

Table 2-6.—Strength values of various woods, based on 15 percent moisture content,¹ to be used in design of aircraft for use in the continental United States (see sections 2.10 and 2.11 for explanations relative to the basis for, and use of, the values in this table)—Continued

Species of wood: common and botanical names	Specific gravity based on volume and weight when oven dry		Weight at 15 percent moisture content	Shrinkage from green to oven-dry condition based on dimensions when green		Static bending				Compression parallel to grain		Compression perpendicular to grain ^{1,7} ($F_{c\perp}$)	Shearing strength parallel to grain ^{1,8} ($F_{s\parallel}$)	Hardness, side load required to imbed 0.444-inch ball to one-half its diameter	Tension		
	Average ²	Minimum permitted ³		Radial	Tangential	Fiber stress at proportional limit ⁴ (F_{bF})	Modulus of rupture ⁴ (F_{br})	Modulus of elasticity ^{4,5} (E_L)	Work to maximum load	Fiber stress at proportional limit ⁶ (F_{cF})	Maximum crushing strength ⁴ (F_{cu})				Strength parallel to grain ⁹ ($F_{t\parallel}$)	Strength perpendicular to grain ⁹ ($F_{t\perp}$)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
SOFTWOODS (CONIFERS)																	
Baldcypress (<i>Taxodium distichum</i>)	0.48	0.43	Lb. per cu. ft. 32	Percent 3.8	Percent 6.2	P. s. i. 5,900	P. s. i. 9,600	1,000 p. s. i. 1,240	In.-lb. per cu. ft. 7.7	P. s. i. 4,020	P. s. i. 5,400	P. s. i. 940	P. s. i. 840	Lb. 480	Tension strength parallel to grain taken as equal to modulus of rupture. See section 2.11.	P. s. i. 140	
Cedar, Alaska (<i>Chamaecyparis nootkatensis</i>)	.46	.41	31	2.8	6.0	5,700	9,900	1,220	10.1	3,840	5,100	810	930	540			180
Douglas-fir (normal) (<i>Pseudotsuga taxifolia</i>) ^{12, 16}	.50	.45	33	5.0	7.8	5,900	10,900	1,480	8.1	4,220	5,600	1,020	950	610			140
Douglas-fir (light) ^{12, 16}	.43	.38	28			4,900	9,000	1,210		3,390	4,500	770					
Fir, California red (<i>Abies magnifica</i>)	.42	.38	28	4.5	7.9	5,100	9,400	1,320	8.2	3,480	4,700	680	890	460			100
Fir, noble (<i>Abies nobilis</i>) ¹²	.42	.36	28	4.5	8.3	5,600	9,800	1,470	8.0	3,580	4,800	700	880	380			110
Fir, Pacific (<i>Abies amabilis</i>)	.42	.38	27	4.5	10.0	5,000	8,400	1,320	8.3	3,370	4,500	530	830	400			
Fir, white (<i>Abies concolor</i>)	.40	.36	26	3.2	7.0	5,300	8,400	1,170	6.3	3,200	4,400	650	780	410			130
Hemlock, Western (<i>Tsuga heterophylla</i>) ¹²	.45	.40	30	4.3	7.9	6,200	11,000	1,510	7.3	4,080	5,500	730	860	540			150
Incense-cedar, California (<i>Libocedrus decurrens</i>)	.36	.32	25	3.3	5.2	5,000	7,600	900	5.6	3,350	4,500	700	760	450			140
Larch, Western (<i>Larix occidentalis</i>)	.59	.53	37	4.2	8.1	6,700	11,000	1,480	7.8	4,780	6,400	1,150	1,110	680			140
Pine, Eastern white (<i>Pinus strobus</i>)	.37	.34	25	2.1	6.1	4,600	7,600	1,060	6.3	2,960	4,060	520	740	350			150
Pine, ponderosa (<i>Pinus ponderosa</i>)	.42	.33	23	3.9	6.3	5,000	8,100	1,070	6.2	3,160	4,200	750	900	410			100
Pine, red (<i>Pinus resinosa</i>)	.51	.46	33	4.6	7.2	7,000	10,800	1,530	8.7	4,320	5,800	820	970	510			100
Pine, sugar (<i>Pinus lambertiana</i>)	.38	.34	26	2.9	5.6	4,700	7,300	1,020	5.5	2,970	4,000	630	830	360			160
Pine, Western white (<i>Pinus monticola</i>)	.42	.38	28	4.1	7.4	5,000	8,300	1,280	7.7	3,400	4,600	560	700	360			
Redcedar, Western (<i>Thuja plicata</i>)	.34	.31	23	2.4	5.0	4,400	7,100	960	5.6	3,160	4,200	640	720	330			110
Spruce, Sitka (<i>Picea sitchensis</i>) ¹²	.41	.36	28	4.2	7.5	5,300	9,400	1,350	8.7	3,530	4,700	740	900	470		170	
Spruce, red (<i>Picea rubra</i>)	.41	.36	28	3.8	7.8	5,600	9,300	1,320	8.1	3,670	4,900	630	890	460		160	
Spruce, white (<i>Picea glauca</i>)	.45	.36	20	4.7	8.2	5,100	8,700	1,150	7.2	3,310	4,400	590	850	440		160	
White-cedar, Northern (<i>Thuja occidentalis</i>)	.32	.29	22	2.1	4.7	3,900	6,000	690	5.0	2,430	3,300	430	700	200		120	
White-cedar, Port Orford (<i>Chamaecyparis lawsoniana</i>) ^{12, 16}	.43	.40	29	4.0	6.9	6,700	10,200	1,430	8.6	4,110	5,500	810	790	510		160	