technology transfer *fact sheet*

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Pseudotsuga menziesii (Mirb.) Franco
Family: Pinaceae
Douglas Fir

The genus *Pseudotsuga* contains about 7 species native to North America [2], and eastern Asia (China to Japan) [5]. The wood of pine can be separated microscopically into the white, red, yellow and the foxtail/pinyon pine groups. Douglas-fir is named for Henry Douglas (1798-1834), a Scottish botanist who traveled in North America. The word *Pseudotsuga* means 'false hemlock" , while *menziesii* is used in recognition of Archibald Menzies (1754-1842), a Scotch physician and naturalist, who discovered Douglas-fir in 1793 on Vancouver Island, British Colombia.

Other Common Names: abete di Douglas, abete odoroso d'America, abeto, acahuite, achahuite, alpine hemlock, black fir, blaue Douglas-tanne, blauwe Douglas, blauwe Douglas spar, blue Douglas-fir, British Columbia Douglas-fir, British Columbia pine, British Columbian pine, cahuite, Canadian Douglas-fir, coast Douglas-fir, Colorado Douglas-fir, Colorado pino real, Colorado real pino, Columbian pine, common Douglas, common Douglas-fir, cork-barked Douglas spruce, Douglaasfenyo, Douglas, Douglas azul, Douglas bleu, Douglas des montagnes, Douglas du Colorado, Douglas glauca, Douglas pine, Douglas spruce, Douglas vert, Douglasfichte, Douglas-fir, Douglas-gran, Douglasia, Douglasia azzurra, Douglasia glauca, Douglasie, Douglaska, Douglaskuusi, Douglasspar, Douglastanne, Duglas, Duglazija, golden rod fir, gray Douglas, green Douglas, groene Douglas, grune Douglas-tanne, guallame, guayame, guayame Colorado, hallarin, hayarin, hayarin Colorado, inland Douglas-fir, interior Douglas-fir, Montana fir, Oregon, Oregon Douglas, Oregon Douglas-fir, Oregon fir, Oregon pine, Oregon spruce, Pacific Coast Douglas-fir, Patton's hemlock, pin de Douglas, pin de i'Oregon, pin d'Oregon, pinabete, pinho de Douglas, pino de corcho, pino de Douglas, pino de Oregon, pino Oregon, pino real, Puget Sound pine, red fir, red pine, red spruce, Rocky Mountain Douglas-fir, Santiam quality fir, sapin de Douglas, spruce, yellow Douglas-fir, yellow fir, yellow national fir.

Distribution: The range of Douglas-fir extends from the Rocky Mountains to the Pacific coast and from Mexico to central British Columbia. The Douglas-fir production comes from the Coast States of Oregon, Washington, and California and from the Rocky Mountain States.

The Tree: Douglas-fir reaches heights of 250 feet (76.20 m), with a diameter of 6 feet (1.83 m), in coastal stands that are between 200 and 800 years old. The largest intact specimen was recorded at 330 feet (100.58 m) near Littlerock Washington.

General Wood Characteristics: The wood of Douglas-fir varies widely in weight and strength. When lumber of high strength is needed for structural uses, selection can be improved by applying the density rule. This rule uses percentage of latewood and rate of growth as they affect density. For equivalent knot sizes, the higher density generally indicates stronger wood. Sapwood of Douglas-fir is narrow in old-growth trees but may be as much as 3 inches (7.62 cm) wide in second-growth trees of commercial size. Fairly young trees of moderate to rapid growth have reddish heartwood and are called red-fir. Very narrow-ringed wood of old trees may be yellowish brown and is known on the market as yellow-fir.

Weight[a]

			Weight
Location	MC[b]	SpGr[c]	lb/ft^3
Coast	Green(37%)[d]	0.45	38

	12%	0.48	34
	Ovendry	0.51	NA
Interior West	Green(34%)[d]	0.46	38
	12%	0.50	31
	Ovendry	0.52	NA
Interior North	Green(30%)[d]	0.45	35
	12%	0.48	30
	Ovendry	0.50	NA
Interior South	Green(30%)[d]	0.43	NA
	12%	0.46	32
	Ovendry	NA	NA

[a]Reference (187).

[b] Moisture Content.

[c] Specific Gravity.

[d]Reference (177).

Mechanical Properties[a]

