The Basics for Builders on 18 key Timber Topics
Sustainable timber

Timber is the most sustainable mainstream building product. It is naturally renewable. Over 90% of timber used in UK construction comes from Europe, where more trees are grown than harvested (source: TTF Statistical Review 2016). Softwood and temperate hardwood forests in Scandinavia, Europe, Canada and North America are stable or growing. Growing forests act as carbon sinks; wood products act as carbon stores. Ask for PEFC or FSC Chain of Custody certification.

See Wood Campus RIBA CPD module Procuring Sustainable Timber for more on timber certification and sustainability and government requirements.
SOURCING SUSTAINABLE TIMBER

For more information on sourcing sustainable timber, visit the Timber Trade Federation www.ttf.org.uk

TOPIC CHECKLIST

- Does your customer require sustainable timber?
- What’s available from your supplier?
- Check delivery notes and invoices for your supplier’s certification and registration number, and for percentages of certified raw timber if relevant, so that you can provide evidence to your client.
- Look for the label that shows the timber’s from a managed source, or FSC/PEFC certification labels
- Keep documentation
- If the wood or timber product you’re buying is for public sector work, check your supplier can meet certification requirements.

1. Rules for government contracts

The UK Government Timber Procurement Policy (TPP) is mandatory across the government estate, including central government departments, executive agencies and non-departmental public bodies.

It is advisable across semi-autonomous organizations, such as universities and local authorities.

It covers all timber, from perimeter fencing to new scaffolding boards, which must be purchased with evidence of legality and sustainability. You must hold documentation that shows it comes from Legal and Sustainable sources. As about 40% of UK timber imports are used in public sector contracts, government policy is a major influence on the sector.

2. How to prove compliance

There are two ways: using Category A evidence (the simplest way) or Category B evidence.

**Category A evidence**
You will need documentary evidence of full PEFC or FSC Chain of Custody certification. Or the timber must carry a FLEGT (Forest Law Enforcement, Governance and Trade) Voluntary Partnership Agreement (VPA).

**Category B evidence**

When is Category B evidence required?
- Where the chain of custody is broken and your supplier has no CoC certificate (note: without Chain of Custody, you can’t publically claim to have purchased a certified product, even if the timber is from a certified forest)
- Where the timber is not from a certified forest.

For both you’ll need credible evidence collected and available showing:
- Forest legality and sustainability criteria are met
- Robust traceability from forest to you.

How is Category B evidence verified?
- 1st party verification: when suppliers check themselves. The most common form of first party verification is a supplier declaration.
- 2nd party verification: when customers check their suppliers
- 3rd party verification: when an independent organization checks the supplier.

The TTF provides help and advice, and its RPP can be used to provide Category B evidence.

3. What Certification schemes does UK government recognize?

There are two key elements to certification schemes:
- Forest Certification: this provides independent third party evidence that the forest of origin is being managed in accordance with the requirements of an accredited forest management standard.
- Chain of Custody Certification: this allows timber suppliers to provide independent third party evidence of an unbroken path from the forest to the consumer, including all stages of manufacturing, transportation and distribution.

The UK Government gives equal recognition to two certification schemes:
- The Forest Stewardship Council (FSC).
- The Programme for the Endorsement of Forest Certification (PEFC). PEFC works by endorsing national forest certification schemes, such as SFI (Sustainable Forestry Initiative), operating in the US, CSA (Canadian Sustainable Forestry) and MTCC (Malaysian Timber Certification Council).
4. What is Verified Progress?
Not all wood is certified. It takes a long time and a considerable investment to set up forest certification throughout the world, so it is important to recognize that forests that are not certified can still be sustainably managed. Verified Progress, sometimes called Verified Legal, is an independently audited assurance that timber is legally harvested and from forests where forest management practices are actively improving towards achieving certification.

5. What is Controlled Mixing?
Certification schemes allow for some controlled mixing of certified and uncertified wood. However, uncertified material must meet the minimum standards set by the relevant certification body. Certified suppliers may state the percentage of certified raw wood on invoices and delivery notes.

The TTF’s Responsible Purchasing Policy (RPP)
All TTF members comply with the RPP, which helps them minimize the risk of illegal timber entering their supply chains. The RPP provides guidance and a due diligence toolkit, designed to align with the needs of the EUTR, containing templates and risk assessment and mitigation frameworks. It supports members in promoting good procurement policies to customers, and provides a phased approach to sourcing increasing proportions of timber products from credible and verified legal and sustainable sources.

The RPP is complementary to certification schemes and gives a second layer of confidence. Buying from TTF Members gives assurance that due diligence has been conducted on all their timber products.

European Union Timber Regulation (EUTR)
There is now a legal requirement within the EU obliging all businesses trading in timber or timber-related products to use due diligence systems to ensure they are legally sourced.

If you are a Trader buying or selling timber products in the EU you have to be able to identify who you bought the timber/timber products from, and to keep this information for at least five years for checks, if requested, by the Competent Authority.

6. How available is certified timber?
Supply of certified softwood timber exceeds demand. But supply of certified hardwood and certified hardwood plywood is more limited, particularly if sourced from tropical forests.

Supplies of certified or Verified Progress hardwood will be available from specialist merchants. Ask your supplier about their purchasing policy.

7. What’s this mean for you?
More and more people recognize the need to use certified timber. In many cases, this is a legal requirement. For example, if you work as a contractor or subcontractor on public sector work, (such as NHS, National Trust, UK government or armed forces) you must ensure you comply with the procurement requirements, whether undertaking new build or maintenance work.

It includes the wood used temporarily during construction works as well as wood fixed as part of a finished structure. This may also apply to local government contracts.

Further information and advice
- The Food and Agriculture Organization of the UN – Sustainable Forest Management http://www.fao.org/forestry/sfm/en/
- PEFC http://www.pefc.co.uk/
- FSC http://www.fsc-uk.org/en-uk
- WWF Forest Campaign http://www.wwf.org.uk/what-we-do/area-of-work/tackling-forest-loss-and-damage
- Wood for Good Lifecycle database http://woodforgood.com/lifecycle-database/
- American Softwoods, the sustainable choice http://americansoftwoods.com(choice/
**TOPIC CHECKLIST**

- Is the species suitable for the end use?
- Does it have the right strength qualities?
- How durable is it?
- What does it look like?
- Will it last?
- Are there legal and sustainable supplies?

**What are the main types of timber species?**

**Softwoods**

Softwood timber is obtained from conifers - trees with needle-like leaves, usually bearing cones. Softwoods are the most commonly-used timber because they offer good value and are readily available from sustainably-managed forests. They are less dense and easier to work with than most hardwoods.

Of the 650 species of softwoods throughout the world, round 50 are in commercial use, with the most common being European Redwood and Whitewood (pine and spruce). Most softwood used in the UK comes from Sweden, UK forests, Finland, Latvia, Germany and Russia.

**Sourcing sustainable timber**

- See Timber Trade Topic 1 Sourcing Sustainable Timber
- See Wood Campus CPD module Procuring Sustainable Timber

**Hardwoods**

Hardwoods are mainly broad leaf, deciduous trees, shedding their leaves in winter, although some hardwoods are evergreen. There are two groups, temperate and tropical, accounting for some 20,000 different commercial species.

Although generally more durable and stronger than softwood, they must be used in the correct way and environment.

The majority of hardwoods are deeper in colour and have a higher density than softwood, due to their cellular structure. However, some hardwoods, particularly tropical species, grow fast enough to be of similar, or lower, density than slow growing softwoods.

Hardwoods are usually supplied in random lengths and widths, but in standard thicknesses are often used as veneers on softwood.

**Temperate hardwoods**

Found in temperate areas of the world, such as Europe, North America, South America, Asia, Australia and New Zealand, most of the temperate hardwoods used in the UK, such as oak, birch or beech, come from Europe or North America.

**Tropical hardwoods**

Found in tropical areas such as Central and South America, West and Central Africa and South East Asia.

Illegal trade in tropical hardwoods has been largely responsible for deforestation. Care should be taken to ensure you are supplied with timber from legal and sustainable sources. See Wood Campus CPD module Procuring Sustainable Timber.

**Which species of wood should I choose?**

Consider these points:

1. The end use – for example, is the wood to be used as a structural material and then covered over with something else, i.e. studding covered by plasterboard, or will it be exposed?
2. What strength is required? Does the timber need to have a high bending strength, such as a joist, or a high tensile strength where the timber is stretched in the application?
3. Is the wood to be used purely for a decorative effect? Is this to be a dark or light colour?
4. Is the wood to be machined? Some species are more easily machined than others.
5. Is the wood from a certified legal and sustainably-managed forest source (i.e. FSC or PEFC) or is it from a source that is making progress towards certification (i.e. Verified Progress)?
6. Cost. It may look nice, but is it worth the additional cost, if another less expensive and more commercially available timber can do the same job?
7. Durability and treatability: is it necessary to use preservatives?
### Softwoods – main characteristics

<table>
<thead>
<tr>
<th>Species/Origin</th>
<th>Colour</th>
<th>Density kg/m²</th>
<th>Texture</th>
<th>Moisture movement</th>
<th>Working qualities</th>
<th>Durability</th>
<th>Treatability (heartwood)</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redwood, European Scandinavia/Europe</td>
<td>Creamy white</td>
<td>510</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Slightly to moderately durable</td>
<td>Difficult to extremely difficult</td>
<td>Flooring, external and interior joinery, furniture, structural</td>
</tr>
<tr>
<td>Whitewood, European Scandinavia/Europe</td>
<td>White to pale yellowish brown</td>
<td>470</td>
<td>Medium</td>
<td>Medium</td>
<td>Good</td>
<td>Slightly durable</td>
<td>Difficult to extremely difficult</td>
<td>Flooring and interior joinery, furniture, structural</td>
</tr>
<tr>
<td>Scots pine UK</td>
<td>Creamy white</td>
<td>510</td>
<td>Coarse</td>
<td>Medium</td>
<td>Medium</td>
<td>Slightly to moderately durable</td>
<td>Difficult to extremely difficult</td>
<td>External and interior joinery, structural</td>
</tr>
<tr>
<td>Douglas fir N America, UK and Europe</td>
<td>Reddish brown to light brown</td>
<td>530</td>
<td>Medium</td>
<td>Small</td>
<td>Good</td>
<td>Moderately durable</td>
<td>Extremely difficult</td>
<td>Interior and exterior joinery, cladding</td>
</tr>
<tr>
<td>Larch, European Europe</td>
<td>Pale reddish brown</td>
<td>550</td>
<td>Fine</td>
<td>Small</td>
<td>Medium</td>
<td>Slightly to moderately durable</td>
<td>Extremely difficult</td>
<td>Cladding, trim</td>
</tr>
<tr>
<td>Western red cedar N America</td>
<td>Reddish brown</td>
<td>390</td>
<td>Coarse</td>
<td>Small</td>
<td>Good</td>
<td>Moderately durable</td>
<td>Difficult to extremely difficult</td>
<td>Cladding</td>
</tr>
<tr>
<td>Spruce, Sitka N America and UK</td>
<td>Reddish brown</td>
<td>450</td>
<td>Coarse</td>
<td>Small</td>
<td>Good</td>
<td>Not durable to slightly durable</td>
<td>Difficult</td>
<td>Interior joinery, packaging, pallets, structural</td>
</tr>
</tbody>
</table>

### Temperate hardwoods – main characteristics

<table>
<thead>
<tr>
<th>Species/Origin</th>
<th>Colour</th>
<th>Density kg/m²</th>
<th>Texture</th>
<th>Moisture movement</th>
<th>Working qualities</th>
<th>Durability</th>
<th>Treatability (heartwood)</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beech, European Europe, UK</td>
<td>White/cream (reddish brown after steaming)</td>
<td>720</td>
<td>Fine</td>
<td>Large</td>
<td>Good</td>
<td>Not durable</td>
<td>Easy (red heart extremely difficult)</td>
<td>Furniture, interior joinery, flooring, plywood</td>
</tr>
<tr>
<td>Birch, European Europe, Scandinavia</td>
<td>Light brown</td>
<td>670</td>
<td>Fine</td>
<td>Large</td>
<td>Good</td>
<td>Not durable</td>
<td>Easy to moderately easy</td>
<td>Cabinet making, furniture, plywood.</td>
</tr>
<tr>
<td>Cherry, European Europe, UK, Scandinavia, Asia, N. Africa</td>
<td>Pinkish brown</td>
<td>510</td>
<td>Fine</td>
<td>Medium</td>
<td>Good</td>
<td>Moderately durable</td>
<td>No information</td>
<td>Cabinet making, furniture</td>
</tr>
<tr>
<td>Chestnut, Sweet Europe, UK, Asia Minor, Australia, N. Africa</td>
<td>Yellow to brown</td>
<td>530</td>
<td>Medium</td>
<td>Large</td>
<td>Good</td>
<td>Durable</td>
<td>Extremely difficult</td>
<td>Interior and exterior joinery, fencing, trim, structural</td>
</tr>
<tr>
<td>Oak, European Europe, Asia Minor, N. Africa</td>
<td>Yellowish brown</td>
<td>550</td>
<td>Medium to coarse</td>
<td>Medium to difficult</td>
<td>Durable</td>
<td>Extremely difficult</td>
<td>Furniture, interior and exterior joinery, flooring, heavy structural</td>
<td></td>
</tr>
</tbody>
</table>

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![Timber Species](image-url)
### Tropical hardwoods – main characteristics

<table>
<thead>
<tr>
<th>Species/Origin</th>
<th>Colour</th>
<th>Density kg/m³</th>
<th>Texture</th>
<th>Moisture movement</th>
<th>Working qualities</th>
<th>Durability¹</th>
<th>Treatability¹ (heartwood)</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teak&lt;br&gt; <em>Burma, Indonesia, Thailand and plantations elsewhere</em></td>
<td>Golden brown some with dark markings</td>
<td>660</td>
<td>Medium</td>
<td>Small</td>
<td>Medium</td>
<td>Very durable</td>
<td>Extremely difficult</td>
<td>Interior and exterior joinery, sports goods, furniture.</td>
</tr>
<tr>
<td>Iroko&lt;br&gt; <em>W. Africa</em></td>
<td>Yellow brown</td>
<td>660</td>
<td>Medium</td>
<td>Small</td>
<td>Medium to difficult</td>
<td>Durable to very durable</td>
<td>Extremely difficult</td>
<td>Interior and exterior joinery, bridge construction</td>
</tr>
<tr>
<td>Sapele&lt;br&gt; <em>W. Africa</em></td>
<td>Reddish brown</td>
<td>640</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderately durable</td>
<td>Difficult</td>
<td>Interior and exterior joinery, furniture, flooring, veneer</td>
</tr>
<tr>
<td>Utile&lt;br&gt; <em>W. Africa</em></td>
<td>Reddish brown</td>
<td>660</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderately durable to durable</td>
<td>Extremely difficult</td>
<td>Interior and exterior joinery, furniture, cabinet work</td>
</tr>
</tbody>
</table>

¹ Moisture movement<br> For structural purposes movement is not usually significant, but if you require stability in varying humidities (e.g. decorative flooring), use a species with small movement. These classifications are not directly related to the shrinkage of green timber.

