PROPERTIES OF STRUCTURAL LUMBER — Sectional Properties of Standard Dressed (S4S) Lumber Sizes

NOMINAL SIZE b(inches)d	STANDARD DRESSED SIZE (S4S) b(inches)d	AREA OF SECTION A	MOMENT OF INERTIA I	SECTION MODULUS S	Weight in pounds per linear foot of piece when weight of wood per cubic foot equals:					
					25 lb.	30 lb.	35 lb.	40 lb.	45 lb.	50 lb.
1 x 3	3/4 x 2 1/2	1.875	0.977	0.781	0.326	0.391	0.456	0.521	0.586	0.651
1 x 4	3/4 x 3 1/2	2.625	2.680	1.531	0.456	0.547	0.638	0.729	0.820	0.911
1 x 6	3/4 x 5 1/2	4.125	10.398	3.781	0.716	0.859	1.003	1.146	1.289	1.432
1 x 8	3/4 x 7 1/4	5.438	23.817	6.570	0.944	1.133	1.322	1.510	1.699	1.888
1 x 10	3/4 x 9 1/4	6.938	49.466	10.695	1.204	1.445	1.686	1.927	2.168	2.409
1 x 12	3/4 x 11 1/4	8.438	88.989	15.820	1.465	1.758	2.051	2.344	2.637	2.930
2 x 3	1 1/2 x 2 1/2	3.750	1.953	1.563	0.651	0.781	0.911	1.042	1.172	1.302
2 x 4	1 1/2 x 3 1/2	5.250	5.359	3.063	0.911	1.094	1.276	1.458	1.641	1.823
2 x 6	1 1/2 x 5 1/2	8.250	20.797	7.563	1.432	1.719	2.005	2.292	2.578	2.865
2 x 8	1 1/2 x 7 1/4	10.875	47.635	13.141	1.888	2.266	2.643	3.021	3.398	3.776
2 x 10	1 1/2 x 9 1/4	13.875	98.932	21.391	2.409	2.891	3.372	3.854	4.336	4.818
2 x 12	1 1/2 x 11 1/4	16.875	177.979	31.641	2.930	3.516	4.102	4.688	5.273	5.859
2 x 14	1 1/2 x 13 1/4	19.875	290.775	43.891	3.451	4.141	4.831	5.521	6.211	6.901
3 x 1	2 1/2 x 3/4	1.875	0.088	0.234	0.326	0.391	0.456	0.521	0.586	0.651
3 x 2	2 1/2 x 1 1/2	3.750	0.703	0.938	0.651	0.781	0.911	1.042	1.172	1.302
3 x 4	2 1/2 x 3 1/2	8.750	8.932	5.104	1.519	1.823	2.127	2.431	2.734	3.038
3 x 6	2 1/2 x 5 1/2	13.750	34.661	12.604	2.387	2.865	3.342	3.819	4.297	4.774
3 x 8	2 1/2 x 7 1/4	18.125	79.391	21.901	3.147	3.776	4.405	5.035	5.664	6.293
3 x 10	2 1/2 x 9 1/4	23.125	164.886	35.651	4.015	4.818	5.621	6.424	7.227	8.030
3 x 12	2 1/2 x 11 1/4	28.125	296.631	52.734	4.883	5.859	6.836	7.813	8.789	9.766
3 x 14	2 1/2 x 13 1/4	33.125	484.625	73.151	5.751	6.901	8.051	9.201	10.352	11.502
3 x 16	2 1/2 x 15 1/4	38.125	738.870	96.901	6.619	7.943	9.266	10.590	11.914	13.238
4 x 1	3 1/2 x 3/4	2.625	0.123	0.328	0.456	0.547	0.638	0.729	0.820	0.911
4 x 2	3 1/2 x 1 1/2	5.250	0.984	1.313	0.911	1.094	1.276	1.458	1.641	1.823
4 x 3	3 1/2 x 2 1/2	8.750	4.557	3.646	1.519	1.823	2.127	2.431	2.734	3.038
4 x 4	3 1/2 x 3 1/2	12.250	12.505	7.146	2.127	2.552	2.977	3.403	3.828	4.253
4 x 6	3 1/2 x 5 1/2	19.250	48.526	17.646	3.342	4.010	4.679	5.347	6.016	6.684
4 x 8	3 1/2 x 7 1/4	25.375	111.148	30.661	4.405	5.286	6.168	7.049	7.930	8.811
4 x 10	3 1/2 x 9 1/4	32.375	230.840	49.911	5.621	6.745	7.869	8.933	10.117	11.241
