DOUGLAS

Family: PINACEAE (gymnosperm)

Scientific name(s): Pseudotsuga menziesii

Commercial restriction: no commercial restriction

Note: Coming from North West of America, DOUGLAS FIR is often used for reaforestation in France and in Europe. Properties of european planted trees (young and with a rapid growth) which are mentionned in this sheet are different from those of the "Oregon pine" (old and with a slow growth) coming from its original growing area.

WOOD DESCRIPTION

Color: pinkish brown

Sapwood: clearly demarcated

Texture: medium

Grain: straight

Interlocked grain: absent

LOG DESCRIPTION

Diameter: from 50 to 80 cm

Thickness of sapwood: from 5 to 10 cm

Floats: pointless

Log durability: low (must be treated)

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

PHYSICAL PROPERTIES

Physical and mechanical properties are based on mature heartwood specimens. These properties can vary greatly depending on origin and growth conditions.

	Mean	Std dev.
Specific gravity *:	0,54	0,04
Monnin hardness *:	3,2	0,8
Coeff. of volumetric shrinkage:	0,46 %	0,02 %
Total tangential shrinkage (TS):	6,9 %	1,2 %
Total radial shrinkage (RS):	4,7 %	0,4 %
TS/RS ratio:	1,5	
Fiber saturation point:	27 %	

Stability: moderately stable

MECHANICAL AND ACOUSTIC PROPERTIES

	Mean	Std dev.
Crushing strength *:	50 MPa	6 MPa
Static bending strength *:	91 MPa	6 MPa
Modulus of elasticity *:	16800 MPa	1550 MPa

(*: at 12% moisture content, with 1 MPa = 1 N/mm²)

Musical quality factor: 110,1 measured at 2971 Hz

NATURAL DURABILITY AND TREATABILITY

Fungi and termite resistance refers to end-uses under temperate climate. Except for special comments on sapwood, natural durability is based on mature heartwood. Sapwood must always be considered as non-durable against wood degrading agents.
E.N. = Euro Norm

Funghi (according to E.N. standards): class 3-4 - moderately to poorly durable

Dry wood borers: durable - sapwood demarcated (risk limited to sapwood)

Termites (according to E.N. standards): class S - susceptible

Treatability (according to E.N. standards): class 4 - not permeable

Use class ensured by natural durability: class 3 - not in ground contact, outside

Species covering the use class 5: No

Note: This species is listed in the European standard NF EN 350-2.
Use class 3 is only for wood components without sapwood.
According to the European standard NF EN 335, performance length might be modified by the intensity of end-use exposition.
Heartwood is not permeable to preservative products. Wood is used most of the time with sapwood which is moderately to poorely permeable to preservative products.

REQUIREMENT OF A PRESERVATIVE TREATMENT

Against dry wood borer attacks: does not require any preservative treatment

In case of risk of temporary humidification: requires appropriate preservative treatment

In case of risk of permanent humidification: requires appropriate preservative treatment

DRYING

Drying rate: rapid to normal
Risk of distortion: slight risk
Risk of casehardening: no
Risk of checking: slight risk
Risk of collapse: no

Possible drying schedule: 3

M.C. (%)	Temperature (°C) dry-bulb	wet-bulb	Air humidity (%)
Green	60	56	81
30	68	58	61
20	74	60	51
15	80	61	41

This schedule is given for information only and is applicable to thickness lower or equal to 38 mm.
It must be used in compliance with the code of practice.
For thickness from 38 to 75 mm, the air relative humidity should be increased by 5 % at each step.
For thickness over 75 mm, a 10 % increase should be considered.

SAWING AND MACHINING

Blunting effect: normal
Sawteeth recommended: ordinary or alloy steel
Cutting tools: ordinary
Peeling: good
Slicing: nood
Note: Risks of clogging of saw blades and tools due to resin pockets.

ASSEMBLING

Nailing / screwing: good
Gluing: correct
Note: Slightly acid wood: risk of nail or screw corrosion if in contact with humidity.

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: Traded timber with CE marking. Possible strength classes: C18, C24 or C30 related to the European standard EN 14081 (May 2006).