² Durability<br> Refers to resistance to fungal decay of the heartwood only. Sapwood in most species is generally not durable and should not be used in exposed conditions without preservative treatment. Classes referred to in BS EN 350-1 are: Class 1 – ‘very durable’<br> Class 2 – ‘durable’<br> Class 3 – ‘moderately durable’<br> Class 4 – ‘slightly durable’<br> Class 5 – ‘not durable’

³ Treatability<br> Refers to how easily timbers can be penetrated with vacuum pressure preservative treatments. The four levels of treatability in BS EN 350-2 are ‘easy’, ‘moderately easy’, ‘difficult’, ‘extremely difficult’.

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**Tannin stain**<br> Tannin is natural in softwoods and hardwoods. For example, oak and Western red cedar will exude tannin as they dry, which may give the appearance of a black deposit. As a result, water running off these surfaces can leave staining, particularly around metal fixings.

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**Further information and advice**

**Sourcing sustainable timber**<br> Available brands of timber are now available that have been modified chemically, such as Accoya® or by heat treatment, such as Thermowood. Generally, these products provide the sustainability of softwoods with the stability and durability normally associated with hardwoods. The different modification processes affect the performance of the timbers in different ways. Consult the manufacturer for specific details.

**Available species**<br> Consult your local timber merchant or Timber Trade Federation member for specific details. See Timber Trade Topic 1 – Sourcing Sustainable Timber for further information. See Wood Campus CPD module – Producing Sustainable timber and timber trade federation member for further information.

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**Technical information**

- **UK grown species**
  - [www.forestry.gov.uk](http://www.forestry.gov.uk)

- **Swedish grown species**
  - [www.swedishwood.com](http://www.swedishwood.com)

- **American species**
  - [www.americанhardwoods.com](http://www.americанhardwoods.com)

- **Further information and advice**
  - [www.trada.co.uk](http://www.trada.co.uk)
Visual strength grading

Visual strength grading uses the grader’s experience to assess each piece of timber according to rules that define the size, type and number of strength-reducing characteristics allowed in each grade. Natural strength-reducing features include knots, wane (the uneven edge caused by a residue of bark) and the slope of the grain. Other strength-reducing features, such as splits or shakes (the splitting of the wood fibres along the grain) may have developed as a result of drying.

The grader assesses each piece and stamps it with the appropriate mark.

Machine strength grading

Machine grading is based on the relationship between strength and stiffness, and is best suited to high volumes of timber of similar species and cross section. The machine grades each piece and stamps it with the appropriate mark.


STRENGTH-GRADING

For more information on strength-grading timber, visit TRADA www.trada.co.uk

TOPIC CHECKLIST

- Does the project need strength-graded timber?
- Do you know enough about grade-marking to be sure you’ve got the right timber?
- Store strength-graded timber in a dry and well-ventilated area away from direct heat sources
Understanding the grade mark

Timber marked DRY is graded at a maximum moisture content of 20% and should be transported, stored and installed in the building in a manner that does not allow this moisture content to be exceeded.

Although moisture content of 20% or less is permissible for internal use, further shrinkage is likely as the timber dries in service. For example, timber joists used in intermediate floors may dry to around 12% moisture content.

The species is shown on the grading stamp by a code such as WPPA (European redwood/pine or whitewood/spruce) or WPNN (British Corsican/Scots pine). GS (General Structural) and SS (Special Structural) are the visual grades of the timber. A supplier’s stamp might look like this:

Strength grades

The strength of a piece of timber depends on a combination of the strength of the timber species and the grade of the individual piece. A high grade of timber from a weaker species may be just as strong as a low grade of timber from a strong species.

To make specifying easier, species and grades are grouped into strength classes of similar strength for softwoods and hardwoods. In both cases, higher numbers indicate stronger timber.

The most common strength classes for softwoods are C16 and C24. TR26 is a class specific to trussed rafters.

Hardwoods range from D18 to D70.

The table below shows some species and grades commonly used in UK construction are grouped into strength classes.
Spans for engineered wood products and I-joists

The introduction of specially engineered timber products, such as glulam beams, I-joists and metal web joists provides solutions across a larger range of depths and spans, and shrinkage after installation is likely to be smaller.

When using these products please refer to the manufacturer’s own literature and span tables, which are usually available from your timber supplier.

The load a member can carry depends on several factors, including its span, thickness, width and species. Usually, the deeper and wider the section, the longer the span.

Span tables determine the size of a timber member of a particular strength class required for a given span, as well as the maximum spacing between each section or timber member.

The following examples, which apply to solid timber members, give an illustration of how to use span tables for domestic floor joists at 400mm centres. Always consult Eurocode 5 Span Tables when calculating spans.

### Permissible clear spans for domestic joists spaced at 400mm

<table>
<thead>
<tr>
<th>Joist size (mm)</th>
<th>Max span (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 x 95</td>
<td>1.61 C16</td>
</tr>
<tr>
<td>47 x 95</td>
<td>1.72 C16</td>
</tr>
<tr>
<td>38 x 220</td>
<td>4.06 C16</td>
</tr>
<tr>
<td>47 x 220</td>
<td>4.36* C16</td>
</tr>
<tr>
<td>38 x 95</td>
<td>1.99 C24</td>
</tr>
<tr>
<td>47 x 95</td>
<td>2.05 C24</td>
</tr>
<tr>
<td>38 x 220</td>
<td>4.52 C24</td>
</tr>
<tr>
<td>47 x 220</td>
<td>4.85 C24</td>
</tr>
</tbody>
</table>

*Two additional joists required - see Eurocode 5, Section 4.1.5

### Permissible clear spans for domestic joists spaced at 600mm

<table>
<thead>
<tr>
<th>Joist size (mm)</th>
<th>Max span (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 x 95</td>
<td>1.32 C16</td>
</tr>
<tr>
<td>47 x 95</td>
<td>1.47 C16</td>
</tr>
<tr>
<td>38 x 220</td>
<td>3.54 C16</td>
</tr>
<tr>
<td>47 x 220</td>
<td>3.81 C16</td>
</tr>
<tr>
<td>38 x 95</td>
<td>1.54 C24</td>
</tr>
<tr>
<td>47 x 95</td>
<td>1.70 C24</td>
</tr>
<tr>
<td>38 x 220</td>
<td>3.95 C24</td>
</tr>
<tr>
<td>47 x 220</td>
<td>4.25 C24</td>
</tr>
</tbody>
</table>

Changing to 600mm centres will change the span distances for the same timber sizes.

So if you wanted to span four metres at 600mm centres, you could use the lighter-weight option of 38mm x 220mm C24 instead of 47mm x 220mm C16.
TREATED TIMBER
For more information, visit our industry technical expert, the Wood Protection Association www.wood-protection.org

TOPIC CHECKLIST
- How durable does the timber need to be for my project?
- Is the timber species naturally durable?
- If not, has it been pressure-treated to the right Use Class?
- Has my supplier given me documentary evidence to prove it?
- Have I treated any cut or notched timber?

How naturally durable are timber species?
Many hardwood species are naturally durable and can be used outdoors untreated, but they are expensive and supplies of certified timber are limited. European oak has been re-classified as Durability Class 2-4; if you are using it outdoors, make sure it meets Durability Class 2-3.

Some softwoods are relatively durable, but most will need preservative pressure-treatment if used outdoors or in humid conditions. They are inexpensive, and certified supplies are plentiful.

Modified timbers, such as Accoya™, provide durability with sustainability, but are expensive and may need specialist stainless steel fixings.

Treatment processes and preservative chemicals
The chemicals used in wood preservatives comply with current EU regulations. They contain specifically targeted biocides that are designed to present a minimum hazard to the wider environment. There are two main types of pre-treatment processes, both carried out by timber suppliers, merchants or joinery companies, in enclosed and strictly controlled industrial vessels.

Vacuum, high-pressure treatment
Suitable for the full range of end uses, but particularly for external applications. Both in and out of ground contact, it provides a 15 to 60-year service life. The preservative is forced deep into the cellular structure of the timber, which generally has a green tint. Additives can give either a rich brown colour, usually for fencing and landscaping timbers, or extra water repellency for decorative external timbers, such as decking and cladding timbers.

Double vacuum, low-pressure treatment
Used for building and joinery timbers in Use Classes 1, 2 and 3c to deliver a 30 to 60-year service life. Treatment provides an effective ‘envelope’ protection around the timber and leaves the colour virtually unchanged. A colour indicator, as well as water-repellency, can be added to the treatment if required.

Cutting or notching will expose untreated timber, which should be treated with a generous coat or two of brush-applied end-grain sealer or preservative.

<table>
<thead>
<tr>
<th>Use Class</th>
<th>Service situation</th>
<th>Application examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal: permanently dry</td>
<td>Pitched roofs; floor boards; architrave; Internal joinery; timbers in upper floors not built into solid external walls.</td>
</tr>
<tr>
<td>2</td>
<td>Internal: occasional wetting</td>
<td>Tiling battens; frame timbers in timber frame houses; timber in pitched roofs with high condensation risk; timbers in flat roofs; ground floor joists; sole plates (above dpc); timber joists in upper floors built into external walls.</td>
</tr>
<tr>
<td>3c (coated)</td>
<td>External: out of ground, frequent wetting</td>
<td>External joinery; roof soffits, fascias and bargeboards; cladding, valley gutter timbers; external load bearing timbers.</td>
</tr>
<tr>
<td>3u (uncoated)</td>
<td>External: out of ground, frequent wetting</td>
<td>Fence rails and boards; gates; agricultural timbers not in soil contact; landscaping and decking timbers not in contact with the ground.</td>
</tr>
<tr>
<td>4</td>
<td>External: in permanent ground or water contact</td>
<td>Fence and deck post; gravel boards; agricultural timbers in soil; earth-retaining walls; poles; sleepers, playground equipment; lock gates; jetties and boardwalk support.</td>
</tr>
<tr>
<td>5</td>
<td>External: in permanent ground or water contact</td>
<td>Marine piling, piers and jetties, dock gates, sea defences, ships hulls.</td>
</tr>
</tbody>
</table>
What’s the right treatment Use Class for the job?

Ask your supplier whether the timber has been treated appropriately for its end use.

Timbers destined for Use Class 4 situations will be permanently exposed to wetting in either ground or fresh water contact.

For optimum durability it is important to ensure the correct specification has been used. Make sure you ask for timber treated to Use Class 4.

Further information and advice
See other Timber Trade Topic sheets and information on www.woodcampus.co.uk:
- Cladding
- Decking
- In the Garden

Find more information at www.wood-protection.org including a free download of the WPA manual Industrial Wood Protection.¹

Key

<table>
<thead>
<tr>
<th>Application</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roof timbers (dry)</td>
<td>1</td>
</tr>
<tr>
<td>2 Roof timbers (risk of wetting)</td>
<td>2</td>
</tr>
<tr>
<td>3 Tiling battens</td>
<td>2</td>
</tr>
<tr>
<td>4 Barge boards, fascias, soffits</td>
<td>3c</td>
</tr>
<tr>
<td>5 Timber frame components (except sole plates)</td>
<td>2</td>
</tr>
<tr>
<td>6 Frame sheathing (plywoods)</td>
<td>2</td>
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<tr>
<td>7 External cladding</td>
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<td>8 Battens for external cladding</td>
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<td>9 First floor joists</td>
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<td>10 Ground floor joists</td>
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<td>11 External joinery</td>
<td>3c</td>
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<tr>
<td>12 External doors</td>
<td>3c</td>
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<td>13 Sole plates above dpc</td>
<td>2</td>
</tr>
<tr>
<td>14 Sole plates below dpc</td>
<td>4</td>
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<tr>
<td>15 Decking (out of ground contact)</td>
<td>3</td>
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<td>16 Decking (in ground contact)</td>
<td>4</td>
</tr>
<tr>
<td>17 Fence posts</td>
<td>4</td>
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<tr>
<td>18 Fence panels</td>
<td>3</td>
</tr>
<tr>
<td>19 Garden products</td>
<td>3-4</td>
</tr>
<tr>
<td>20 Garden products (in water contact)</td>
<td>4</td>
</tr>
</tbody>
</table>

¹Manual: Industrial Wood Protection
Specification and Practice
WOOD COATINGS

Fore more information, visit out industry technical expert, the Wood Window Alliance www.woodwindowalliance.com

TOPIC CHECKLIST

- Are you using the right timber?
- Is it designed to shed water?
- Do you want a paint or a stain?
- Are you using water-based micro-porous paint?
- How often will you need to redecorate?

1. Factors affecting coatings performance

To get the most out of a coating, you need to consider the timber you are using and how your joinery is designed.

Is the species stable in fluctuating moisture conditions?
The dimensional stability of the timber species and its moisture content are key influences on coating performance.

Some species show significant dimensional change with changes in humidity. The more stable the species, the less likely it is to suffer surface splits, stress or open joints; and the longer coating life it will give.

Oak, for example, though naturally resistant to biodegradation, is prone to surface splitting, which disrupts coatings and requires frequent maintenance.

Softwood timber that has been engineered or chemically modified, such as Accoya™, has good dimensional stability.

Exterior joinery should have a moisture content of 12%. If it’s much lower, the timber will tend to swell as it absorbs moisture. Too high a moisture content will compromise coating adhesion.

Does it have knots?
Knots are attractive in the original wood and under translucent finishes. However, particularly with opaque finishes, they can cause tannin staining, resin bleed and surface defects.

Modern coatings and fillers can minimise, but not totally eradicate, knot staining, and there is no preventative solution to resin bleed, which although unsightly does not affect service life.

The use of laminated, engineered or modified timbers overcomes most of these problems by eliminating knots and typically producing a more stable substrate.

For further information, see BS EN 942.

Is it designed correctly?
Moisture ingress is the most common cause of premature coating failure. There are three key design features that help eliminate water traps and moisture ingress:

- Rounded edges
- Sloping cills
- Capillary gaps

The main elements of best practice joinery design and assembly are detailed in BS EN 644.

Is any end-grain sealed?
End-grain is particularly vulnerable to moisture, and early failure is often seen at lower joints and corners where the end-grain is exposed.

Timber’s natural movement means that joints tend to open up over time. When a gap opens, exposed and unprotected end-grain will absorb moisture much faster than the surrounding timber.

End-grain must be sealed with a proprietary sealer designed for this purpose. Construction joints and mitred joints should be ‘V’ cut and neatly filled with a proprietary joint sealer. This provides a seal and accommodates a small amount of movement before the joint is exposed.

