

## Douglas fir

**Family.** Pinaceae

**Botanical Name(s).**

*Pseudotsuga menziesii*

**Continent.** Europe

**CITES.**

This species is not listed in the CITES Appendices (Washington Convention 2023).

**Notes.** Originally from North West of North America, DOUGLAS FIR is widely used in reforestation in France and Europe. This sheet presents the properties of fast-growing European plantation woods. These properties are different from those of the "Oregon Pine", old and slow growing, coming from its original growing area.

### Description of logs

**Diameter.** From 50 to 80 cm

**Thickness of sapwood.** From 5 to 10 cm

**Floats.** Pointless

**Log durability.** Low (treatment necessary)

### Description of wood

**Colour reference.** Pinkish brown

**Sapwood.** Clearly demarcated

**Texture.** Medium

**Grain.** Straight

**Interlocked grain.** Absent

**Notes.** Heartwood is pinkish brown with veins, the large sapwood is yellowish. Wood may show some resin pockets, sometimes of a great dimension.

### Physics and mechanics

*The properties indicated are for mature wood. These properties may vary significantly depending on the origin and growing conditions of the wood.*

| Property                            | Average value |
|-------------------------------------|---------------|
| Specific gravity <sup>1</sup>       | 0.54          |
| Monnin hardness <sup>1</sup>        | 3.2           |
| Coefficient of volumetric shrinkage | 0.46 % per %  |
| Total tangential shrinkage (St)     | 6.9 %         |
| Total radial shrinkage (Sr)         | 4.7 %         |
| Ratio St/Sr                         | 1.5           |
| Fibre saturation point              | 27 %          |
| Thermal conductivity ( $\lambda$ )  | 0.19 W/(m.K)  |
| Lower heating value                 | 18,720 kJ/kg  |
| Crushing strength <sup>1</sup>      | 50 MPa        |



Flat sawn



Quarter sawn

|                                      |            |
|--------------------------------------|------------|
| Static bending strength <sup>1</sup> | 91 MPa     |
| Modulus of elasticity <sup>1</sup>   | 16,800 MPa |

<sup>1</sup> At 12 % moisture content, with 1 MPa = 1 N/mm

## Natural durability and preservation

**Resistance to fungi.** Class 3-4 - moderately to poorly durable

**Resistance to dry wood borers.** Class D - durable (sapwood demarcated, risk limited to sapwood)

**Resistance to termites.** Class S - susceptible

**Treatability.** Class 4 - not permeable

**Use class ensured by natural durability.**

Class 3 - not in ground contact, outside

**Notes.** Standard NF EN 350 (2016) states that durability class 3-4 results from laboratory or field tests simulating soil contact situations. According to this standard, laboratory tests to determine durability against decay fungi give durability class 3-5 (moderately to not durable). In practice, it should be remembered that most Douglas-fir timber on the market today has a significant proportion of sapwood, as it comes from plantations where it is felled young (less than 60 years old). The higher the proportion of sapwood, the more the wood's performance is diminished against attack by decay fungi, and also insects for interior uses. The duration of performance can be modified by the situation in service (as described in standard NF EN 335 of May 2013). The heartwood cannot be impregnated. The wood is most often used with its sapwood, which is moderately to slightly impregnable.

## Requirement of a preservative treatment

**Against dry wood borer.** Does not require any preservative treatment

**In case of temporary humidification.** Requires appropriate preservative treatment

**In case of permanent humidification.** Requires appropriate preservative treatment

## Drying

**Drying rate.** Rapid to normal

**Risk of distortion.** Slight risk

**Risk of casehardening.** No known specific risk

**Risk of checking.** Slight risk

**Risk of collapse.** No known specific risk

**Suggested drying program.**

| Phases              | Duration (H) | MC (%) probes | T (°C) | Rh (%) | UGL (%) |
|---------------------|--------------|---------------|--------|--------|---------|
| <b>Prewarm 1</b>    |              | > 50          | 60     | 81     | 14.0    |
| <b>Prewarm 2</b>    | 3            | > 50          | 65     | 76     | 12.0    |
| <b>Drying</b>       |              | > 50          | 68     | 64     | 10.0    |
|                     |              | 50 - 40       | 70     | 63.0   | 9.1     |
|                     |              | 40 - 35       | 70     | 61.0   | 8.7     |
|                     |              | 35 - 30       | 70     | 56.0   | 7.9     |
|                     |              | 30 - 27       | 72     | 50.0   | 7.0     |
|                     |              | 27 - 24       | 72     | 44.0   | 6.3     |
|                     |              | 24 - 21       | 75     | 39.0   | 5.5     |
|                     |              | 21 - 18       | 75     | 34.0   | 4.9     |
|                     |              | 18 - 15       | 75     | 29.0   | 4.3     |
|                     |              | 15 - 12       | 80     | 28.0   | 3.9     |
|                     |              | 12 - 9        | 80     | 24.0   | 3.4     |
|                     |              | 9 - 6         | 80     | 22.0   | 3.2     |
| <b>Conditioning</b> | 6            |               | 73     | (3)    | (2)     |
| <b>Cooling</b>      | (1)          |               | Arrêt  | (3)    | (2)     |

