

European Oak Details



Common Name(s):	European Oak, English Oak, French Oak
Scientific Name:	<i>Quercus robur</i> , <i>Quercus petraea</i>
Distribution:	Europe and parts of western Asia
Tree Size:	80-100 ft (24-30 m) tall, 3-6 ft (1-1.8 m) trunk diameter
Average Dried Weight:	47 lbs/ft ³ (755 kg/m ³)
Specific Gravity: (Basic, 12% MC)	0.60, 0.75 (Basic, 12% MC)
Janka Hardness:	1,120 lbf (4,980 N)
Modulus of Rupture:	14,800 lbf/in ² (102 MPa)
Elastic Modulus:	1,740,000 lbf/in ² (12.00 GPa)
Crushing Strength:	7,440 lbf/in ² (51.3 MPa)
Shrinkage:	Radial: 4.0%, Tangential: 8.6%, Volumetric: 12.6%, T/R Ratio: 2.2

Colour/Appearance: Heartwood is light to medium brown, often with an olive cast. Colour tends to darken with age. Prominent medullary rays produce a distinctive fleck pattern on quartersawn surfaces.

Grain/Texture: Grain is usually straight, though can be irregular. Coarse, uneven texture with good natural luster.

Rot Resistance: Heartwood is rated as durable to very durable with good resistance to decay. Excellent resistance to moisture penetration due to tyloses, making it suitable for exterior and boatbuilding applications. Moderate insect resistance.

Workability: Generally easy to work with hand and machine tools, though its density can cause moderate tool wear. Reacts with iron fasteners, causing staining and potential corrosion—stainless steel or coated fixings are recommended. Glues, stains, and finishes well.

Pricing/Availability: Widely available across Europe. Moderately expensive, with higher prices for wide boards, quartersawn stock, and character grades.

Sustainability: Not listed in CITES Appendices. Both species are listed as Least Concern on the IUCN Red List. Widely sourced from sustainably managed European forests.

Comments: A historically important timber used in construction, furniture, flooring, and cooperage (barrel making). European oak is generally more porous and less dense than *Quercus alba*, though both share similar durability characteristics. Its high tannin content contributes to its durability but can also cause staining when in contact with metals or alkaline materials.

Timber Quality Advice – Oak

Oak is a popular choice for construction and external furnishings, but it is important to reiterate that **all solid timbers are organic materials** and therefore constantly change relative to their environment.

Surface Features

When specifying large profile, solid oak timber for your project you should expect the following natural features in the face and end grain of the pieces.

These features should not be considered defects and the extent of many surface features in the timber will change seasonally, sometimes closing up entirely due to natural expansion or shrinkage:

Knots

Knots appear as dark and often gnarled blemishes on the surface of the timber.

They generally occur where branches leave the trunk of the tree, or where a tree had become damaged throughout its life.

It is sometimes possible to choose prime lumber that has been specially selected from a batch to show fewer knots, or to resin-fill voids, but these options come at increased cost.



Checks

Checks have the appearance of knife-like slits that follow the grain line on the faces of the piece. Checking usually occurs where drying stresses exceed the grain's perpendicular tensile strength. The surface of a piece dries and shrinks much faster than its heartwood, which remains wet and swollen for longer.

Checking can be minimised by strictly controlling the drying of the piece through kilning or other methods.



Splits

Splits are a separation of the wood from one face to the opposite.

They can occur as a result of mechanical damage while processing but most commonly occur during the drying process.

Many large profile oak beams will have small or partial splits visible on the surface and end grain but unless they run the entire length of the piece, pose minimal structural concerns for application in non-load bearing exterior furnishings.



Shake

Shakes are lengthwise separations of wood along the grain usually occurring between or through the rings of annual growth. Shakes are commonly most noticeable on the end grain of a piece.



Dimensional Tolerance & Movement

The sawmills and suppliers of our timber products will generally work to a rough-sawn dimensional tolerance of $\pm 6/0$ mm. They will then ensure pieces are planed flat and cut to final size with all faces and ends square, with tolerances as close as $\pm 0.4/0.4$ mm. However, when specifying large-profile oak boards/beams for a project, size and handling restrictions for some machinery may mean that dimensional and squareness tolerances can be much greater.

Oak will also be subject to seasonal movement and other environmental factors, and dimensions are likely to change slightly from sawmill to our assembly plant to delivery on site.

As a general rule, a board/beam of 300mm can shrink/expand across its width as much as 6mm. This will dictate minimum distance adjacent timbers are spaced on a product as any contact between expanding pieces could have a severe effect on the integrity of the support or fixings. Longer oak pieces will also expand and contract at different rates along their length resulting in lines originally cut perfectly straight becoming wavy over time. It is important to allow the timber to move without restriction to avoid failure.

We can advise on any design changes/limitations to be set to minimise these issues.



Surface Treatments and Protection

As standard we treat the majority of our timber products with clear Danish oil, however when it comes to oak we are commonly asked to leave it untreated. If milled and dried correctly, an untreated oak board/beam should only be marginally more susceptible to excessive movement so with the right design management of the product a natural finish should not cause any issues.

The potential problem with untreated oak is the effect of the environment and the wood's own natural tannins on the visible surfaces of a piece:

Oak is open to prominent staining from contaminants and even rainwater. Rain will also unevenly raise the grain of the wood which can cause the surface to roughen over time. This will lead to a natural weathered appearance over time, which may still be the desired finish but is not suitable on every site. Constant use of the furniture product will also counteract this weathering, to an extent.

Oak's tannins (chemicals suspended in the sap of the wood) will naturally leech out over time. After exposure to rainwater for a short period after installation, tannins will be washed from the surface of the wood, desaturating its colour and potentially staining surrounding floor level finishes. As tannins are water soluble any staining should disappear over time. Oak tannins also react strongly with some materials, especially steels, and can leave dark marks on the surface of the wood that can only be removed with planing, heavy sanding or chemical cleaning. If tools or steel strapping are left on oak products during or after installation you are likely to see unwanted discolouration.



By requesting a clear oil, or even UV protective surface treatment on your oak products, staining, and tannin-leeching can be minimised. Applying an oil finish will also bring out the rich colours of the oak timber and improve its visual quality, however oil must be periodically reapplied to maintain a good finish.



Natural vs. Oiled Oak

Delivery & Storage

We often deliver timber products to site strapped and wrapped for secure shipping and we are aware that products are commonly stored on site for weeks or months before installation:

If products are left tightly bound/strapped any natural movement may be restricted, leading to severe, uneven dimensional changes and even failure of the timber or fixings. **All strapping must be removed or loosened immediately following delivery to site.**

If products are left wrapped in shipping materials they may be subject to much higher temperature and humidity than the surrounding environment, which will lead to moisture being drawn out from the wood at a high rate, potentially causing severe dimensional changes. As this moisture will have nowhere to go the products will accumulate a large amount of condensate, which can stain the timber and even damage steelwork; the timber may also begin to rot if left in this state for too long. **All wrapping must be removed immediately following delivery to site.**

Consider assigning an outdoor, but covered area to store furniture products before final installation.



The workshop team at Bailey Street Furniture Group will assess every piece of timber to be used in your furniture product and will reject those that have excessive splitting, warping or potentially dangerous surface features.

Faces will be sanded to minimum 80 grit and all sharp corners softened unless instructed otherwise.