Coatings are principally applied for decorative reasons, though they also protect the timber surface against:

- The effects of weathering
- UV degradation
- Moisture ingress

Modern, factory applied, opaque coating systems typically perform well for up to 8 years between maintenance cycles. However, the selection of coating system, timber species, joinery, building design and exposure conditions all influence performance.

If you wish to use a ‘slightly durable’ or ‘not durable’ wood outside, you should ensure the wood you buy has been pressure-treated with preservatives.

Factory-finished opaque paint coating.
2. Types of coating

Use water-based micro-porous acrylic products specially formulated for external use on timber. There are two types of products used in wood finishing:

- **Stains**, which are used to colour the timber substrate but have no film build and offer limited protection. They typically contain a low level of pigment to enhance the colour of the wood, and some resin to stabilise the surface. Stains are normally used indoors on furniture, and outdoors on fencing, sheds and decking, where they normally require annual maintenance.

- **Paints**, which provide thick film build and protect as well as decorate the timber. They are supplied as either solid coloured (opaque) or translucent products, which have much lower pigment content, allowing the wood surface and structure to remain visible below the paint film.

**Acrylic paint**

Most modern joinery paints are based on water-borne acrylic resins. Acrylics have largely replaced solvent-based alkyd paints because of their flexibility, which helps accommodate timber’s natural movement, and so minimises flaking and cracking of the paint finish. Acrylics also resist yellowing in sunlight and so maintain their colour better.

**UV protection**

Solid paint colours generally require less frequent maintenance than translucent shades, as their pigmentation helps protect the timber surface from UV degradation, which in turn degrades the paint film integrity.

Totally clear (colourless) paints, provide very little UV protection, so require frequent maintenance and are usually not recommended for external use.

Very dark colours absorb heat from sunlight, which encourages resin bleed and cracking on some timbers as their surface dries out.

3. Paint systems

Film thickness is important for paints. Too little, and the timber will not be fully protected. Too much will not significantly improve performance and won’t look right.

A factory finish will always provide better protection than site applied brushing. Factory-finished products, like windows, should have a minimum dry film thickness of 120µm on exposed surfaces, and 60µm on recesses and closures.

Opaque paint systems are normally composed of two paints - a primer and a topcoat. As well as providing good adhesion to the wood and a smooth uniform surface for the topcoat, primers may also include additives to resist staining from knots or tannin extractives from hardwoods. The topcoat is optimised to give good aesthetic performance and weather resistance.

Translucent systems are composed of a base stain and topcoat, both of which are lightly tinted to give some UV protection to the timber surface and enhance its colour and uniformity. The base stain is designed to penetrate the timber substrate to give UV protection, colour and improve the adhesion of subsequent topcoats. Used alone, base stains provide limited long-term protection and need to be over coated with translucent topcoats to achieve an acceptable life to first maintenance.

4. Maintenance

All exterior joinery should be washed down annually. Spot repair any minor areas of coating damage, shakes or open joints as soon as possible.

South-facing joinery will need re-coating soonest because of its exposure to the sun and joinery in exposed areas, such as coastal sites, hills or multi-storey buildings will need more frequent maintenance.

Factory-finished joinery will need less frequent maintenance and less onerous preparation than traditional joinery.

Here’s an example of maintenance frequencies for factory-finished windows:

<table>
<thead>
<tr>
<th>Coating type</th>
<th>Window position</th>
<th>Moderate climate: Non-coastal areas and ground floor</th>
<th>Hard climate: Within 1/2m of coast-line, second floor or above, or on a hillside</th>
<th>Extreme climate: High altitude or exposed coastal areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>White or light-coloured paint</td>
<td>Set back</td>
<td>10 years</td>
<td>7 years</td>
<td>7 years</td>
</tr>
<tr>
<td></td>
<td>On building face</td>
<td>8-10 years</td>
<td>5-7 years</td>
<td>4-6 years</td>
</tr>
<tr>
<td>Dark-coloured paints and dark trans lucrants</td>
<td>Set back</td>
<td>6-8 years</td>
<td>4-6 years</td>
<td>3-4 years</td>
</tr>
<tr>
<td></td>
<td>On building face</td>
<td>4-6 years</td>
<td></td>
<td>3-4 years</td>
</tr>
<tr>
<td>Light translucents (e.g. light oak or pine)</td>
<td>Set back</td>
<td>3-4 years</td>
<td>2-3 years</td>
<td>1-2 years</td>
</tr>
<tr>
<td></td>
<td>On building face</td>
<td>2-3 years</td>
<td></td>
<td>1-2 years</td>
</tr>
</tbody>
</table>
Redecoration
With factory-finished joinery, little preparation is necessary – just give a light abrasion to provide a key for the paint, wipe down and apply one or two top coats with a long-haired synthetic brush.

Use a water-based micro-porous acrylic paint. You won’t need to decorate tricky areas that aren’t exposed to the sun.

Any bare wood should be primed before top-coating.

If there is any resin exudation, do not try to remove it when it’s fresh and sticky; wait for it to oxidise and brush off.

See Wood Window Alliance Advice Note Maintenance Guidelines for Timber Windows and video Redecorating factory-finished wood windows.

Further information
British Standards

Wood Campus modules
Wood Coatings and Preservatives
Wood Window Alliance
Maintenance Guidelines
Redecorating factory-finished windows
British Woodworking Federation
Introduction to timber coatings
Wood Protection Association

STORING TIMBER ON SITE

TOPIC CHECKLIST
- Plan deliveries of factory-finished products to be ready when you want to install them
- Keep all timber products protected from rain, surface water and sunlight
- Before work on the site begins, consider the type and size of indoor or undercover storage you might need
- Check the moisture content of your timber products on delivery and report to your supplier if they don’t comply with the specification
- Check products have been properly covered for transit from the factory or supplier, and there is no evidence of damage
- Use the correct mechanical handling gear for unloading and storage and avoid edge damage, common on sheet materials
- Leave any existing protective coverings in place
- Ensure wet trades have finished before installing timber
- Make sure the building is adequately ventilated throughout the process
- Where there are openings, such as windows and doors, have them glazed or covered, even if only as a temporary measure temporary before final fitting.

Check condition and moisture content on delivery
Protect against sunshine
Protect against precipitation

STORING TIMBER ON SITE

Do not unwrap
Car cassing timber

All timber, even carcassing, benefits from good covering and storage. If you have to store carcassing outside:

- Store on dry, even ground that doesn’t hold water
- If possible, spread the area with gravel or sand
- To help prevent warping with changing conditions, stack the timber flat on equal sized bearers of, say 75mm x 75mm. Put one bearer towards each end of the timber and one in the middle
- Use a waterproof cover over the timber, but allow air circulation around the timber. This will not only keep it dry but will also protect it from direct sunlight, which could warp the timber.

Joinery or manufactured and factory-finished timber products

These products, such as windows and doors, are expensive and can be easily damaged. Typically delivered direct from the factory ready for installation, these products will have been manufactured to a precise moisture content and wrapped to protect the finish. Take extra care when storing them under cover:

- Without unwrapping the product, check there has been no damage on delivery
- Where possible, store in a well ventilated area, preferably the building they are to be installed in once the building has properly dried out
- If this isn’t possible, use well ventilated temporary storage, such as a garage or large shed with some form of heating control to maintain the factory moisture content
- Store vertically, taking care to avoid damage caused by the ironmongery
- Store in the order you’ll be using the product.

Some of the problems that can result from poor site storage:

- Increased wetting of the timber leading to a higher moisture content
- Defects occurring in the timber because of this, shrinkage etc. leading to the product being unfit for purpose
- Damage to metal fixings, for example metal plates on roof trusses.

Sheet Materials

- Preferably store in similar conditions to factory finished products
- Do not store interior quality sheet materials outside
- If possible, always store flat on equal sized bearers positioned at maximum 600mm centres. This will help to keep the sheets level, and away from direct ground contact
- Keep bearers horizontally aligned to avoid any distortion of the boards
- If storing materials thinner than 6mm, use a thicker sheet of material, say 18mm, under them to provide additional support
- When storing large numbers of sheet materials, split them up into 10-15 boards, stuck in line with bearers. This will provide even more protection against distortion, especially if they are not going to be used quickly
- When using factory-finished and speciality sheet materials indoors, try to store them as described for a minimum of 48 hours in the dried-out building they are going to be fixed in.

Moisture Content

A timber product should arrive on site with the right moisture content. Changes to moisture content can give you all sorts of problems. Make sure you:

- Check the timber’s moisture content’s right on delivery
- Store timber products inside the building where they are going to be used
- If this isn’t possible, try and provide good quality temporary covering
- If you have to store timber products outside, under cover, make sure there is adequate ventilation to help prevent changes to moisture content
- Be cautious when storing timber products in newly plastered buildings or near newly concreted floors, as the moisture in the atmosphere could be high. Try and wait until the building has dried out. Use temporary storage in this case - a garage or shed, but make sure it has good ventilation.

Certified products

- Try and store separately from your other site products to allow easier identification of the product
- If you are project managing, ensure that they have a valid chain of custody certificate.

Roof trusses and structural timber components, e.g. I-joists

- As these are bulky items, schedule site deliveries so that you are using the products as soon after delivery as possible
- Store vertically with trestle support and bearers underneath the metal connecting plates
- If you have to store horizontally, ensure you use evenly-sized timber supports to keep them off the ground placing them underneath each truss node
- Cover and protect as previously described
- Take care to only lift trusses at the designated fixing points
- Once fixed to form the roof, cover with felt as quickly as possible to provide additional protection.

Timber Frame Panels

- Make sure these factory-engineered components are stored side up on equal sized bearers at even intervals
- Cover and protect as previously described.

Cover
Recommended maximum moisture content for timber/timber products at the point of installation.

<table>
<thead>
<tr>
<th>Use</th>
<th>Moisture Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcassing timber</td>
<td>22%</td>
</tr>
<tr>
<td>Joinery</td>
<td></td>
</tr>
<tr>
<td>Internal – unheated buildings</td>
<td>12-16%</td>
</tr>
<tr>
<td>Internal – buildings heated to 12-21°C</td>
<td>9-13%</td>
</tr>
<tr>
<td>Internal - buildings heated to over 21°C</td>
<td>6-10%¹</td>
</tr>
<tr>
<td>External</td>
<td>12-19%</td>
</tr>
<tr>
<td>Flooring timber¹</td>
<td></td>
</tr>
<tr>
<td>Softwood structural</td>
<td>18%</td>
</tr>
<tr>
<td>Softwood and hardwood decorative</td>
<td>10-12%</td>
</tr>
<tr>
<td>With underfloor heating²</td>
<td>8-10%</td>
</tr>
</tbody>
</table>

¹ May only be available by special order. Pay special attention to maintaining moisture content.
² Seek manufacturer’s advice for buildings with continuous or underfloor heating.

NB: Keep timber waste in a specific recycling container.
Keep preservative-treated or fire-treated timber waste separate.

Further information and advice
Advice on stacking and handling wood products safely is available from the Health and Safety Executive (www.hse.gov.uk).

Information on the care of trussed rafters can be found in the Trussed Rafter Association’s Technical Handbook and its Product Data Sheet No 3: Guidelines for the Storage and Erection of Trussed Rafters (www.tra.org.uk).

For further information on storing timber, contact the Timber Trade Federation (www.ttf.org.uk).

What are the different types of fixings?
There are two groups of mechanical fasteners, defined by how they transfer the forces between the connected members:

- Dowel-type fasteners, such as nails, screws, bolts and dowels, which transfer the load along the shank or length of the dowel
- and connectors, such as metal plate fasteners, which carry the load at the surface of each member.

Joints can be fixed by other methods, such as adhesives or carpentry and joinery techniques or by a combination of methods.

Generally, bolts and dowels are heavier duty fasteners than screws or nails, and have the greatest individual load-bearing capacity.

Screws are normally chosen instead of nails for their demountability and better pull-out resistance.
Dowel-type fasteners

Nails
Nails are used primarily for connecting timber, steel or wood-based panel products together, sometimes in conjunction with flat or shaped metal fittings, typically in timber frame stud walls and floor diaphragms.

The most common is the round wire nail. Nails with a square cross-section are also suitable for similar applications. Oval nails are often used to reduce the risk of splitting the wood.

Pre-drilling holes for larger nails may be necessary when driving into dense hardwoods, or to prevent splitting in softwoods such as larch and Douglas fir. The hole diameter should be less than 80% of the nail diameter.

Galvanised nails, or those with other forms of coatings, have greater corrosion resistance than uncoated nails, which in turn can have a small effect on the loadbearing capacity.

Screws
Although wood screws can be used for plain timber-to-timber joints, they are especially suitable for steel-to-timber and panel-to-timber joints.

Insert screws by turning, not by driving with a hammer, which will reduce the load-carrying capacity.

The diameter of a screw is measured on the smooth part of the shank, or the outer edge of the thread, and ranges from 6mm to 20mm for coach screws, and from 4mm to 8mm for countersunk screws. The root diameter of most screws in the threaded portion is about 70% of the outer diameter.

The depth of the thread varies from 0.125d to 0.140d and the thread pitch from 0.4d to 0.5d (d being the diameter of the screw). The length of the threaded portion is normally about 60% of the total length of the shank.

Fixing steel balconies to timber frame flats

If the joint has to carry a structural load, the design must be checked by a structural engineer.

Structural design follows BS EN 1995, part of Eurocode 5: Design of timber structures.

Pre-drill for screws with a diameter greater than 5mm to prevent splitting the wood.

Pre-drill and use washers for coach screws, which are available in lengths of 25mm to 300mm. In large connections, they hold timber connectors conveniently in place or replace bolts when only single-sided access is available.

Coach screw Photo: Wurth

Countersunk head

Bolts
Bolts and dowels are used to hold two or more members together to form a joint, generally loaded in shear (across the fastener).

Bolts are usually made from mild steel with a minimum tensile strength of 400N/mm². The most common diameters for use with wood range from 8mm to 30mm. A typical bolt size is M8, meaning metric 8mm diameter.

When installing a bolt, pre-drill the hole up to 1mm larger than the bolt to allow for easy insertion and to reduce the risk that the wood will split on assembly or after drying out.

Bolts should be tightened so that the members fit closely. If the wood shrinks in service, the bolts should be retightened.

Always use a washer under any head or nut in contact with the timber or steel. The diameter of the washer should be at least three times the bolt’s. Its thickness should be at least 0.3 times the bolt’s diameter.

Hidden fasteners are often used for projects such as decking and cladding, where appearance is key.

Not all are suitable for every type of wood, so it is essential to follow the manufacturer’s guidelines.

Because they allow for closer fitting of boards, concealed clips should only be used with timber with a moisture content of 16% or less to avoid problems caused by the natural movement of the wood.

Remember:
• individual boards are difficult to remove once fastened
• installing hidden clips may be more time-consuming than fixing with screws.
**Dowels**

Dowels are generally smooth (but some are ribbed), and available in diameters typically from 6mm to 30mm.