Property	Green	Dry
Coast		
MOE	1.56 ¥ 10^6 lbf/in^2	1.95 ¥ 10^6 lbf/in^2
MOR	7.70 ¥ 10^3 lbf/in^2	12.4 ¥ 10^3 lbf/in^2
C||	3.78¥ 10^3 lbf/in^2	7.23 ¥ 10^3 lbf/in^2
C∧	0.38 ¥ 10^3 lbf/in^2	0.80 ¥ 10^3 lbf/in^2
WML	7.6 in-lbf/in^3	9.9 in-lbf/in^3
Hardness	500 lbf	710 lbf
Shear||	0.90 ¥ 10^3 lbf/in^2	1.13 ¥ 10^3 lbf/in^2
Interior West		
MOE	1.51 ¥ 10^6 lbf/in^2	1.83 ¥ 10^6 lbf/in^2
MOR	7.70 ¥ 10^3 lbf/in^2	12.6 ¥ 10^3 lbf/in^2
C||	3.87 ¥ 10^3 lbf/in^2	7.43 ¥ 10^3 lbf/in^2
C∧	0.42 ¥ 10^3 lbf/in^2	0.76 ¥ 10^3 lbf/in^2
WML	7.2 in-lbf/in^3	10.6 in-lbf/in^3
Hardness	510 lbf	660 lbf
Shear||	0.94 ¥ 10^3 lbf/in^2	1.29 ¥ 10^3 lbf/in^2
Interior North		
MOE	1.41 ¥ 10^6 lbf/in^2	1.79 ¥ 10^6 lbf/in^2
MOR	7.40 ¥ 10^3 lbf/in^2	13.1 ¥ 10^3 lbf/in^2
C||	3.47 ¥ 10^3 lbf/in^2	6.90 ¥ 10^3 lbf/in^2
C∧	0.36 ¥ 10^3 lbf/in^2	0.77 ¥ 10^3 lbf/in^2
WML	8.1 in-lbf/in^3	10.5 in-lbf/in^3
Hardness	420 lbf	600 lbf
Shear||	0.95 ¥ 10^3 lbf/in^2	1.40 ¥ 10^3 lbf/in^2

Mechanical Properties, cont'd

Property	Green	Dry
Interior South		
MOE	1.16 ¥ 10^6 lbf/in^2	1.49 ¥ 10^6 lbf/in^2
MOR	6.80 ¥ 10^3 lbf/in^2	11.9 ¥ 10^3 lbf/in^2

C||	3.11 ¥ 10^3 lbf/in^2	6.23 ¥ 10^3 lbf/in^2
C^	0.34 ¥ 10^3 lbf/in^2	0.74 ¥ 10^3 lbf/in^2
WML	8.0 in-lbf/in^3	9.0 in-lbf/in^3
Hardness	360 lbf	510 lbf
Shear||	0.95 ¥ 10^3 lbf/in^2	1.51 ¥ 10^3 lbf/in^2

[a] Reference (187) (2-inch standard).

Drying and shrinkage[a]

Type of shrinkage	Percentage of shrinkage (green to final moisture content)		
	0%MC[b]	0%MC[c]	0%MC[d]
Tangential	7.6	6.9	7.5
Radial	4.8	3.8	4.8
Volumetric	12.4	10.7	11.8

[a]Reference (187).

[b] Coast.

[c] Interior North.

[d] Interior West.

Coastal timbers may contain red-brown chemical stains, gray sapwood stains, ring failure or honeycomb, possibly due to wood extractives, slow drying or wetwood (infrequent occurrence)(177).

Kiln drying schedule

Conventional Temperatures/Moisture Content-Controlled Schedules[a]

Condition	4/4, 5/4 stock	6/4 stock	8/4 stock	10/4 stock	12/4 stock	British Schedule 4/4 stock
Lower Grades						
Coastal	T7-A4	NA	T7-A4[b]	NA	NA	NA
Inland	T9-A4[c]	NA	T9-A4[c]	NA	NA	NA
Upper Grades						
Coastal	T11-A4	NA	T10-A3	T5-A1	T5-A1	NA
Inland	NA	NA	NA	NA	NA	NA

[a]Reference (28 & 177).

[B]Maximum wet-bulb depression 25°F, Reference (177).

[C]Maximum wet-bulb depression 20°F, Reference (177).

Conventional Temperatures/Time-Controlled Schedules[a]

Condition	Lower Grades			Upper Grades			
	4/4, 5/4 stock	6/4 stock	8/4 stock	4/4, 5/4 stock	6/4 stock	8/4 stock	12/4, 16/4 stock
Standard	291[b]	291[c]	291[c]	294[d]	294[d]	294[d]	288

[a]Reference (28).

[B]Omit step 1 and reduce step 3 to 12 hours, reference (28).

[C]Reduce step 3 to 12 hours, reference (28).

[D]Omit step 1 for vertical grain, reference (28).

High Temperatures[a]

Condition	4/4, 5/4 stock	6/4 stock	8/4 stock	Other Products

Standard	400[b,c,d,e]	400[b,e]	400[b,e]/414e	NA

[a]References (28).

[b]Schedule for western species is for 6 inches and narrower in width, for use with common and dimension grade, except as noted for upper grades, reference (28).

[c]Reduce step 1 and 2 to 6 hours for 4/4-5/4 for western species, references (28).

[d]In upper grades, use only vertical garin stock, references (28).

[e]Can be dried with western larch, references (28).

Working Properties: No information at this time.

Durability: Rated as moderately resistant to decay. (187)

Preservation: No information at this time.

Uses: Douglas-fir is used mostly for building and construction purposes in the form of lumber, timbers, piles, and plywood. Considerable quantities go into railroad crossties, cooperage stock, mine timbers, poles, and fencing. Douglas-fir lumber is used in the manufacture of various products, including sash, doors, laminated beams, general millwork, railroad-car construction, boxes, pallets, and crates. Small amounts are used for flooring, furniture, ship and boat construction and tanks. Douglas-fir plywood has found ever-increasing usefulness in construction, furniture, cabinets, and many other products.

Toxicity: Can cause dermatitis, septic splinter wounds, or contact eczema. (69, 150 & 207)

Additional Reading & References Cited (in parentheses):

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