(1) ) Cooling: until the temperature inside the kiln no longer exceeds external temperature by more than 30 °C.

(2) UGL = final H% x 0,8 to 0,9.

(3) Subtract RH from the UGL determined in (2) and temperature, using the Hailwood-Horrobin equation.

## Sawing and machining

Blunting effect. Normal

Sawteeth recommended. Ordinary or alloy steel

Cutting tools. Ordinary

Peeling. Good

Slicing. Good

Notes. Risks of clogging of saw blades and tools due to resin pockets.

## Assembling

Nailing and screwing. Good

Notes. Slightly acid wood: risk of nail or screw corrosion if in contact with humidity, risks of stain.

## Commercial grading

Appearance grading for sawn timbers.

According to European standard EN 1611-1 (October 1999) Possible grading (on 2 sides): G2-0, G2-1, G2-2, G2-3, G2-4 Possible grading (on 4 sides): G4-0, G4-1, G4-2, G4-3, G4-4

Visual grading for structural applications

According to European standard EN 1912 (2012) and associated national standards, strength classes C14, C16, C18, C20, C22, C24, C30 and C35 can be provided by visual grading. Strength classes C18, C24 and C30 can be provided by visual grading according to French standard NF B 52-001-1 (2018).

## Fire safety

Conventional French grading.

Thickness > 18 mm: M3 (moderately inflammable)

Thickness < 18 mm: M4 (easily inflammable)

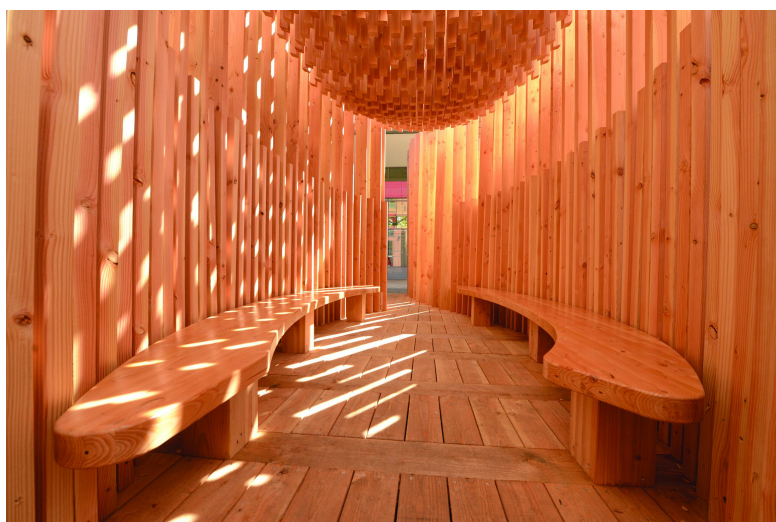
**Euroclasses grading.** D-s2, d0

Default grading for solid wood, according to requirements of European standard EN 14081-1+A1 (August 2019).

It concerns structural graded timber in vertical uses and ceiling with mean density upper 0.35 and thickness upper 22 mm.

## End-uses

- Exterior joinery
- Exterior panelling
- Glued laminated
- Heavy carpentry
- Interior joinery
- Interior panelling
- Poles
- Ship building
- Veneer for back or face of plywood
- Wood frame house



Temporary micro-architecture display – Forum Bois Construction, Lyon 2016; Built for: France Douglas; Architect: Patriarche & Co - France (© Jean-Claude Chazelon).

## Main local names

| Country                          | Local name       |
|----------------------------------|------------------|
| France (temperate timber)        | Douglas          |
| France (temperate timber)        | Pin d'oregon     |
| France (temperate timber)        | Sapin de Douglas |
| Germany (temperate timber)       | Douglasie        |
| Germany (temperate timber)       | Douglastanne     |
| United States (temperate timber) | Douglas fir      |