Timber-to-timber joints made with dowels look better than bolted joints and are also stiffer, because dowels are ‘snug’ fitted whereas bolts are ‘loose’ fitting in the hole.

Pre-drill holes with a diameter not greater than the dowel itself, taking care to position them accurately. The most common approach is to restrain the members in their assembled positions and drill through all the members at once.

If steel members are incorporated in a dowelled joint, the holes in the steel members must include a clearance, and due allowance should be made for any extra slip that may occur as a result.

Timber engineered connections are possible in which dowel heads are welded to steel plates. In large dowelled connections it may be necessary to replace some of the dowels with threaded bolts in order to stop the joint from opening laterally.

**Connectors**

Connectors are widely used in place of traditional carpentry joints to connect timber members together, usually in conjunction with a dowel-type metal fastener. Easy to use, they are readily available and do not require complex timber machining. Common types include joist hangers, framing anchors, truss clips and wall ties made of steel plate, sheet or strip.

Mass-produced connectors are usually made from pre-galvanised mild steel, 1mm to 3mm thick. Heavier components, up to 12mm thick, are available for larger structures. Some manufacturers also supply stainless steel components to order.

**Two-dimensional plates**

Punched metal plate fasteners are suited to factory prefabrication and transfer member forces with smaller connection areas than hand-nailed plates. They are widely used with trussed rafters, but also for in-plane joints in other components. Take care in handling, as the joints are flexible out of plane and can be damaged during erection.

**Three-dimensional plates**

These are widely available for many applications, such as joist hangers, as brackets, or as multi-angled connectors. They can be face-mounted or fitted over a girder as ‘stirrup-type’ hangers.

Follow the manufacturer’s instructions and loading guidelines when fixing them. Using the correct number of nails, screws or bolts, and fixing them in the right way, is essential to avoid potential failure.

**Spacings**

The values for spacings and edge distances vary from one fastener type to another, as well as between the various material types and should be designed by an engineer.

Dowel-type fasteners must be spaced at suitable distances from each other and from the ends and edges of timber or wood-based materials to avoid splitting.

**Connectors used with bolts**

Bolted connectors can sometimes be useful in particular situations, such as site-assembled timber-to-timber joints. These connectors transfer any load directly between the surfaces of the connecting members.

Eurocode 5 includes three types of bolted connectors:

- split-ring connectors
- shear-plate connectors
- toothed-plate connectors.

The strength of the connection often depends on the density of the timber. Toothed-plate connectors, for example, cannot easily be used in hardwoods.

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**Further information and advice**

- WIS 2/3-52: Fasteners for structural timber: nails, screws, bolts and dowels, TRADA Technology, 2012
- Ross, P., Hislop, P., Mansfield-Williams, H. and Young, A. Concise illustrated guide to timber connections, TRADA Technology, 2012
- See Timber Decking and Cladding Association website [www.tdca.org.uk](http://www.tdca.org.uk)
ENGINEERED WOOD PRODUCTS

For more information visit our industry technical expert, the Structural Timber Association www.structural-timber.co.uk

TOPIC CHECKLIST

- Would solid wood meet your project’s needs?
- Would sustainable glulam be better than a steel beam?
- Do you want to make a visual feature of the structure?
- Is speed and accuracy important to your building?
- Is your building site in a sensitive area?

What are Engineered Wood Products?

Timber products that have been engineered to remove natural weaknesses and enhance natural strengths. They provide stronger, longer, wider and more stable solutions than natural timber.

They deliver sustainable, low carbon structural solutions with a unique elegance, low weight and natural beauty.

This Topic sheet focuses on the most common structural products:

- I Beams
- Glulam
- LVL (Laminated Veneered Lumber)
- Engineered wood flooring
- CLT (cross-laminated timber panels)

Sheet materials, like plywood, and engineered joinery timber are covered in separate Topic sheets.

The key benefits

- Stronger sections
- Stiffer sections
- Greater stability
- Greater lengths and spans
- Consistency – particularly as they are factory manufactured with lower moisture contents, a benefit when being installed in heated buildings.

I Beams or I Joists

The most widely specified engineered wood product in the UK. Used in residential and commercial construction as load-bearing and non load-bearing members for floors, walls and roofs.

Made with conventional timber or LVL flanges linked with a panel product web, typically OSB. Some joists are made with metal web inserts, making access to services easier.

- Often used instead of the traditional solid timber sections for floor and ceiling joist and for forming wall sections in timber frame style buildings
- Available in a range of flange widths (typically 47–97mm), joist depths (145–450mm) and standard lengths (8, 9, 10 and 12m)
- Products backed by precise calculations, for specifier confidence
- Light-weight and stable
- Designed for ease of services installation.
**Glulam**

A high specification engineered timber beam, with excellent strength, stiffness and dimensional stability, glulam is made from parallel solid timber sections, glued together under high pressure.

- Available in curved sections for forming arches and special features
- Lengths up to 12 meters
- Widths from 38-240mm
- Fire resistance similar to solid timber, with slow charring and strength retention
- Available in visual and non-visual finishes.

**LVL**

LVL is made from rotary-peeled veneers of solid timber glued to form continuous panels, like giant sheets of plywood.

Used where long spans are needed, e.g. roof and floor joists, as well as for forming lintels.

Available in two different styles:

- Parallel wood grain in all the veneers – ideal for joists and beams
- Mainly parallel wood grain with 20% grain at right angles. Gives a uniform stiffness with exceptional dimensional stability and high compression strength.

Benefits include:

- Good bending resistance, tension and compression properties
- Good load bearing characteristics
- Can be used both vertically and horizontally, providing design flexibility
- Available in widths up to 2.5m, which can be cut into narrower widths
- Available in lengths up to 26m.

**Engineered wood flooring**

Provides the look, feel, comfort and durability of a solid wooden floor, with greater stability, minimizing movement due to changes in moisture content.

Particularly suitable for continuous floors that include higher moisture areas, such as bathrooms and kitchens, along with dryer areas, such as living rooms. May be suitable for using with underfloor heating (check manufacturer’s advice).

The tongue and groove boards consist of a solid timber surface bonded to an engineered timber substrate for strength and stability.

Available with a variety of surface veneers and thicknesses.

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**CLT**

Cross-laminated timber panels are large, rigid, solid timber construction sheets used for all elements of a building’s superstructure – walls, floors and roofs.

They are made from kiln-dried, finger-jointed timber planks (typically spruce), cut into sheets and bonded under pressure in perpendicular layers.

CLT is an ideal material for off-site construction, with panels arriving on site machined to precise sizes, including apertures and trunking conduits. Benefits include:

- Exceptional construction speed, with most structures watertight in days
- Exceptional carbon storage because of the volume of timber used, making carbon negative buildings possible
- Suitable strength and stability for multi-storey developments (the UK already has a 10-storey CLT building)
- Clean and quiet construction site with no need for heavy tools
- Relatively low site skills
- High comfort for occupants, with good humidity control from the ‘breathable’ structure.

Panels are available in lengths of up to 22m and widths of up to 3.5m. Floor panels are generally manufactured in 2.4m widths, wall panels in 2.95m widths. Panel lengths are dependent on delivery and site logistics.
FIRE DOORS & DOORSETS

For further information on fire doors and doorsets visit our industry technical expert, the British Woodworking Federation www.bwfcertifire.org.uk

TOPIC CHECKLIST

- Does the project require a fire door?
- Are the doors marked as certified?
- Is the hardware certified and CE-marked?
- Have the doors been modified since they were certified?
- Have you fitted the doors correctly?

What is a fire door?

A fire door has been tested to withstand fire and/or smoke for a specific period of time. It has an intumescent seal designed to expand to fill the gap between the door and the frame. A doorset package includes the door leaf, frame, hardware, intumescent seals and smoke seals. Each component plays a critical role in the doorset’s fire resistance. Changes from the tested specification should only be made with the approval of an appropriate expert authority, such as a UKAS-accredited testing laboratory.

What are the regulations for new buildings?

Building Regs (Approved Document B in England and Wales) specify the requirements for doorsets to protect occupants for a minimum time in different locations in the building. Volume 1 covers domestic houses; Volume 2, all other buildings.

Correct installation of fire doorsets, using compatible fixings and methods, is critical to performance in a fire.

Why choose fire doorsets?

Use fire-resisting doorsets, rather than single ‘fire door’ leaves. A doorset package includes the door leaf, frame, hardware, intumescent seals and smoke seals. Each component plays a critical role in the doorset’s fire resistance.

Changes from the tested specification should only be made with the approval of an appropriate expert authority, such as a UKAS accredited testing laboratory.

Correct installation of fire doorsets, using compatible fixings and methods, is critical to performance in a fire, and certification is void if the specifications are changed.

When is a fire door needed?

Domestic buildings
- In any building of over two storeys
- When installing a loft conversion
- Between the house and an integral garage (must be self-closing)
- In any flat on to common parts.

Non-domestic buildings
- All exit routes must be protected by fire doors.

We recommend specifying certified doorsets for all building projects.

An increasing number of companies are building products covered by a third party certification scheme into their building specifications so as to provide information about specification and product performance.

In addition, major insurers often insist on third party certificated products.

Some buildings, or insurance requirements, may require doorsets giving 90 or 120 mins’ performance. Where Building Regs refer to FD20 doors, use FD30 doors for added protection.

<table>
<thead>
<tr>
<th>Performance requirement</th>
<th>Rating for doors tested to BS 476-22:1987</th>
<th>Rating for doors tested to EN 1634-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 mins’ fire resistance</td>
<td>FD30</td>
<td>E30</td>
</tr>
<tr>
<td>30 mins’ fire resistance with smoke control</td>
<td>FD30S</td>
<td>E30Sa</td>
</tr>
<tr>
<td>60 mins’ fire resistance</td>
<td>FD60</td>
<td>E60</td>
</tr>
<tr>
<td>60 mins’ fire resistance with smoke control</td>
<td>FD60S</td>
<td>E60Sa</td>
</tr>
</tbody>
</table>
Why choose certified doors/doorsets?

Fire doors are life-critical. So it makes sense to use certified product.

Certification schemes, like the BWF-CERTIFIRE Fire Door and Doorset Scheme and BM TRADA’s Q-Mark Fire Door Scheme, ensure doorsets are fit for purpose.

Certified doors leave the factory with clear identification – a label or permanent plug in the door edge. This makes them recognizable as compliant, quality products, traceable for building control approval and any future fire risk assessments.

Use certified doors and doorsets to be sure they will meet the specified performance to:

• protect escape routes from the effects of fire and smoke so occupants can leave safely
• protect the contents and/or structure of the building by limiting the fire spread (an insurance requirement)
• and to permit fire fighting.

Changes from the tested specification should only be made with the approval of an appropriate expert authority, such as a UKAS accredited testing laboratory.

Correct installation of fire doorsets, using compatible fixings and methods, is critical to performance in a fire, as certification is void if the specifications are changed.

Components

Fire doors

• Doorsets: the door comes hung in its frame, complete with all essential hardware and seals.

• Door kits: the door and frame are sold factory-prepared and ready for hanging, complete with compatible components.

• Door leaves: leaves may be supplied unfinished, veneered or painted, and must be matched with the correct size frame and compatible components.

• Door blanks: oversized, unfinished leaves to be trimmed to size, lipped and veneered. They must carry evidence of performance once converted to a doorset. Their specification must match the approval, including manufacturing and all components.

Essential hardware

These vary by doorset design, but include:

• hinges and latches for single-acting doorsets
• door closers where required
• floor springs and pivots for double-acting doorsets.

Check all hardware has test evidence to demonstrate fitness for purpose - only hardware listed on the fire door certificate should be used on a fire door. Fit according to the manufacturer’s specifications, using intumescent gaskets and seals as necessary.

WARNING!

DO NOT cut glazed apertures, or openings, yourself as this will invalidate the fire certificate. This must be performed by a licensed company.

Intumescent seals

These expand with heat, providing a fire stop and thermal insulation. As their expansion properties vary, the type, size and installation must remain exactly as tested for the end use application.

Seals are fitted around the perimeter of the frame or in the edge of the door leaf, to seal the gap between leaf and frame in a fire. Intumescent paper or mastic gaskets are often necessary between ironmongery and timber door components. Ensure seals of the right size and material are fitted in the correct locations as indicated by the fire door manufacturer.

Fire doors that need a glazed aperture, or different aperture, should be supplied straight from the certificated supplier. Fire doors must not be glazed on site - this will invalidate certification.

Smoke seals

Smoke is the biggest cause of death in fires. Even when not specified by Building Regulations, you should consider smoke seals for additional safety. They are fitted to the entire perimeter gap between the doorleaf and the frame and can be:

• brushes built into the casing of the intumescent seal
• flexible fins built into the casing of the intumescent seal
• compression seals fitted into the frame rebate
• automatic drop down seals either face fixed or rebated into the bottom of the leaf, located at the threshold.

Glazing

Wired glass is no longer the only option for FD30 and FD60 doorsets; many systems and glass types are available. The compatible glazing systems relevant to the specific door will be detailed on the fire door certificate.

Installation

Aligning doors

Make sure the door leaf is square in the frame, with an even gap of 2–4mm around the sides and top edge. Set the threshold gap at the bottom edge according to the manufacturer’s specification. Smoke sealing requirements for the doorset may also dictate the size of gap under the door. In the absence of a threshold seal, set a gap of 3mm.

Trimming doors

Some fire door leaves permit limited trimming during installation. Only trim within the allowance stated on the fire door certificate. Identification marks or labels should not be damaged during resizing.

Rebated leaves

Double leaf doorsets with rebated meeting edges must have supporting test evidence as detailed on the fire door certificate. Intumescent protection and ironmongery can differ from a single door, so always check the fire door certificate to ensure compatible materials and specification.

Apertures for glass and transfer grilles

A fire-resisting doorset is an engineered safety device. Any alterations, such as adding glazing apertures, should only be carried out by an approved manufacturer or installer. Do not carry out this work on site as unauthorised alterations to fire door components usually invalidate the certification.
Maintenance
As with any safety device, a fire-resisting doorset and all its components should be checked and maintained on a regular basis (Article 17 of the Regulatory Reform Fire Safety Order 2005 requires that fire safety equipment and devices are maintained in efficient working order and in good repair). Any replacement components should match those originally fitted and be fit for purpose. If the door has to be replaced, it must comply with the appropriate Building Regulations.

Regulations for existing buildings
The Regulatory Reform (Fire Safety) Order 2005 places responsibility in all non-domestic buildings, including the common parts of flats and houses of multiple occupation, on the so-called ‘responsible person’, who must carry out a fire safety risk assessment and implement and maintain a fire management plan. The law applies to you if you are:
- responsible for business premises
- an employer or self-employed with business premises
- responsible for a part of a dwelling where that part is solely used for business purposes
- a charity or voluntary organisation
- a contractor with a degree of control over any premises
- providing accommodation for paying guests.

