

# PROPERTIES OF STRUCTURAL TIMBER

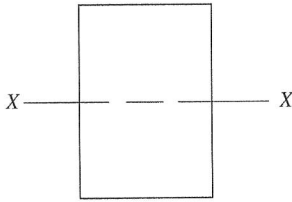


TABLE E.1 U.S. Customary units

Nominal Size in.	Dressed Size in.	A in. <sup>2</sup>	Wt. lb/ft	I <sub>x</sub> in. <sup>4</sup>	S <sub>x</sub> in. <sup>3</sup>
2 × 4	1½ × 3½	5.25	1.46	5.36	3.06
× 6	× 5½	8.25	2.29	20.8	7.56
× 8	× 7¼	10.9	3.02	47.6	13.1
× 10	× 9¼	13.9	3.85	98.9	21.4
× 12	× 11¼	16.9	4.68	178	31.6
× 14	× 13¼	19.9	5.52	291	43.9
× 16	× 15¼	22.9	6.35	443	58.2
× 18	× 17¼	25.9	7.17	642	74.5
3 × 4	2½ × 3½	8.75	2.42	8.93	5.10
× 6	× 5½	13.8	3.82	34.7	12.6
× 8	× 7¼	18.1	5.04	79.4	21.9
× 10	× 9¼	23.1	6.42	165	35.6
× 12	× 11¼	28.1	7.81	297	52.7
× 14	× 13¼	33.1	9.20	485	73.2
× 16	× 15¼	38.1	10.6	739	96.9
× 18	× 17¼	43.1	12.0	1070	124
4 × 4	3½ × 3½	12.3	3.40	12.5	7.15
× 6	× 5½	19.3	5.35	48.5	17.6
× 8	× 7¼	25.4	7.05	111	30.7
× 10	× 9¼	32.4	8.93	231	49.9
× 12	× 11¼	39.4	10.9	415	73.8
× 14	× 13¼	46.4	12.9	678	102
× 16	× 15¼	53.4	14.9	1030	136
× 18	× 17¼	60.4	16.8	1500	174

Notes: Properties and weights are for dressed sizes. Assumed unit weight of timber is 40 pcf. Moment of inertia and section modulus are about the strong axis.

TABLE E.1 U.S. Customary units (Continued)

Nominal Size in.	Dressed Size in.	A in. <sup>2</sup>	Wt. lb/ft	$I_x$ in. <sup>4</sup>	$S_x$ in. <sup>3</sup>
6 × 6	5½ × 5½	30.3	8.40	76.3	27.7
× 8	× 7½	41.3	11.4	193	51.6
× 10	× 9½	52.3	14.5	393	82.7
× 12	× 11½	63.3	17.5	697	121
× 14	× 13½	74.3	20.6	1130	167
× 16	× 15½	85.3	23.6	1710	220
× 18	× 17½	96.3	26.7	2460	281
× 20	× 19½	108	29.8	3400	349
8 × 8	7½ × 7½	56.3	15.6	264	70.3
× 10	× 9½	71.3	19.8	536	113
✓ × 12	× 11½	86.3	23.9	951	165
× 14	× 13½	101	28.0	1540	228
× 16	× 15½	116	32.0	2330	300
× 18	× 17½	131	36.4	3350	383
× 20	× 19½	146	40.6	4630	475
× 22	× 21½	161	44.8	6210	578
10 × 10	9½ × 9½	90.3	25.0	679	143
× 12	× 11½	109	30.3	1200	209
× 14	× 13½	128	35.6	1950	289
× 16	× 15½	147	40.9	2950	380
× 18	× 17½	166	46.1	4240	485
× 20	× 19½	185	51.4	5870	602
× 22	× 21½	204	56.7	7870	732
× 24	× 23½	223	62.0	10,300	874
12 × 12	11½ × 11½	132	36.7	1460	253
× 14	× 13½	155	43.1	2360	349
× 16	× 15½	178	49.5	3570	460
× 18	× 17½	201	55.9	5140	587
× 20	× 19½	224	62.3	7110	729
× 22	× 21½	247	68.7	9520	886
× 24	× 23½	270	75.0	12,400	1060