4 x 12	3 1/2 x 11 1/4	39.375	415.283	73.828	6.836	8.203	9.570	10.938	12.305	13.672
4 x 14	3 1/2 x 13 1/4	46.38	678.5	102.4	8.051	9.661	11.27	12.88	14.49	16.10
4 x 16	3 1/2 x 15 1/4	53.38	1034	135.7	9.266	11.12	12.97	14.83	16.68	18.53
6 x 1	5 1/2 x 3/4	4.125	0.193	0.516	0.716	0.859	1.003	1.146	1.289	1.432
6 x 2	5 1/2 x 1 1/2	8.250	1.547	2.063	1.432	1.719	2.005	2.292	2.578	2.865
6 x 3	5 1/2 x 2 1/2	13.750	7.161	5.729	2.387	2.865	3.342	3.819	4.297	4.774
6 x 4	5 1/2 x 3 1/2	19.250	19.651	11.229	3.342	4.010	4.679	5.347	6.016	6.684
6 x 6	5 1/2 x 5 1/2	30.250	76.255	27.729	5.252	6.302	7.352	8.403	9.453	10.503
6 x 8	5 1/2 x 7 1/2	41.250	193.359	51.563	7.161	8.594	10.026	11.458	12.891	14.323
6 x 10	5 1/2 x 9 1/2	52.250	392.963	82.729	9.071	10.885	12.700	14.514	16.328	18.142
6 x 12	5 1/2 x 11 1/2	63.250	697.068	121.229	10.981	13.177	15.373	17.569	19.766	21.962
6 x 14	5 1/2 x 13 1/2	74.250	1127.672	167.063	12.891	15.469	18.047	20.625	23.203	25.781
6 x 16	5 1/2 x 15 1/2	85.250	1706.776	220.229	14.800	17.760	20.720	23.681	26.641	29.601
6 x 18	5 1/2 x 17 1/2	96.250	2456.380	280.729	16.710	20.052	23.394	26.736	30.078	33.420
6 x 20	5 1/2 x 19 1/2	107.250	3398.484	348.563	18.620	22.344	26.068	29.792	33.516	37.240
6 x 22	5 1/2 x 21 1/2	118.250	4555.086	423.729	20.530	24.635	28.741	32.847	36.953	41.059
6 x 24	5 1/2 x 23 1/2	129.250	5948.191	506.229	22.439	26.927	31.415	35.903	40.391	44.878
8 x 1	7 1/4 x 3/4	5.438	0.255	0.680	0.944	1.133	1.322	1.510	1.699	1.888
8 x 2	7 1/4 x 1 1/2	10.875	2.039	2.719	1.888	2.266	2.643	3.021	3.398	3.776
8 x 3	7 1/4 x 2 1/2	18.125	9.440	7.552	3.147	3.776	4.405	5.035	5.664	6.293
8 x 4	7 1/4 x 3 1/2	25.375	25.904	14.802	4.405	5.286	6.168	7.049	7.930	8.811
8 x 6	7 1/4 x 5 1/2	41.250	103.984	37.813	7.161	8.594	10.026	11.458	12.891	14.323
8 x 8	7 1/2 x 7 1/2	56.250	263.672	70.313	9.766	11.719	13.672	15.625	17.578	19.531
8 x 10	7 1/2 x 9 1/2	71.250	535.859	112.813	12.370	14.844	17.318	19.792	22.266	24.740
8 x 12	7 1/2 x 11 1/2	86.250	950.547	165.313	14.974	17.969	20.964	23.958	26.953	29.948
8 x 14	7 1/2 x 13 1/2	101.250	1537.734	227.813	17.578	21.094	24.609	28.125	31.641	35.156
8 x 16	7 1/2 x 15 1/2	116.250	2327.422	300.313	20.182	24.219	28.255	32.292	36.328	40.365
8 x 18	7 1/2 x 17 1/2	131.250	3349.609	382.813	22.786	27.344	31.901	36.458	41.016	45.573
8 x 20	7 1/2 x 19 1/2	146.250	4634.297	475.313	25.391	30.469	35.547	40.625	45.703	50.781
8 x 22	7 1/2 x 21 1/2	161.250	6211.484	577.813	27.995	33.594	39.193	44.792	50.391	55.990
8 x 24	7 1/2 x 23 1/2	176.250	8111.172	690.313	30.599	36.719	42.839	48.958	55.078	61.198