Fire doors play a major role in the fire safety and protection of ALL buildings covered by the FSO and it is important that fire doors are inspected correctly and maintained in order to ensure compliance.

Failure to do so can place property and lives at risk and is likely to result in criminal prosecution.

IMPORTANT!
The dangers of buying and installing non-certified doors and doorsets and/or the wrong components are obvious. Failure of the door or doorset is likely to occur, putting people and property at risk and resulting in possible prosecution for the manufacturer, supplier and installer.

FLOORING

What are the main types of wood flooring?

Solid wood structural
Square-edge softwood boards, fixed with nails or screws onto support battens. The gaps between the boards will change with changes in moisture. They are normally covered by another material, but sometimes used for a rustic look. Use normal trade stock.

Solid wood decorative
Softwood or hardwood tongue and groove boards. They can be secret-nailed (fixed), clipped (floating) or stuck directly to the sub-floor. The boards must be kiln dried to 8-10% moisture content.

Engineered
Engineered/laminated flooring is more stable than solid wood flooring as it is made from a solid wood layer bonded onto an engineered core, such as plywood. Often recommended for use with underfloor heating, or for areas subject to extreme moisture changes, such as kitchens and bathrooms.

Most engineered wood flooring is now designed with a click system that makes installation simple. Use the manufacturer’s recommended underlay.

Parquet
Use directly over a continuous supporting surface, such as a base of concrete, wood or plywood.
Before you begin

- Allow the wood to stabilise to the room’s moisture conditions for at least 24hrs (48hrs for hardwood) before fixing
- For installations over under floor heating, ensure the moisture content of the boards is between 6% and 8% at the time of laying
- Ensure that any cement sub-floors register a relative humidity (RH) reading of no higher than 75% (65% or less for under floor heating installations or for floors intended as stick-down installations) when tested with a hygrometer
- Ensure all wet trades (plasterwork, screeds etc.) have had time to dry out fully before installing the floor.

Choosing the right species for your job

For most domestic use, any species with a medium or small movement will be fine. For commercial use or for areas with heavy traffic, choose a species with high wear resistance.

For underfloor heating, or for areas subject to extreme moisture changes, choose low movement species or engineered flooring (refer to manufacturer’s guidelines).

Board thickness

When fixing boards to support battens or joists, choose a thickness of board appropriate to the span of the batten or joist to avoid deflection and squeaking.

### Species and dimensional movement

<table>
<thead>
<tr>
<th>Movement classification</th>
<th>Commonly used species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>iroko, teak, merbau, American mahogany, dark red meranti, western hemlock</td>
</tr>
<tr>
<td>Medium</td>
<td>European redwood/whitewood, ash, European oak, American white oak, maple, sycamore, European cherry</td>
</tr>
<tr>
<td>Large</td>
<td>beech, birch, sweet chestnut</td>
</tr>
</tbody>
</table>

### Wear resistance

<table>
<thead>
<tr>
<th>Level of traffic</th>
<th>Suggested species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Domestic</td>
<td>European redwood/whitewood, idigbo, European birch, Douglas fir, and light red meranti</td>
</tr>
<tr>
<td>Normal</td>
<td>teak, afzelia, iroko, dark red meranti, merbau and sapele</td>
</tr>
<tr>
<td>Heavy</td>
<td>European beech, European oak and maple</td>
</tr>
</tbody>
</table>

Fitting a solid wood floor

Open packs and store boards where they will be fitted for at least 24 hrs (48hrs for hardwoods) to allow acclimatisation. Use a 10mm spacer block against all walls to allow natural movement, covering the gap with skirting. Consider an acoustic underlay.

If fixing to joists, it’s a good idea to fit a half-inch plywood subfloor to provide a consistent surface. If you’re not using a click system or adhesive underlay, ‘secret nail’ through the tongues and glue ends.

If ‘floating’ over an existing floor, use adhesive along the upper edge of the tongue to secure the boards. If you are laying the floor on concrete, make sure it’s dry, and use a damp-proof membrane.

Cut round pillars, angles, etc. Measure the amount you need to cut away, leaving room for an air gap. Lay the board on top of the outside row, exactly in its final position and mark it where you intend to cut, using a Tri square.

Use a hammering block, a punch to ‘secret nail’ through the tongues and a special tool to fit the final board. Before laying the last row, adjust the width of the final board by cutting lengthways with a circular saw.

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### Joist spans for domestic use

<table>
<thead>
<tr>
<th>Finished board thickness</th>
<th>Maximum span (centre to centre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16mm</td>
<td>505mm</td>
</tr>
<tr>
<td>19mm</td>
<td>600mm</td>
</tr>
<tr>
<td>21mm</td>
<td>635mm</td>
</tr>
<tr>
<td>28mm</td>
<td>790mm</td>
</tr>
</tbody>
</table>
Underfloor heating
Follow the manufacturer’s guidance. Use engineered timber or species with small movement characteristics. Maximum board widths of 75mm are recommended. Ensure the moisture content of the boards is 6% to 8% when the floor is laid.
Any underfloor hot water or heating pipes should be well lagged.

Further information and advice
BS 8201:2011 Code of practice for installation of flooring of wood and wood-based panels, BSI
The Timber Trade Federation: www.ttf.org.uk
Wood Campus: www.woodcampus.co.uk
Technical information is available from www.trada.co.uk

Installation of flooring over underfloor heating ducts. Photo: Junckers

ROOF BATTENS
For more information on battens, visit the Timber Trade Federation www.ttf.org.uk

TOPIC CHECKLIST
- Do my battens comply with BS 5534?
- Are they at least 38mm x 25mm?
- Are you using the correct nails?
- Is the roof likely to face extreme weather

What is the British Standard for battens?
BS 5534:2003 states the requirements for roofing battens, and includes information about the species, grades, treatment and required markings.
Most organisations, for example NHBC (National House Builders Council) LABC (Local Authority Building Control) and NFRC Co-partnership require fully-compliant battens.
NHBC now require that timber used for battens should be indelibly marked to demonstrate compliance with BS 5534.

Roof battens are not just to provide footholds for roofers, but are an important part of the roof structure itself.
They take the loads imposed by slates or tiles as well as loads from snow and wind.
Quality battens are increasingly seen as an important part of forming a secure roof.
Although not a legal requirement, BS 5534 sets out the standard for battens. The best way to ensure battens are fit for purpose is to choose those marked as BS 5534-compliant.
How can I be sure the battens meet BS 5534?

Manufacturers often add a coloured dye to their preservative treatment process, but this is not enough to show the battens meet BS 5534. Every batten must be indelibly marked showing:

- It has been graded to BS 5534
- Its size
- The suppliers’ name
- The timber species
- A third-party certification scheme.

Why use BS 5534-compliant battens?

Graded battens are usually graded, with the exception of a final grading for knots and wane.

Standard/Ungraded battens may be smaller than those allowed in BS 5534 or have other strength-reducing characteristics.

BS 5534 factory-graded battens may be more expensive than ungraded or partially graded battens, but they are the best choice because:

- They avoid time spent on site grading, which is not best practice
- And time spent marking each batten, which is sometimes a contractual requirement
- They result in less wastage, which can be as high as 40%
- And reduced liability if there is a problem with the overall roof.

Tips on fixing battens

British standards BS 5534 and BS 8000-6:1990 give the information you need for fixing and installation:

- Ensure battens are fixed to rafters at centres not more than 600m apart
- Ensure battens span at least three trusses and are therefore more than 1.2m long
- Batten moisture content (after treatment) should not exceed 22%
- Use round shank nails, 10 gauge and usually 65mm long
- Use zinc coated nails where extreme weather (e.g. coastal conditions) might be experienced
- Use galvanised nails when fixing treated timber battens to avoid corrosion
- Take some time in the setting out process, as this will help reduce the number of cuts to tiles and slates
- Ensure both the horizontal and perpendicular courses of the battens are true
- Nail through the middle of the batten into the middle of each rafter
- Cut joints square and butt joint at the centre of each rafter, providing maximum support and fixing
- Angle nails inwards to the rafter centre for greater holding
- Replace any battens that have split due to nailing.

Sizes

Ensure battens are a minimum size of 38mm x 25mm.

For longer spans than those given here, or for other loading conditions, battens should be designed in accordance with Annex E of BS 5534.

The tolerances for battens are:

- +/- 3mm on width
- -0/+3mm on thickness
- Use 50mm x 25mm when using slates.

Minimum timber batten sizes for roofing and vertical work

<table>
<thead>
<tr>
<th>Application</th>
<th>Minimum batten size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Up to 450mm span</td>
</tr>
<tr>
<td>Slates (double-lap)</td>
<td></td>
</tr>
<tr>
<td>Natural: sized or random</td>
<td>50 x 25</td>
</tr>
<tr>
<td>Fibre-cement or concrete</td>
<td>38 x 25</td>
</tr>
<tr>
<td>Clay and concrete tiles</td>
<td></td>
</tr>
<tr>
<td>Double-lap</td>
<td>38 x 25</td>
</tr>
<tr>
<td>Single-lap</td>
<td>38 x 25</td>
</tr>
</tbody>
</table>

Always walk on the rafter line when installing the slates and tiles. Avoid walking on the battens between trusses and rafters.

For trusses where the batten gauge is greater than 200mm

- DON’T have more than one joint on any four consecutive battens on the same support.
- DON’T have more than three joints in any 12 consecutive battens on the same support.
How durable are battens?

Most battens are supplied with an industrially applied treatment process designed to provide a 60-year design life under Use Class 2. The relevant Standard is BS 8417:2011 Preservation of Wood.

Cut ends should be treated with brush-applied preservative, especially those in contact with mortar.

Further information and advice
Building Research Establishment (BRE):
www.bre.co.uk
BS 5534:2003+A1:2010 Code of practice for slating and tiling (including shingles), BSI
BS 8000-6:1990 Workmanship on building sites. Code of practice for slating and tiling of roofs and claddings, BSI
BS 8417:2011 Preservation of Wood. Code of Practice, BSI
HSE HSG33 Health and safety in roof work, available at www.hse.gov.uk/pubns/books/hsg33.htm
The United Kingdom Accreditation Service (UKAS):
www.ukas.org

Sheet Materials

For more information visit the Timber Trade Federation www.ttf.org.uk

TOPIC CHECKLIST

- Does your structural plywood meet Eurocode 5?
- Are the sheet materials you are using fit for purpose?
- Are they CE marked?
- Are you using the right grade for the job?
- Are the sheets marked as FSC or PEFC certified?

What are sheet materials?

Sheet materials are structural and non-structural panels engineered from both solid timber and recycled timber using different types of adhesives.

The most widely used products in construction are plywood, medium density fibreboard (MDF) particleboard (chipboard) and oriented strand board (OSB).

They all have different grades for different uses. It is important to use the correct grade for the job.

Plywood

A versatile building material with a wide range of applications, from wall and floor sheathing, to designer interiors and glider fuselages. This Topic sheet deals mainly with structural plywood.

Softwood plywood is usually made from European spruce and mainly used in construction. Hardwood plywood is usually European birch, with clearer grades available for decorative use.
**Marine plywood**

It has good weather resistance and strength properties in compliance with specific standards such as BS EN 13986 (plywood in marine use), rather than the structural standard code Eurocode 5, and should not be used structurally. Marine plywood must have third party accreditation to demonstrate full compliance with BS 1088: 2003 Marine Plywood. See the TTF guide to Marine Plywood.

**Plywood for formwork**

Durability, glue bond performance and resistance to decay may have to be considered, if not appearance and strength. Suitable sheets are available from Scandinavia, North America and the Far East.

**Structural plywood**

Plywood for structural loadbearing applications, such as walls, floors and roofs, must be strong enough for the loading. Always use plywood listed in Eurocode 5, which typically comes from Sweden, Finland, America or Canada.

They must also comply with the Construction Products Regulation (CPR) by meeting the requirements of BS EN 13986, or by other means.

Must carry the CE mark to demonstrate CPR compliance and fitness for a particular purpose.

**Plywood for roofing**

Spruce plywood is ideal as a roofing membrane, strong, light-weight, easy to handle and fully compliant with Eurocode 5. Precisely dimensioned, the panels are easily converted into durable surfaces, such as the foundation for the construction of moisture barrier roof structures.

They can also be fitted together to form safe working surfaces while the roof installation is being carried out. In attic spaces, the foundation panels can be left uncovered.

- Sheet materials must comply with the Building Regulations and be fit for purpose.
- They must comply with the Construction Products regulation (CPR) through compliance with BS EN 13986
- Must carry a CE mark to indicate CPR compliance and fitness for purpose
- Check the characteristics of the sheets you are using for their suitability for the job, especially when using sheets for structural use
- Look for FSC or PEFC marks to show the timber is from legal and sustainable sources
- Using plywood structurally? Make sure the plywood you use is listed in Eurocode 5 (ref the earlier BS 526802:2003).

**Installing plywood for roofing**

Fitting plywood sheets to roof trusses to form a solid base for battens is known as sarking. It results in a robust roof structure that is particularly popular in Scotland.

- When using on-site, store panels in dry conditions, on a flat, level surface, clear of the ground
- Joists must be treated ‘dry’, or proprietary I-beam
- Regularise timbers to provide an even bearing surface for the panels
- Ensure all roof support timber dimensions and spacings are calculated by a qualified structural engineer in accordance with the overall requirements of the roof
- Lay panels with the face grain parallel to the span
- Support all short edges on a joist and stagger end joints
- Support the perimeter of the roof continuously on noggins
- Use galvanised flat head nails, or countersunk screws, 2.5 times the panel’s thickness
- Space fixings not less than 4 to each supporting timber per board width of 1220mm, and not less than 10mm from the panel edge
- Protect panels from wet weather until felt battens and tiles have been fixed. Some manufacturers provide a removable weather-resistant coating to give short-term protection.

**CE Logo**

- CE Logo
- No of Notified Body – Directive
- Product/Certificate of Conformity No
- Manufacturers name and address
- Year CE mark affixed
- Plywood standard for humid conditions
- Harmonised European Standard
- Formaldehyde Class
- Intended end use application
The most common types of plywood available for use in UK construction are structural plywood for humid uses (EN 636-2 S) and general plywood for humid uses (EN 636-2 G). These types of plywood are made from durable resins that are suitable for most construction uses.

<table>
<thead>
<tr>
<th>Plywood type</th>
<th>Typical uses</th>
<th>Standard</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural plywood</strong></td>
<td></td>
<td>BS EN 13986:2004</td>
<td>9mm-24mm</td>
</tr>
<tr>
<td>Softwood</td>
<td>Floors, walls and roofs.</td>
<td>BS EN 13986:2004</td>
<td>9mm-24mm</td>
</tr>
<tr>
<td>Hardwood</td>
<td>Floors, walls and roofs.</td>
<td>BS EN 13986:2004</td>
<td>9mm-24mm</td>
</tr>
</tbody>
</table>

**Non-structural plywood**

General plywood has product performance information provided by the supplier but this will not include strength performance data and so should not be used in a structural application.