TABLE E.2 SI units

Nominal Size mm	Dressed Size mm	$A$ $\text{mm}^2 \times 10^3$	Mass kg/m	$I_x$ $\text{mm}^4 \times 10^6$	$S_x$ $\text{mm}^3 \times 10^6$
50 × 100	38.1 × 88.9	3.39	2.17	2.23	0.0502
× 150	× 140	5.33	3.42	8.71	0.124
× 200	× 184	7.01	4.49	19.8	0.215
× 250	× 235	8.95	5.74	41.2	0.351
× 300	× 286	10.9	6.98	74.3	0.519
× 360	× 337	12.8	8.23	122	0.721
× 410	× 387	14.7	9.45	184	0.951
× 460	× 438	16.7	10.69	267	1.22
80 × 100	63.5 × 88.9	5.65	3.62	3.72	0.0836
× 150	× 140	8.89	5.70	14.5	0.207
× 200	× 184	11.7	7.49	33.0	0.358
× 250	× 235	14.9	9.56	68.7	0.584
× 300	× 286	18.2	11.64	124	0.866
× 360	× 337	21.4	13.71	203	1.20
× 410	× 388	24.6	15.79	309	1.59
× 460	× 438	27.8	17.82	445	2.03
100 × 100	88.9 × 88.9	7.90	5.06	5.21	0.117
× 150	× 140	12.4	7.97	20.3	0.290
× 200	× 184	16.4	10.48	46.2	0.502
× 250	× 235	20.9	13.39	96.1	0.818
× 300	× 286	25.4	16.29	173	1.21
× 360	× 337	30.0	19.20	284	1.68
× 410	× 388	34.5	22.1	433	2.23
× 460	× 438	38.9	24.9	623	2.84
150 × 150	140 × 140	19.6	12.56	32.0	0.457
× 200	× 191	26.7	17.13	81.3	0.851
× 250	× 241	33.7	21.6	163	1.36
× 300	× 292	40.9	26.2	290	1.99
× 360	× 343	48.0	30.8	471	2.75
× 410	× 394	55.2	35.3	714	3.63
× 460	× 445	62.3	39.9	1030	4.62
× 510	× 496	69.4	44.5	1420	5.74

Notes: Properties are for dressed sizes. Assumed unit mass of timber is 641 kilograms per cubic meter. Moment of inertia and section modulus are about the strong axis.

TABLE E.2 SI units (Continued)

Nominal Size mm	Dressed Size mm	A mm <sup>2</sup> × 10 <sup>3</sup>	Mass kg/m	I <sub>x</sub> mm <sup>4</sup> × 10 <sup>6</sup>	S <sub>x</sub> mm <sup>3</sup> × 10 <sup>6</sup>
200 × 200	191 × 191	36.5	23.4	111	1.16
× 250	× 241	46.0	29.5	223	1.85
× 300	× 292	55.8	35.7	396	2.71
× 360	× 343	65.5	42.0	642	3.75
× 410	× 394	75.3	48.2	974	4.94
× 460	× 445	85.0	54.5	1400	6.30
× 510	× 495	94.5	60.6	1930	7.80
× 560	× 546	104	66.8	2590	9.49
250 × 250	241 × 241	58.1	37.2	281	2.33
× 300	× 292	70.4	45.1	500	3.42
× 360	× 343	82.7	53.0	810	4.73
× 410	× 394	95.0	60.8	1230	6.24
× 460	× 445	107	68.7	1770	7.95
× 510	× 495	119	76.4	2440	9.84
× 560	× 546	132	84.3	3270	12.0
× 610	× 597	144	92.2	4270	14.3
300 × 300	292 × 292	85.3	54.6	606	4.15
× 360	× 343	100	64.2	982	5.73
× 410	× 394	115	73.7	1490	7.55
× 460	× 445	130	83.3	2140	9.64
× 510	× 495	145	92.6	2950	11.9
× 560	× 546	159	102.2	3960	14.5
× 610	× 597	174	111.7	5180	17.3

# DESIGN VALUES FOR TIMBER CONSTRUCTION

Note: Values shown are selected from a range and are provided solely for use in solving examples and problems in this text.

TABLE F.1 U.S. Customary units

Species	Allowable Stress <sup>a</sup> (psi)					Modulus of Elasticity <i>E</i> (ksi)
	<i>F<sub>c</sub></i>	<i>F<sub>c<sub>p</sub></sub></i>	<i>F<sub>t</sub></i>	<i>F<sub>b</sub></i>	<i>F<sub>v</sub></i>	
Douglas fir	1050	550	625	900	180	1700
Southern pine	1250	410	825	1400	175	1700
Hem-fir	1300	400	500	1000	150	1400
Eastern white pine	725	350	275	600	135	1100
Redwood	1050	650	600	1000	160	1300

<sup>a</sup>Allowable stresses:  
*F<sub>c</sub>*: compression parallel to grain  
*F<sub>c<sub>p</sub></sub>*: compression perpendicular to grain  
*F<sub>t</sub>*: tension parallel to grain  
*F<sub>b</sub>*: bending  
*F<sub>v</sub>*: horizontal shear

TABLE F.2 SI units

Species	Allowable Stress <sup>a</sup> (MPa)					Modulus of Elasticity <i>E</i> (MPa × 10 <sup>3</sup> )
	<i>F<sub>c</sub></i>	<i>F<sub>c<sub>p</sub></sub></i>	<i>F<sub>t</sub></i>	<i>F<sub>b</sub></i>	<i>F<sub>v</sub></i>	
Douglas fir	7.24	3.79	4.31	6.21	1.24	12
Southern pine	8.62	2.83	5.69	9.65	1.21	12
Hem-fir	8.96	2.76	3.45	6.89	1.03	9.7
Eastern white pine	5.00	2.41	1.90	4.14	0.93	7.6
Redwood	7.24	4.48	4.14	6.89	1.10	9.0

<sup>a</sup>Allowable stresses:  
*F<sub>c</sub>*: compression parallel to grain  
*F<sub>c<sub>p</sub></sub>*: compression perpendicular to grain  
*F<sub>t</sub>*: tension parallel to grain  
*F<sub>b</sub>*: bending  
*F<sub>v</sub>*: horizontal shear