture content

Moisture content is important to consider, as any significant changes in the environmental conditions and moisture content of the timber can lead to expansion or contraction of the substrate, which can lead to premature failure of the joinery and increased maintenance.

Moisture content is usually subject to national requirements and end use conditions. Where national requirements and end use are not available, the moisture content of the timber shall not exceed 13% for heated buildings or 16% for use in unheated buildings. Specific national requirements are given in Annex A of EN 14220:2006 and EN 14221:2006.

Manufacturers should take into consideration that in the UK the climate will vary the equilibrium moisture content (MC) from approx. 8% in July to approx. 20% in November. Tangentially timber moves approx. 1% for every 3-5% change in MC & within a yearly cycle "high" movement timber could move 4%.

Timber moisture content should be specified when ordering and then measured & recorded on delivery. Thereafter regular checks should be made during manufacture and prior to delivery.

For further information on moisture content and see <http://www.bwf.org.uk/toolkit/moisture-content>

Advice on storage and handling should be sent to the client when joinery is delivered to site. Fact sheets are available for download from the BWF web site.

Whilst every effort has been made to ensure the accuracy of advice given, the federation cannot accept liability for loss or damage arising from the use of the information supplied in this publication

Further information is available via the Heritage section of the BWF website (www.bwf.org.uk) or via the BWF Technical Team on 0844 209 2610 or via bwf@bwf.org.uk. If you are having a conservation, planning or building regulations issue related to Heritage or Conservation work, please do not hesitate to get in touch.