FIRE SAFETY

Conventional French grading: Thickness > 18 mm : M.3 (moderately inflammable)
Thickness < 18 mm : M.4 (easily inflammable)

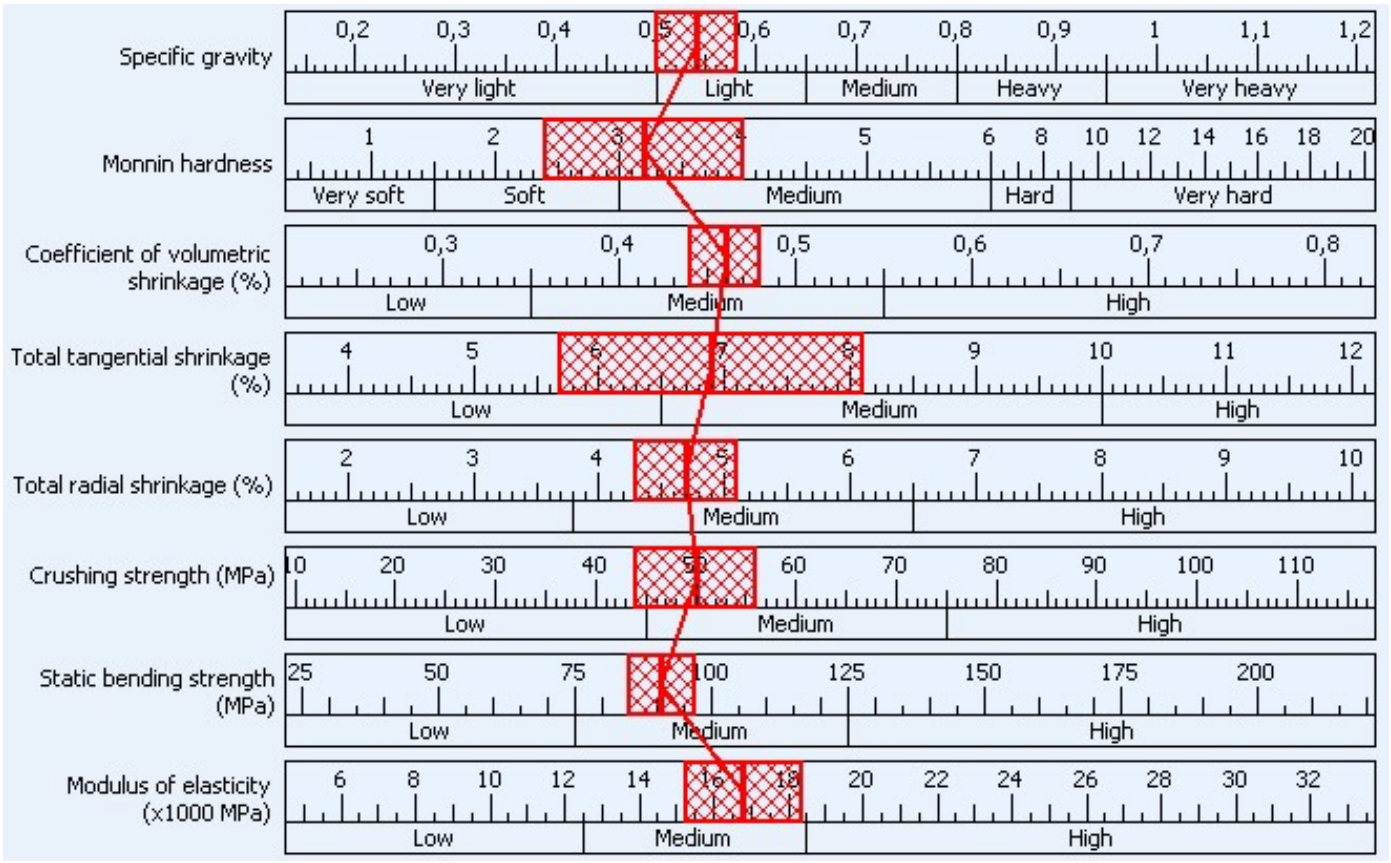
Euroclasses grading: D s2 d0
Default grading for solid wood, according to requirements of European standard EN 14081-1 annex C (April 2009). It concerns structural graded timber in vertical uses with mean density upper 0.35 and thickness upper 22 mm.