<table>
<thead>
<tr>
<th>Plywood type</th>
<th>Typical uses</th>
<th>Standard</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softwood</td>
<td>Signage, shelving, cases, boxing-in.</td>
<td>BS EN 13986:2004</td>
<td>12mm-18mm</td>
</tr>
<tr>
<td>Hardwood</td>
<td>Signage, shelving, cases, boxing-in.</td>
<td>BS EN 13986:2004</td>
<td>12mm-18mm</td>
</tr>
<tr>
<td>Marine ply</td>
<td>Mainly used in boatbuilding; also other areas where moisture is a consideration, such as bathrooms and kitchens. Prime and seal before fixing.</td>
<td>Must conform with BS 1088:2003</td>
<td>6mm-25mm</td>
</tr>
</tbody>
</table>

**Structural plywood standards**

- **BS EN 13986:2004** The harmonised European standard for wood-based panels for use in construction.
- **EN 636-1** Dry use. Interior no risk of wetting.
- **EN 636-2** Humid use. Most construction uses fall into this category as they are covered or rarely exposed to weather, but still at risk of wetting.
- **EN 636-3** Exterior use. Permanently outside exposed to the weather.
- **EN 314-2:2003** Bonding quality requirements.

**MDF**

A stiff, flat, engineered sheet made of wood fibres, bonded with resin. It has a consistent surface, without grain or knots and can be machined, drilled, cut and filled easily without damaging the surface.

It is available in finished products, such as skirting boards, architraves and other mouldings, and as Fire-rated and external grades. It is sometimes colour-coded by dyes in the board layers:

- Green for moisture resistant
- Grey for exterior use
- Red shows treatment with flame-retardant chemicals.

When used in construction, MDF must comply with Construction Products Regulation (CPR).

**Always wear a facemask when sanding wood – especially MDF.**
Particleboard

Particleboard, or chipboard, is made from wood chips, often recycled, compressed together with resin to give a smooth, knot-free surface.

Different grades and thicknesses are available for use in a variety of structural and non-structural applications.

OSB

Resin-bonded sheets of thin strands of wood, compressed into layers to form a mat, giving good dimensional stability with no knots or voids.

Different grades and thicknesses are available for use in a wide range of structural and non-structural uses.

Further information and advice

BS EN 13986:2004 Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking, BSI

BS EN 622-5:2009 Fibreboards. Specifications. Requirements for dry process boards (MDF), BSI


BS 1088-1:2003 Marine plywood. Requirements, BSI

BS EN 300:2006 Oriented strand boards (OSB). Definitions, classification and specifications, BSI

BS EN 312:2010 Particleboards. Specifications, BSI

BS EN 636:2003 Plywood. Specifications, BSI


For further information on all the sheet materials, specifications, sizes and thicknesses, fixing locations, support details and spans, especially in structural applications, ALWAYS refer to the manufacturer’s own literature or website, or enquire through your local merchant.

TIMBER CLADDING

For more information on timber cladding, visit our industry technical expert, The Timber Decking and Cladding Association www.tdca.org.uk

TOPIC CHECKLIST

- Will the species be suitably durable?
- Is the profile appropriate for the direction of the boarding?
- Are the battens pressure-treated and strength-graded?
- Have you allowed the right cavity size?
- Do you need a breather membrane?
- Are you using the right fixings?

Choosing the timber species

If you’re using softwood, whether spruce (whitewood) or pine (redwood) you need good quality, slow growth timber, typically from Sweden and other Nordic countries.

Its moisture content should be between 16% and 19%.

Both pine and spruce need to be preservative pressure-treated to Use Class 3, even if you are going to paint them. Make sure the surface of the wood is thoroughly dry after treatment, otherwise any decorative coating won’t adhere well.

Other softwoods, such as Siberian larch, Douglas fir and Western red cedar may be used untreated, but you will need to specify heartwood timber (the sapwood excluded).

Many hardwoods, such as sweet chestnut, red louro and yellow balau can also be used untreated, as can modified timbers like Accoya™. In the latest version of EN350, European oak has been re-classified as Durability Class 2-4; to ensure oak is suitable for cladding, verify it meets Durability Class 2-3.

Some modified timbers and high tannin species, such as oak require special stainless steel fixings.
There are two main things to remember about cladding:

- Timber cladding must be designed so that it can dry out after it gets wet.
- A decorative finish will affect the cladding’s appearance, but not necessarily its service life.

Getting the detailing and fixing right are as important to the life of the cladding as choice of species.

BS 8605:2015 is the standard covering external timber cladding.

Refer to Wood Campus Specification1 sheets for design and fixing details for different applications.

### Natural durability class

<table>
<thead>
<tr>
<th>Natural durability class</th>
<th>Need for treatment /modification</th>
<th>Desired service life (years)</th>
<th>Occasionaly wet</th>
<th>Frequently wet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Very durable)</td>
<td>Suitable without treatment</td>
<td>&gt;60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>2 (Durable)</td>
<td>Suitable without treatment</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3 (Moderately durable)</td>
<td>Suitable without treatment except for tall or exposed buildings</td>
<td>30</td>
<td>15 (untreated)</td>
<td></td>
</tr>
<tr>
<td>4 (Slightly durable)</td>
<td>Treatment required</td>
<td>15-30 years treated</td>
<td>15-30 years treated</td>
<td></td>
</tr>
<tr>
<td>5 (Not durable)</td>
<td>Treatment required</td>
<td>15-30 years treated</td>
<td>15-30 years treated</td>
<td></td>
</tr>
</tbody>
</table>

### Examples of softwood species used for cladding in the UK

<table>
<thead>
<tr>
<th>Common name</th>
<th>Natural Durability Class BSEN350:2:1994</th>
<th>Sapwood treatability</th>
<th>Movement</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine</td>
<td>European redwood 3 to 4</td>
<td>Permeable</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Scots pine</td>
<td>European redwood 3 to 4</td>
<td>Permeable</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Southern Yellow pine</td>
<td>European redwood 4</td>
<td>Permeable</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Spruce</td>
<td>European whitewood 4</td>
<td>Resistant</td>
<td>Small/medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Sitka spruce</td>
<td>European whitewood 5</td>
<td>Resistant</td>
<td>Small/medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>UK 4</td>
<td>Resistant</td>
<td>Small</td>
<td>Medium</td>
</tr>
<tr>
<td>N American</td>
<td>3</td>
<td>Resistant</td>
<td>Small</td>
<td>Medium+</td>
</tr>
<tr>
<td>Western red cedar</td>
<td>UK 3</td>
<td>Resistant</td>
<td>Small</td>
<td>Low</td>
</tr>
<tr>
<td>Canadian</td>
<td>2</td>
<td>Resistant</td>
<td>Small</td>
<td>Low+</td>
</tr>
<tr>
<td>Larch</td>
<td>European 3 or 4</td>
<td>Resistant</td>
<td>Small</td>
<td>Medium</td>
</tr>
<tr>
<td>Siberian</td>
<td>3</td>
<td>Resistant</td>
<td>Small</td>
<td>Medium</td>
</tr>
</tbody>
</table>

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<tr>
<th>Common name</th>
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<th>Movement</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>European oak</td>
<td>2 to 4</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Sweet chestnut</td>
<td>2</td>
<td>Small</td>
<td>Medium</td>
</tr>
<tr>
<td>Balau</td>
<td>2</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Iroko</td>
<td>2</td>
<td>Small</td>
<td>High</td>
</tr>
<tr>
<td>Massaranduba</td>
<td>1 or 2</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Opepe</td>
<td>1</td>
<td>Small</td>
<td>High</td>
</tr>
<tr>
<td>Red Grandis</td>
<td>3</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Red Louro</td>
<td>2</td>
<td>Small to medium</td>
<td>High</td>
</tr>
<tr>
<td>Tatajuba</td>
<td>2</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

### Moisture

Wood’s moisture content will change relative to its surroundings. Different species have different degrees of movement and this must be accounted for in cladding design.

Timber cladding should have a moisture content of 16% ± 3% at the time of installation. Wood expands across the grain, rarely along it. Oak, pine and spruce will change 1% in dimension for every 4% change in moisture.

Good design and installation practice will help minimize the effects of moisture:

- Use species that are dimensionally stable or with small to medium movement
- Use wood specifically processed for timber cladding
- Use eaves and overhangs to deflect rain - or flashing to protect the board tops
- Finish cladding at least 200mm from the ground or a horizontal surface. Where possible use a surface that diffuses rain, such as gravel
- Board widths should generally be 4 to 6 times board thickness (typically less than 150 mm)
- Design detailing must include measures that minimise water penetration
- T&G boards should have a tongue long enough to stay engaged if it shrinks
- If finishing with a pigmented coating, apply the basecoat and at least one top coat before installing.
Choosing the board profile

There is a wide choice of standard profiles available in softwoods, modified woods and hardwoods typically up to 150mm in width. Are you laying the boards horizontally, vertically or diagonally? Check which profiles are suitable.

Styles can vary from one manufacturer to another, so always obtain samples and agree quality parameters before ordering.

If you need a bespoke profile or specific species, contact a member of the TDCA.

Only specify cladding manufactured under a recognised quality scheme such as the TDCA CladMark® or ISO9001.

Thickness is largely determined by the profile required. Guidance is available in British Standard BS8605: External Timber Cladding Part 1: Method of specifying.  

Avoid sharp edges on cladding. A minimum radius of 3mm on the bottom of horizontal cladding will help shed water and prevent it tracking up the back of the cladding.

Direction of boarding

Cladding can be applied in any one of three directions, which will have an impact on the methods of fixing as well as on the overall look of the façade.

Horizontal boarding

Available with overlapped or profiled sections.

Shiplap or feather edge boards should have a minimum 15mm overlap, and 2mm gaps between the up-stands.

Tongued and grooved boards should have a maximum face width of 125mm, with a 2mm clearance above the tongue for expansion. Install with the tongue upwards.

Open joint boards should have an 8-15mm gap at the ‘water face’. Chamfered edges allow the boards to overlap slightly, reducing any exposure of the cavity.

Vertical boarding

Board-on-board, shiplap and tongued and grooved profiles are used. Tongues need to be long enough to allow for slight movement of the timber so that open gaps do not develop with natural movement.

The face width of tongued and grooved vertical boards should not exceed 125mm.

The most versatile fixing method is board on board. Any overlap should be a minimum of 20mm.

Diagonal boarding

Overlapping boards are not suitable. Shiplap boards are advisable and should be fixed to battens. Use counter-battens to provide ventilation.

Suitability of profiles

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cladding joint</th>
<th>Horizontal</th>
<th>Diagonal</th>
<th>Vertical</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue &amp; groove</td>
<td>Closed</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>20mm min</td>
</tr>
<tr>
<td>Rectangular</td>
<td>Closed</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>16-25mm+</td>
</tr>
<tr>
<td>Feather edge</td>
<td>Closed</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>9mm x 16-15mm</td>
</tr>
<tr>
<td>Shiplap</td>
<td>Closed</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>18mm</td>
</tr>
<tr>
<td>Parallelogram</td>
<td>Open</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>16-25mm+ (up to 50mm)</td>
</tr>
</tbody>
</table>
Board lengths
- Most softwoods are available up to a maximum length of 4.8m
- Most temperate hardwoods are available up to around 3.6m
- Tropical hardwoods are available in maximum lengths of 2.1m to 4.2m, depending on the species.

Battens
Use softwood battens that are preservative treated for a BSEN335:1 use Class 3 application and structurally graded to ensure they are able to carry the weight of the board material.

Fix horizontal boards to vertical battens, taking care where boards are jointed to ensure they sit securely on sufficient batten width.
Fix vertical boards to horizontal battens, with vertical 'counter' battens to facilitate drainage and ventilation. Horizontal battens should have the top edge machined at an angle to help shed water into the cavity.
Support battens should be fixed at spacings of no more than 600mm, whether vertical or horizontal, and at no more than 400mm for diagonal boards. For high moisture content species like green oak use 400mm centres.

Cavities
Create a well-ventilated cavity of at least 21mm. The more open the cladding style, the wider the cavity required to protect against moisture penetration.

On timber frame buildings, the minimum sized batten (21mm) may be used so long as its position coincides with wall studs.

Breather membranes

Timber frame buildings: The inner wall structure should be fitted with a breather membrane to seal the building against damp and weather penetration. The membrane should be durable and tear resistant in accordance with Type 1 membranes in BS4016.

Masonry buildings: Fitting a breather membrane between cladding and battens attached to a property with cavity walls is not essential. Where cladding is fitted to an existing building with solid walls, use a waterproof coating, membrane or wax-treated insulation board.

Design detailing
Specification sheets for design details are available on Wood Campus:
- Cavities, structural supports, battens and membranes
- Installing horizontal cladding (new build)
- Installing horizontal cladding (existing buildings)
- Fixing horizontal cladding
- Installing vertical cladding (new build)
- Installing vertical cladding (existing buildings)
- External corners
- Detailing openings (horizontal cladding)
- Detailing openings (vertical cladding)
- British Standards and Building Regulations

Angle the top surfaces of horizontal battens to aid drainage away from the cladding
Space battens at 600mm centres.
For high moisture content species like green oak use 400mm centres
Use counter battens to improve ventilation
Fixing cladding

Softwood
- Use stainless steel annular ring shank nails (essential for high tannin species or those installed ‘green’)
- The nail penetration into the batten is generally twice the thickness of the board being fixed
- Punch the nail slightly below the wood’s surface
- Use double fixings for boards over 125mm wide
- Make sure that butt joints always meet on sufficient batten support width

Hardwood
- Use counter-sunk stainless steel screws
- Slight over-sizing of the screw holes will allow for any movement in the wood and prevent splits
- Where ‘green’ wood is used, it may be necessary to fit washers to the screws to maintain the fixing security.

Some modified timbers, such as Accoya™, are acidic and require high quality stainless steel fixings.

Finishes

Use a specialist water-based micro-porous coating, opaque or semi-translucent.
Coatings adhere better to sawn than planed boards.
Re-coating before failure of the system means you don’t have to spend a lot of time preparing the surface.
Pre-finished boards are widely available.

Further information and advice

British Standards
- BS 8605-1:2015 Method of specification
- BS 8605-2:2015 Code of practice for design and installation
- BS 1183-3 Timber for workmanship in joinery
- BS 8417:2014 Preservation of timber
- BS EN 350-1,2 Durability of wood and wood-based products
- BS EN 14915 Solid wood paneling and cladding
- BS EN 15146 Solid softwood paneling and cladding. Machined profiles without tongue and groove

See Cladding resources on Wood Campus
See Cladding resources on Timber Decking and Cladding Association website www.tdca.org.uk

Do I need planning permission?

