



## European Oak

*Quercus robur* L. Syn. - *Q. pedunculata* Ehrh., *Quercus petraea* Liebl. Syn. - *Q. sessiliflora* Salisb = *Q. sessilis* Ehrh.

### Commercial names:

English:	Oak, European oak, Pedunculate oak, English oak ( <i>Q. robur</i> ), Sessile oak, Durmast oak ( <i>Q. petraea</i> ).
Spanish:	Roble común ( <i>Q. robur</i> ).
French:	Chêne, Chêne pédonculé, Chêne d'Europe ( <i>Q. robur</i> ), Chêne rouvre ( <i>Q. petraea</i> ).
Italian:	Farnia, Quercia gentile ( <i>Q. robur</i> ), Rovere ( <i>Q. petraea</i> ).
German:	Stieleiche, Sommerliche, Früheiche ( <i>Q. robur</i> ), Traubeneiche, Winterliche Spätheiche ( <i>Q. petraea</i> ).

### Common names:

Galicia:	Roble, Carvalho, Carvallo, Carballo.
Castille:	Roble, Rouro.
Basque Country:	Aritza, Aretxa, Ariza.
Cataluña:	Roura.

### Physical properties:

Density:	670-710-760 Kg/m <sup>3</sup>
Shrinkage:	Moderately unstable.
Shrinkage values:	Total Unitary
Volumetric:	11.9 <sup>(1)</sup> -14.5 <sup>(2)</sup> % (0.40-0.49)
Tangential:	6.9 <sup>(1)</sup> -10.5 <sup>(2)</sup> % (0.23-0.35)
Radial:	3.9 <sup>(1)</sup> -4.7 <sup>(2)</sup> % (0.11-0.22)
Hardness:	3.5-4.4 Semi-hard

(1) *Q. robur*, (2) *Q. petraea*.

### Mechanical properties (Wood free of defects)

Static bending:	86-138 N/mm <sup>2</sup>
Modulus of elasticity:	10,500-14,500 N/mm <sup>2</sup>
Compression parallel to grain:	52-64 N/mm <sup>2</sup>
Compression perpendicular to grain:	12 N/mm <sup>2</sup> (UNE)
Shear:	9.3-11.5 N/mm <sup>2</sup>
Toughness:	5.0-7.4 J/cm <sup>2</sup>

### Origin and availability:

This wood is found in Europe, Asia Minor and the north of Africa. It is found in northern Spain from Galicia to Catalonia. The presence of *Q. robur* is most abundant in Galicia and decreases towards Catalonia. *Q. petraea* is abundant in Catalonia and becomes more scarce westward. This tree is also found in the Urbion and Moncayo mountains. The southern limit is in the Guadarrama mountains. The forested area, production and export are stable.

### Wood description:

The color of the heartwood varies from a light yellow-brown to brown, and the sapwood is somewhat lighter. The sapwood is clearly differentiated. The growth rings are visible and very distinct. In edge-grained lumber large woody rays appear in the form of large flecks characteristic of oak, and in flat-grained (plainsawn) lumber the rays appear as vertical lines somewhat darker than the rest of the wood. The grain is straight and the grain texture is coarse (open). The wood has a rather strong smell of tannin. The wood is described as acid, and it can corrode metals such as iron or steel when in contact with them. Gases emitted by green wood can also be corrosive.

### Drying:

In air drying, board ends and the top part of the lumber stacks should be protected, especially if there are strong prevailing winds and a high exposure to sunlight. The use of 12 mm stickers is recommended. The drying rate is slow. There is a risk of superficial checks. In very thick lumber internal checks (honeycombing) can appear if the wood is dried too quickly. The recommended drying schedules are number 1 from the CTBA, T3 C2 (4/4) and T1-C1 (8/4) from the FPLM, and schedule C (4/4) from the PRL.

### Natural durability and ease of penetration:

The wood is classified as durable against the decaying action of fungi, susceptible to anobiids, lyctids and cerambycids, and moderately durable against termites. The heartwood is not penetrable and the sapwood is penetrable.

### Technological properties:

Green wood is difficult to saw. Saws become dull at a normal rate. The wood is well suited for sliced veneer, but it must be steamed or boiled beforehand. Machining presents no problems. Tools dull at a normal rate. The wood has good properties for steam bending. Gluing presents no problems. Screws and nails need a previously bored hole. A pretreatment with filler is recommended before applying varnish. The wood can be painted and stained without difficulty.

### Applications:

Interior carpentry: floors, moulding, base boards./ Cooperage./ Railroad ties./ Furniture and cabinetwork./ Structural framing./ Naval construction./ Hydraulic works./ Flooring for railway freight cars and containers./ This is an ideal wood for cooperage, and oak cooperage is essential in the elaboration of rich, full-bodied wines. Oak was used extensively in gothic churches in France, Germany, and England where it is still admirably well preserved. In the past, the oak groves of the Spanish Navy, used for naval construction, were very famous. (In the seventeenth and eighteenth centuries 2,000 logs were needed to build a ship of the line and 1,200 to build a frigate.) Trees of the species *Q. robur* can live as long as ten centuries, like the old oak in Guernica; but normally they do not live more than six hundred years.