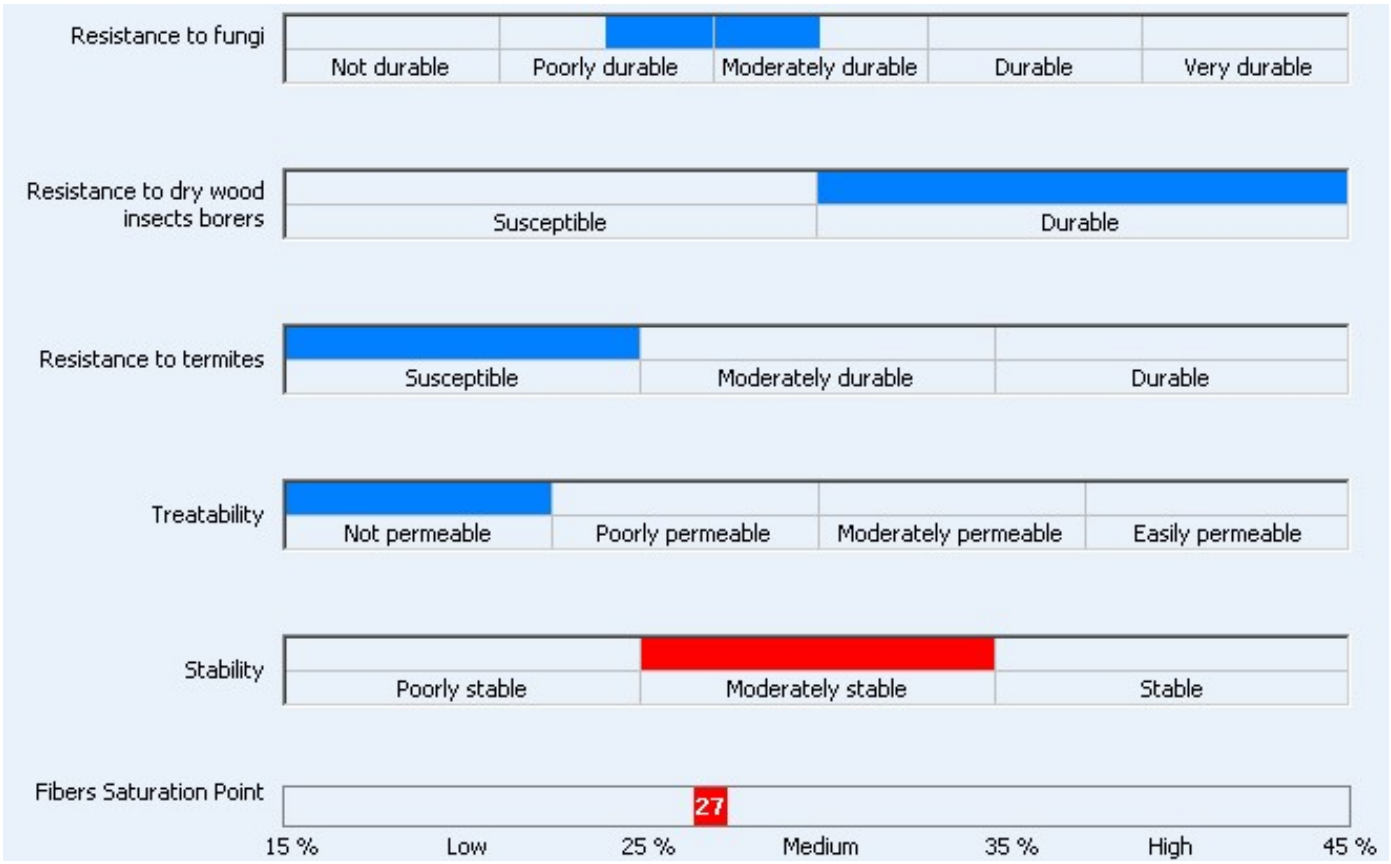
END-USES

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

MAIN LOCAL NAMES

Country	Local name	Country	Local name
Germany (temperate timber)	DOUGLASIE	France (temperate timber)	DOUGLAS
France (temperate timber)	PIN D'OREGON	France (temperate timber)	SAPIN DE DOUGLAS
United States (temperate timber)	DOUGLAS FIR		


Specific gravity
0,2 0,3 0,4 0,5 0,6 0,7 0,8 0,9 1 1,1 1,2
Very light Light Medium Heavy Very heavy
Monnin hardness
1 2 3 4 5 6 8 10 12 14 16 18 20
Very soft Soft Medium Hard Very hard
Coefficient of volumetric shrinkage (%)
0,3 0,4 0,5 0,6 0,7 0,8
Low Medium High
Total tangential shrinkage (%)
4 5 6 7 8 9 10 11 12
Low Medium High
Total radial shrinkage (%)
2 3 4 5 6 7 8 9 10
Low Medium High
Crushing strength (MPa)
10 20 30 40 50 60 70 80 90 100 110
Low Medium High
Static bending strength (MPa)
25 50 75 100 125 150 175 200
Low Medium High
Modulus of elasticity (x1000 MPa)
6 8 10 12 14 16 18 20 22 24 26 28 30 32
Low Medium High


Resistance to fungi
Not durable Poorly durable Moderately durable Durable Very durable
Resistance to dry wood insects borers
Susceptible Durable
Resistance to termites
Susceptible Moderately durable Durable
Treatability
Not permeable Poorly permeable Moderately permeable Easily permeable
Stability
Poorly stable Moderately stable Stable
Fibers Saturation Point
27
15 % Low 25 % Medium 35 % High 45 %