It is the property owner’s responsibility to check whether planning or building consent is required before work starts. Contact your local Planning Department if:
- The proposed deck platform is more than 30cm (1’) above ground level
- The area of the proposed deck, together with any extensions or outbuildings, will be more than 50% of the garden
- The deck is within 20 metres’ direct line of site of a highway

• The deck will be in a conservation area, National Park, or attached to a listed building.

For more information in England visit www.planningportal.co.uk. Contact your local authority for details of requirements for Scotland, Wales and Northern Ireland.

As decks are load-bearing structures, it’s vital that correct design practices, due care, materials and installation techniques are used.
Building control consent

As a general rule, any deck that requires planning permission will also require detailed construction drawings to establish that it is safe and fit for purpose. Check with your local authority.

Quality assurance

For assurance of quality, look for components manufactured under the DeckMark® quality accreditation scheme for decking.

There are four basic types of deck:
1. Ground level - built directly onto the ground
2. Floating - raised less than 600mm (24")
3. High level - raised more than 600mm (24")
4. Roof top - an area on an existing flat roof.

The complexity of build depends on the site and height from the ground.

Timber decks can be attached to a property or freestanding.

For new properties, the National House-Building Council (NHBC) requires all decks to conform to Timber Decking and Cladding Association (TDCA) guidelines.

The information in this Timber Topic sheet is based on those guidelines.

Certified timber

Chain of Custody certified hardwoods and softwoods are now widely available and designers should ensure that the materials they specify can be supplied from sustainable and managed forests.

The right timber for the job

Use timber capable of giving a service life of at least 15 years. This means either a naturally durable species, such as Ipe, Iroko, Oak, Jarrah, Balau and Western Red Cedar, or a softwood that has been pressure-treated to the right level for the job.

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Treated wood – fitness for purpose

Based on BS EN 335:1, which defines the treatment Use Class for different applications

<table>
<thead>
<tr>
<th>Use Class</th>
<th>Application</th>
<th>Risk of failure</th>
<th>Suitable for decking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal</td>
<td>Low</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Internal</td>
<td>Low</td>
<td>No</td>
</tr>
<tr>
<td>3c (coated)</td>
<td>External: out of ground</td>
<td>Medium/high</td>
<td>No</td>
</tr>
<tr>
<td>3u (uncoated)</td>
<td>External: out of ground</td>
<td>Medium/high</td>
<td>Yes – for deck boards etc. above ground</td>
</tr>
<tr>
<td>4</td>
<td>External: in permanent ground or water contact</td>
<td>High</td>
<td>Yes – for posts in ground contact</td>
</tr>
</tbody>
</table>

Timber strength

All decks should be built with strength-graded timber. Strength class C16 is considered the minimum standard, with C24 recommended for heavy domestic or commercial structures. For hardwoods, C30 is the minimum strength class.

Good quality pressure-treated softwoods with a medium or high density rating will give good wear resistance not only for private and domestic decks, but for most commercial projects as well. Species with lower density ratings, like Western Red Cedar, are more appropriate to domestic deck structures.

Slip resistance and standing water

Anti-slip decking boards, with grip inserts, are often used to give extra security. Occasional stiff brushing will reduce slipperiness.

Prevent standing water and saturated wood by designing a slight fall into the deck surface. Grooved boards, which channel water flow, can improve drainage further. Lay them so the channels are in the direction of the fall. Specifying a water repellent treatment will also help.

Density ratings of some common species used for decking

<table>
<thead>
<tr>
<th>Species</th>
<th>Density (kg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Red Cedar</td>
<td>390</td>
</tr>
<tr>
<td>British pine / E. Redwood</td>
<td>510</td>
</tr>
<tr>
<td>Douglas Fir</td>
<td>530</td>
</tr>
<tr>
<td>Larch</td>
<td>550</td>
</tr>
<tr>
<td>Southern Yellow Pine</td>
<td>590</td>
</tr>
<tr>
<td>Iroko</td>
<td>660</td>
</tr>
<tr>
<td>Oak (European)</td>
<td>720</td>
</tr>
<tr>
<td>Opepe</td>
<td>750</td>
</tr>
<tr>
<td>Jarrah</td>
<td>820</td>
</tr>
<tr>
<td>Yellow Balau</td>
<td>980</td>
</tr>
</tbody>
</table>
Metal fixings

Corrosion is the biggest threat to fixings used out of doors. Stainless steel, hot dipped galvanised, or high quality coated carbon steel fixings are best. Electroplated, brass, or uncoated steel fixings should not be used. Do not use aluminium either.

Always use the same type of metal for fixings and connectors.

Site preparation

Clear all vegetation from under low level decks. If the area under the deck is visible, lay weed-suppressing sheeting, held in place with clips or a layer of gravel.

Construction principles

The diagram below shows the basic principles of a post and beam deck construction.

Deck boards are fixed to joists, which are supported by beams attached to posts to create a raised deck

- Wall plates (sometimes called ledger boards) are used to attach decks to a property, leaving a gap of at least 10mm to allow rainwater to drain away freely. Take care not to damage the property’s dpc
- Post, beam and joist spacing varies depending on a number of factors. These include the size of the deck board being used, and the size and strength class of the framing materials. Some typical joist centres and spans are shown in the table for softwood strength class C16.

Laying deck boards

- Build a slight fall into a decked surface for drainage. Lay grooved boards in the direction of fall
- The space between boards should be 5mm to 8mm wide to allow water to drain away and stop dirt accumulating
- Always locate abutting boards over a joist to which a 47mm batten has been attached with two fixing points positioned at the quarter points of the board
- Fix grooved boards at the bottom of a groove, ensuring fixings are flush to avoid water retention
- Install hardwood boards using screws, pre-drilling every fixing point 2mm oversize to allow for any seasonal movement in the wood that could cause screws to break under the tension
- To improve grip, align boards, whether plain or grooved, at a right angle to the primary direction of travel.

Parapets or balustrades

For decks raised less than 600mm from the ground, building regulations require parapets or balustrades to be at least 900mm high.

For decks raised more than 600mm, balustrades must be 1100mm high.

Spaces between individual components, like a baluster or rail, should never exceed 100mm wide.

All newel posts should be capped to avoid water being absorbed into the grain.

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Further information and advice
Published by the Timber Decking and Cladding Association www.tdca.org.uk
- Technical Bulletin 02 Statutory Regulations
- Technical Bulletin 04 Deck Parapet Design and Installation
- Technical Bulletin 08 Metal Fixings
- Code of Practice 08/01 Raised Timber Decks

Published by TRADA www.trada.co.uk
- Timber Decking, by Patrick Hislop

Available on www.woodcampus.co.uk:
- Deck design and installation (online learning)
- Many other videos and publications.

Are the windows fully factory-finished?
Are they CE-marked?
Do they carry Chain of Custody certification?
Are they tested to meet British Standards for air and water-tightness?
Do they meet Building Regulations?

WOOD WINDOWS
For further information on wood windows visit our industry technical expert, the Wood Window Alliance www.woodwindowalliance.com
Fitting factory-finished windows
Use durable packings between windows and wall to avoid distortion to the frames when securing them.

Position side fixings 150mm from top and bottom of the frame and at max 450mm centres. Add fixings to the head and sill for windows exceeding 1800mm in width, or two frames together. Be careful packings to sash windows don’t distort the sliding mechanism.

Fit damp-proofing in accordance with Building Regulations and use specialized fixings and foams for fixing to the walls and sealing gaps.

Avoid projecting timber sills – use stone, brick or tile sub-sills (stone sills should not be used in timber frame buildings). See Wood Window Alliance Advice Note Installation Guidelines for Timber Windows.1

Fitting hand made windows
Bead glazing must be used with insulated glazed units. When preparing and finishing, ensure surfaces, edges, and primer coats are in good condition. On external surfaces, use a micro-porous acrylic paint or a high build stain.

Second coats or undercoats must be applied to primed windows before exposure to the elements. Fit double-glazing units on appropriate setting blocks with distance pieces whenever non-setting glazing compounds are specified to protect against moisture ingress.

Use only the recommended glazing materials in accordance with the manufacturer’s details.

Storage and handling tips
Check the delivery matches the order and there’s no damage. Store windows upright in clean, dry and covered conditions, or, if outside, stack on level bearers and cover with a tarpaulin. Don’t use polythene – it causes condensation. Store in the sequence of use and use spacers between frames with projecting sills or hardware. Don’t lift frames by their fittings.

Wood vs PVC-u windows
PVC-u windows are cheaper to buy, but factory-finished wood windows made to WWA standards:

Last longer
Frames have a Planned Service Life of around 60 years

Are better value
Because they last twice as long as a plastic window

Are greener
Each wood window chosen instead of PVC-u will save 160 kgs CO₂e over its 60-year life.

Life Cycle Assessment of timber, modified timber and aluminium-clad timber windows, Heriot Watt University, Edinburgh, June 2013.

Choosing the right window type
1. Vertical sliding sash
Available single, double or even triple-glazed. Double-glazed windows can achieve u-values of 1.2w/m²K with less than 50% openable area.

To achieve slim, period glazing bars, these are often ‘applied’, rather than structural, although matching spacer bars within the glazing units give the appearance of structural bars.

There are two types of lifting mechanism:
• Traditional cords and weights, which require additional space
• Modern spiral balances, which are a space-saving and more economical option.

An additional inward tilt function is available to make cleaning easier. Factory-finished sliding sash windows are easy to re-decorate, as the elements not exposed to sunlight are unlikely to need re-coating. Lockable sashes and opening restrictors are available.

2. Side-hung casements
Outward opening, with an almost 100% openable area. There are three basic types:
• Storm, where the sash sits over the frame. This type is generally not suitable for period buildings
• Flush-fitting, where the sash sits flush in the frame. This type is suitable for period and modern buildings
• Easy-clean, where the hinge geometry opens the sash clear of the frame.

They can be double or triple-glazed, are inherently energy-efficient and can be made very secure.
3. Top hung casements
As side-hung, but inward or outward opening – however opening is restricted. Can be fully reversible for easy cleaning and decoration.

4. Tilt and Turn
A continental, inward opening, style that allows an inward tilt fixed opening from a bottom hinge and a wide inward opening from a side hinge (usually without a stay). Generally available in contemporary styles and highly energy-efficient.

Replacing period windows
The right window style makes a big difference to the look of a building and can enhance its value. Today’s wood windows can combine traditional looks with modern performance. Narrow Cavity glazing units and specialist glass finishes are available.

If a building is Grade II listed (or above) or in a Conservation Area where Article 4 directions apply, planning permission will be required.

See Wood Window Alliance Advice Note Replacing windows in Listed Buildings and Conservation Areas.

Maintaining wood windows

Frequency
Factory-finished wood windows should last around 8-10 years between coatings, depending on the coating and the exposure conditions. Generally, opaque coatings are more durable than translucent coatings or stains, and pale opaque colours are better than darker shades, as they don’t heat up so much in the sun.

For translucent coatings, darker shades are better as the pigment provides UV protection. South-facing windows will need re-coating soonest because of their exposure to the sun. Windows in exposed areas, such as coastal sites, hills or multi-storey buildings will need more frequent maintenance.

Redecoration
With factory-finished windows, little preparation is necessary – just give a light abrasion to provide a key for the paint, wipe down and apply one or two top coats with a long-haired synthetic brush.

Use a water-based micro-porous acrylic paint. You won’t need to decorate tricky areas that aren’t exposed to the sun. Any bare wood should be primed before top-coating, and if there is any resin exudation, do not try to remove it when it’s fresh and sticky; wait for it to oxidise and brush off.

See Wood Window Alliance Advice Note Maintenance Guidelines for Timber Windows and video on re-decorating factory-finished wood windows.
**Tips on energy-efficiency**

The energy-efficiency of a window is measured in two ways: **U-values** and **Window Energy Ratings (WERs)**.

### U-values

U-values measure heat loss through a material in W/m²K (watts per square metre per degree kelvin); lower values indicate greater efficiency. ‘Whole window’ U-values measure the heat loss through the whole window. Some manufacturers may quote ‘centre pane’ U-values, a measurement of the heat loss through the glass alone, which will show a lower figure.

### WERs

Some manufacturers’ windows are tested by the British Fenestration Rating Council (BFRC) to determine the window’s energy rating (WER). The WER includes the total solar heat gain of the glass, the U-value of the window and air leakage through the seals. Current ratings range from a best of A++ down to E.

### Double or triple-glazing?

Double-glazing, with an inert gas (e.g. Argon), low-emissivity glass for the outer pane and warm edge spacers, offers the best value option. However, if you need U-values below 1.2, or are building to Passivhaus standards, you will need to invest in triple-glazing. Bear in mind that triple-glazing is likely to reduce solar gain.

In a double-glazed unit, the optimum gap between the sheets of glass is 16mm (although a 20mm gap is often used). As the standard glass thickness is 4mm, an IGU will be 24mm thick (4-16-4).

Narrow cavity units are available. Ensure they are CE-marked and meet the requirements for the durability of glass units given in the BS EN 1279 series of standards. See the Wood Window Alliance Narrow Cavity Advice Note.

**Key Building Regulations**

The two most important regulations are Part L (energy-efficiency) and Part Q (security) or equivalents in Scotland.

### Part L

The figures for domestic dwellings are:

- **Part L1 A (new dwellings)**
  - Target 1.4 W/m²K, with a minimum 2.0 W/m²K
  - Part L1 B (existing dwellings)
    - Target 1.6 W/m²K, with a minimum 1.8 W/m²K.

In Scotland, the requirements are set out in section 6, Energy, as follows:

- **New buildings (table 6.4)**
  - Area-weighted target for all elements of the same type:
    - 1.6 W/m²K, with a minimum value for an individual window of 3.3W/m²K

- **Extension of existing building (table 6.5)**
  - Area-weighted target for all elements of the same type, where wall and roof of the existing dwelling are **poorer** than 0.7 and 0.25 respectively: 1.4 W/m²K (or WER band A)
  - Area-weighted target for all elements of the same type, where wall and roof of the existing dwelling are **better** than 0.7 and 0.25 respectively: 1.6 W/m²K (or WER band C)
  - Minimum value for an individual window: 3.3W/m²K

- **Replacement windows and doors (table 6.5 columns b and c)**
  - Area-weighted target for all elements of the same type: 1.6 W/m²K (or WER band C)
  - Minimum value for an individual window: 3.3W/m²K

### Part Q

For all new build homes, ensure windows comply with Part Q (security standards) of the Building Regulations (or Standard 4.13 in Scotland).

### British Standards

The main standard for factory-finished wood windows is BS 644:2009. Windows must meet the performance requirements defined in BS 6375 Parts 1, 2 and 3 relating to weather-tightness, operation and strength characteristics.
IN THE GARDEN

For further information visit our industry technical experts, the Timber Decking and Cladding Association [www.tdca.org.uk](http://www.tdca.org.uk) or the Wood Protection Association [www.wood-protection.org](http://www.wood-protection.org)

**TOPIC CHECKLIST**

- Check whether the project needs planning permission
- Is the timber treated to the right Use Class?
- Have I treated any cut ends?
- Will any play equipment be safe?
- Are the fence posts the right size?

Do I need planning permission?

It’s worth checking with your local authority planning department, especially if you live in a listed building, conservation area, Area of Outstanding Natural Beauty, or National Park.

Outbuildings don’t generally need planning permission, so long as:

- They are not built on land forward of a wall forming the house’s main elevation
- They are single-storey, with a maximum eaves height of 2.5 metres and maximum overall height of four metres with a dual pitched roof, or three metres for any other roof

- They have a maximum height of 2.5 metres if within two metres of a boundary of the house
- No more than half the area of land around the original house will be covered by additions or other buildings.

Rules governing outbuildings apply to sheds, greenhouses and garages as well as other ancillary garden buildings such as swimming pools, ponds, sauna cabins, kennels and enclosures (including tennis courts).

Verandahs, balconies and other platforms (including tree houses/playhouses) require planning permission, with the exception of decking up to 300mm above ground level.

The right timber for the job

Use timber capable of giving a service life of at least 15 years. This means either a naturally durable species, such as being Ipe, Iroko, Oak, Jarrah, Balau and Western red cedar, or a softwood that has been pressure-treated to the right level for the job.

Most timber sold for use in the garden has already been pressure-impregnated with wood preservative and may be recognized by its green or mid-brown tint. Check with your supplier whether the timber is suitable for above ground or in-ground contact (see the Treated Wood Use Class table below):

Treated wood – fitness for purpose

Based on BS EN 335:1, which defines the treatment Use Class for different applications

<table>
<thead>
<tr>
<th>Use Class</th>
<th>Application</th>
<th>Risk of failure</th>
<th>Suitable for decking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal</td>
<td>Low</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Internal</td>
<td>Low</td>
<td>No</td>
</tr>
<tr>
<td>3c (coated)</td>
<td>External: out of ground</td>
<td>Medium/high</td>
<td>No</td>
</tr>
<tr>
<td>3u (uncoated)</td>
<td>External: out of ground</td>
<td>Medium/high</td>
<td>Yes – for deck boards etc. above ground</td>
</tr>
<tr>
<td>4</td>
<td>External: in permanent ground or water contact</td>
<td>High</td>
<td>Yes – for posts in ground contact</td>
</tr>
</tbody>
</table>

The performance of naturally durable hardwoods can be matched by low-cost preservative-treated softwoods.

But not all preservative-treated timber is suitable for use in the garden.

Make sure you ask for timber treated to Use Class 4 for any timber that will end up in contact with the ground.

Use external grades fixings, usually hot-dipped galvanized or stainless steel. Further advice on fixings is available in this Timber Trade Topics series.

Modern preservatives are safe

Modern pressure-impregnated wood preservatives and water-based proprietary products are safe for plants, pets and people unless eaten.

If you are using solvent-based preservatives or coatings on sheds or fence panels, follow the manufacturer’s advice and instructions.
Fencing
Check fence panels are suitably pre-treated, so they won’t need other treatments, although you might want to paint or stain them.

Use gravel boards (pressure-treated to Use Class 4) to support the panels off the ground so as to extend their service life. It’s cheaper and easier to replace any rotted boards than the panels themselves.

Gravel boards will take up any unevenness in ground levels, so the fence panels can simply be slotted into place.

Suitably pre-treated fence posts are available in a range of lengths and sizes, either in the round, or as square sections. Use a section size of at least 75mm x 75mm – larger for exposed areas or particularly high fences.

Make sure your fence posts are the right length, based on the height of the panel:

<table>
<thead>
<tr>
<th>Panel height</th>
<th>Minimum post length (no gravel board)</th>
<th>Minimum post length (150mm gravel board)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,400 or less</td>
<td>Panel height + 500mm</td>
<td>Panel height + 650mm</td>
</tr>
<tr>
<td>4</td>
<td>Panel height + 600mm</td>
<td>Panel height + 750mm</td>
</tr>
</tbody>
</table>

Play equipment
Consider the suitability of the location, the safety of the ground surface and whether the equipment requires securing (e.g. in concrete). Check the equipment is CE marked and that the packaging states it is manufactured to meet BS EN 71.

Follow the manufacturer’s installation instructions carefully. Avoid sharp edges, rough surfaces and protruding fixings, adding caps to all ends. Use suitable, water-based coatings.

Ideally you should seek specialist advice before designing or building garden play equipment, as you must observe the relevant safety standards. For example, you will need to avoid small gaps that could trap children’s fingers or heads.

Timber garden buildings
There are many different types of timber garden buildings, including sheds, kennels, decks and tree houses. Many are sold in panels that can simply be nailed together. Others, such as summer houses or log cabins, may need screws or coach bolts to fix them together. They will usually be pressure-treated. To ensure a long life:

• Support floors off the ground on appropriately treated pressure-impregnated timber bearers (which may be supplied with the building) on a concrete or paving-slab base.
• Avoid damage to roofing felts, and fix roof coverings, such as shingles or slates, correctly, as any leaks could result in premature failure.

Sleepers
These are popular for making raised beds, steps or pond structures. Use new sleepers, as they are treated with modern preservatives. Creosote-treated timbers (typically old railway sleepers) are best avoided as there are restrictions on creosote use in gardens in areas likely to be in frequent skin contact.

For guidance on the use or disposal of used creosote-treated timber, contact the Wood Protection Association (see Further information and advice).

Don’t burn offcuts from pre-treated timber on a bonfire or barbecue. They should be disposed of in a landfill site, or incinerated in accordance with national regulations.

Further information and advice
Other relevant Timber Trade Topic sheets:
• Decking
• Fixings

Relevant associations:
The Timber Decking and Cladding Association: www.tdca.org.uk
Wood Protection Association: www.wood-protection.org
Planning permission:
https://www.planningportal.co.uk/info/200130/common_projects/43/outbuildings

British Standards
BS 1722-11: 2006 Fences. Specification for prefabricated wood panel fences, BSI
BS EN 71-1: 2011 Safety of toys. Mechanical and physical properties, BSI

Isolate pre-treated timbers from ponds using a liner.
CONVERTING THE LOFT

For more information about loft conversion, visit the Timber Trade Federation www.ttf.org.uk

TOPIC CHECKLIST

- Do I need planning permission?
- Do my plans meet Building Regulations?
- Do I need to consult a structural engineer?
- Have I checked for evidence of bats?
- Will I need to strengthen the joists?
- Am I installing a certified fire door?

Will I need planning permission?
The answer is YES if:
- The property is in a conservation area, world heritage site, national park or area of outstanding natural beauty,
- The loft will be larger than 50m³ for a semi-detached or detached home (40m³ for a terraced property)
- You plan to use materials with a different appearance from the rest of the property

Or if you plan to:
- Add a balcony, veranda or dormer window
- Change the height or pitch of the roof

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- You plan to use materials with a different appearance from the rest of the property

Or if you plan to:
- Add a balcony, veranda or dormer window
- Change the height or pitch of the roof

Will I need Building Regulations approval?
Unless the conversion is for lightweight storage only and accessed by a retractable or removable ladder, the answer is YES.
The regulations will be applied to ensure, for example:
- the structural strength of the new floor is sufficient
- the stability of the structure (including the existing roof) is not endangered
- safe escape from fire
- safely designed stairs to the new floor
- reasonable sound insulation between the conversion and the rooms below.

It is recommended that you contact Building Control to discuss your proposal and for further advice and you must also find out whether work you intend to carry out falls within The Party Wall etc. Act 1996.
Refer to Approved Document B (fire safety) for details of fire safety requirements.

Floor joists
Even if the loft was previously used for light storage you will almost certainly have to strengthen the ceiling joists in the loft floor. You can do this by adding larger and stronger timber floor joists between the existing ceiling joists. Support them on the existing walls if they are strong enough, or add extra timber support beams if necessary. A professionally designed loft conversion plan that complies with building regulations will be needed.
Check with a structural engineer.

Building regulations require 30-minute fire resistant floors for loft conversions in two or more-storey homes.

Load-bearing walls and foundations
New floor joists will need support. This can be achieved either from an existing wall, which will need to continue all the way down through the house to a foundation, or by an adequate intermediate support, such as steel or timber beams. It is particularly important to assess the structural integrity of houses with rooms knocked through on lower storeys and older properties.

In some cases, the proposed increase in load could require underpinning of the foundations. Check with a structural engineer or your building control body.

Bats
Bats and bat roosts are protected by law. If there are bats living in a roof, they cannot be disturbed or removed. If you see bats or bat droppings in the loft, you must notify the local Statutory Nature Conservation Organisation (see Further information and advice) to seek advice before work starts.
Getting your services in

There are rules about where and how much a structural timber member can be notched or drilled for wiring and pipework, as even a small amount of drilling or notching can significantly weaken the timber.

Holes or notches should not be cut in any rafters, purlins or engineered timber joists unless justified by the structural engineer.

Take advice from a structural engineer and your local building inspector.

Engineered products, such as I-joists may have drilling positions marked. Follow manufacturer’s instructions.

Stairs

Building Regulations apply, such as:

- A minimum headroom of 2m above a staircase, which means that the top of the stairs often needs to be close to where the roof is highest.

- In a multi-storey dwelling with a habitable loft and the stairs are the sole means of escape, the staircase must be constructed and enclosed so that it attains ‘protected stair’ status.

The main types of timber staircase you could use for a habitable loft conversion are conventional, spiral and alternating tread. Retractable ladders are not acceptable for habitable rooms in the roof because they don’t provide constant access and means of escape.

Spiral stairs and alternating tread stairs are only allowed to access one habitable room (as well as a bathroom and/or toilet in the case of alternating tread stairs, as long as it isn’t the only toilet in the building).

The opening for new stairs is normally formed by cutting away some of the existing ceiling joists between the existing loft-space and the floor below. As these joists support the existing ceiling and restrain the pitched roof from spreading, you must provide replacement support, such as timber “trimmers” around the opening. These will probably be at least two timbers fixed together (double trimmer) to ensure the load is transferred to remaining timbers.

Not all the guidance in the Building Regulations is compulsory for sound transmission, but you may need to comply with Approved Document E if any additional work is required to meet the standard in the existing property.

Bespoke staircases can be purchased from joinery manufacturers. Look for a member of the BWF Stair Scheme. Alternatively, timber components can be assembled on site. Download the BWF Stair Installation Guide.

Windows

Part L1B of the Building Regulations requires a target C rating (or U-value of 1.6) in England and Wales, though higher-rated windows are widely available. See Timber Trade Topic No. 2 Wood Windows.

Factory-finished timber window frames are a high quality solution. They may cost a little more than PVC-u, but will last up to twice as long, only need re-coating every 8-10 years, are much more environmentally-friendly.

When installing a roof window, achieve an airtight seal round the frame to maintain the thermal performance of the roof. Consider solar-control glass to minimize heat gain from the sun, or use a fitted blind. See Timber Trade Topic No. 2 Wood Windows for more information on frame types and installation.
Fire safety

Additional fire protection may be necessary in the existing parts of the house. For example, a typical loft conversion to a two-storey house will require new fire-resisting doors, and sometimes partitions, to protect the stairway, as it is too dangerous to escape via windows from floors above first floor level. Fire doors are life-critical. So it makes sense to use certified products. Certification schemes, like the BWF-CERTIFIRE Fire Door and Doorset Scheme and BM TRADA’s Q-Mark Fire Door Scheme, ensure doorsets are fit for purpose. See Timber Trade Topic No. 3 Fire doors & doorsets for more information.

Mains powered, interlinked smoke alarms are also required within the stairway at each level; and you may need to upgrade the fire protection to some parts of the structure of the house, such as the floors, where building regulations require 30-minute fire resistant floors for loft conversions in two or more-storey homes. Consult Approved Document B (fire safety). 4

Insulation

Building regulations require a minimum 270mm of insulation in the void between the floor joists (see adding larger, stronger joists above).

You can achieve acceptable sound insulation by using a wood-based board, such as plywood or 22mm tongued and grooved chipboard, weighing more than 15kg/m² for the floor surface. With a terraced or semi-detached house, the building control body may also ask for sound insulation between the converted loft and the neighbours loft to be improved.

A timber floor makes sense, as it is durable, easy to keep clean and good-looking. If you are laying a decorative timber floor, use an acoustic underlay. See Timber Trade Topic No. 15 Flooring for more information.

You should insulate your loft by insulating the roof itself as well as, or rather than, the loft floor. Use rigid insulation boards between the roof rafters, cut so they fit snugly between the rafters. They can then be covered by plasterboard, or timber panelling. Rafters aren’t usually very deep, so to get the best performance you may have to insulate over them as well, using insulated plasterboard. If there isn’t room to do this, make sure you use the highest performance insulation board.

Wood panelling

As well as adding character to a room, wood panelling can improve thermal and acoustic insulation and mask defects.

Many species are suitable, but pine and spruce are the most popular and are also available in a variety of pre-finished stains and finishes. Boards come tongued and grooved in a range of sizes and decorative profiles with thicknesses from approx. 7mm to 25mm – boards thicker than 12mm providing additional structural strength. For best results use timber manufactured from higher grades and kiln dried to 8-12%.

Store in the room for 24hrs before fitting.
Fitting wood panelling

On stud walls and unplastered ceilings, the panelling can be nailed direct to the studs or joists.
Otherwise, 22 x 38mm sawn battens provide an easy surface on which to nail the panelling and also form a flat base (fig 1).

Pack out any substantial irregularities under the battens. Use ‘secret nailing’: drive the nails diagonally through the tongue of each board (fig 2). Only the first and last boards require nailing through the face. Punch these home and fill with wood filler.

Don’t forget to allow an expansion gap around the perimeter of the panelling, particularly across the width of the boards. Use skirting boards and moulded trims to hide these gaps (fig 3).

Sound insulation should also be considered between walls and floors in order to prevent noise transmission between floors or to an adjoining neighbour’s house.

Pre-finished panelling systems are becoming increasingly available. Designed for accurate and rapid installation, they also avoid the need for on-site finishing.

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Further information and advice

Loft conversion planning permission
Loft conversion project guide
Construction Products Association
Building Regulations
England and Wales Building Regulations: Approved Document B (Fire safety) – Volume 1: Dwellings
Approved Document E (Resistance to the passage of sound)

Bat Conservation Trust
The Party Wall etc. Act 1996
Timber Trade Topic Sheets
No. 2 Wood windows
No. 3 Fire doors & doorsets
No. 4 Strength-grading
No. 15 Flooring

For more information on staircases and fire doors, visit bwf.org.uk

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If you have any questions on timber and the timber industry, our team of experts will be happy to help.

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