WOOD COLUMNS

Use of Tabular Column Data

The tabular data included herein for unit axial stresses provides a simplified and accurate method for calculating design loads on columns of any size and length. The load is determined by multiplying the appropriate tabular unit stress by the cross-sectional area of the member, based on net dimensions. Where the degree of refinement so indicates, the weight of the column should be deducted to determine the design load which may be applied.

Unit axial stresses are provided for simple solid columns, spaced columns with end condition "a" and spaced columns with end condition "b".

Ratio of ℓ/d

The ℓ/d ratio is calculated in the manner previously described in the text on wood columns. Values of F_c' for ℓ/d ratios intermediate to those given may be determined by straight line interpolation. For example, a simple, solid column having an F_c of 1,200 psi and E of 1,600,000 psi, the F_c' for an ℓ/d of 28 is 529 psi and the F_c' for an ℓ/d of 29 is 500 psi. For an ℓ/d of 28.4, the F_c' is $500 + 0.6(529-500) = 517.4$ psi.

Design Values of E and F_c

Modulus of elasticity, E, and compression parallel to grain, F_c, design values for the species and grade of wood to be used may be obtained from the National Design Specification for Wood Construction. If appropriate, E and F_c should be adjusted as previously described for the conditions under which the column will be used.

Tabular values of F_c' are provided for a range of E values from 2,100,000 to 900,000 psi, for F_c values between 200 and 3,600 psi as appropriate for each E. Values of F_c' for F_c values intermediate to those tabulated may be determined by straight line interpolation. For example, for an ℓ/d of 25 and E of 1,400,000 psi, the F_c' for an F_c of 1000 psi is 543 psi and the F_c' for an F_c of 800 psi is 502 psi. For an F_c of 875 psi, the interpolated F_c' is $502 + 75/200 (543-502) = 517.4$ psi.

Use of Tabular Data for Round Columns

Unit axial loads for simple solid columns of square cross section may be converted to unit loads for round columns. First, multiply the column diameter by 0.886 to determine the dimension, d, and then calculate the ℓ/d ratio. From the tabular data obtain the applicable F_c' for that ℓ/d ratio and multiply this by the cross sectional area of the round column to determine the design load for the column.

Conversely, to determine the diameter of a round column required to carry the same total load as a square column, multiply the dimension d of the square column by 1.128.

WOOD STRUCTURAL DESIGN DATA

1992 REVISIONS

The following pages replace the identically numbered pages from the National Forest Products Association's manual for *Wood Structural Design Data, 1986 Edition*. These revisions result from recent changes to the *National Design Specification® for Wood Construction*.

A Manual for Architects, Builders, Engineers and Others Concerned with Wood Construction

1986 Edition

American Forest & Paper Association

PROPERTIES OF STRUCTURAL LUMBER

Average specific gravity and average weight in pounds per cubic foot for commercially important species or species combinations.

SPECIES	SPECIFIC[1] GRAVITY	WEIGHT PER CUBIC FOOT[2]
Aspen	0.39	26.6
Balsam Fir	0.36	24.6
Beech-Birch-Hickory	0.71	46.5
Coast Sitka Spruce	0.39	26.6
Cottonwood	0.41	27.9
Douglas Fir-Larch	0.50	33.6
Douglas Fir-Larch (North)	0.49	33.0
Douglas Fir-South	0.46	31.1
Eastern Hemlock	0.41	27.9
Eastern Hemlock-Tamarack	0.41	27.9
Eastern Hemlock-Tamarack (North)	0.47	31.7
Eastern Softwoods	0.36	24.6
Eastern Spruce	0.41	27.9
Eastern White Pine	0.36	24.6
Engelmann Spruce-Lodgepole Pine[3] (MSR 1650f and higher grades)	0.46	31.1
Engelmann Spruce-Lodgepole Pine[3] (MSR 1500f and lower grades)	0.38	25.9
Hem-Fir	0.43	29.2
Hem-Fir (North)	0.46	31.1
Mixed Maple	0.55	36.7
Mixed Oak	0.68	44.7
Mixed Southern Pine	0.51	34.2
Mountain Hemlock	0.47	31.7
Northern Pine	0.42	28.5
Northern Red Oak	0.68	44.7
Northern Species	0.35	24.0
Northern White Cedar	0.31	21.4
Ponderosa Pine	0.43	29.2
Red Maple	0.58	38.6
Red Oak	0.67	44.1
Red Pine	0.44	29.8
Redwood, close grain	0.44	29.8
Redwood, open grain	0.37	25.3
Sitka Spruce	0.43	29.2
Southern Pine	0.55	36.7
Spruce-Pine-Fir	0.42	28.5
Spruce-Pine-Fir (South)	0.36	24.6
Western Cedars	0.36	24.6
Western Cedars (North)	0.35	24.0
Western Hemlock	0.47	31.7
Western Hemlock (North)	0.46	31.1
Western White Pine	0.40	27.2
Western Woods	0.36	24.6
White Oak	0.73	47.7
Yellow Poplar	0.43	29.2

1. Specific gravity based on weight and volume when oven dry.
2. Weight per cubic foot is based on weight and volume at a moisture content of 15 percent.
3. Applies only to Engelmann Spruce-Lodgepole Pine machine stress rated (MSR) structural lumber.

PROPERTIES OF STRUCTURAL LUMBER

grouping. The other standard is ASTM Designation D-245, "Methods for Establishing Structural Grades for Visually Graded Lumber" which sets forth reduction factors to be applied to the clear wood values and provides procedures for determining strength ratios, based on knots and other characteristics, which, when applied to the adjusted clear wood values, results in working stresses for the various commercial grades of any species. This standard also provides adjustments for degree of density and for condition of seasoning.

A third standard is ASTM D-1990, "Standard Practice for Establishing Allowable Properties for Visually Graded Dimension Lumber from In-Grade Tests of Full-Size Specimens," which outlines criteria to properly analyze data from In-Grade tests. ASTM D-1990 applies directly to dimension lumber in sizes from 2x2 to 4x16.

Lumber Grading Rules

Lumber grading rules are, in effect, specifications of quality in that the maximum knots, slope of grain and other strength reducing characteristics are described in sufficient detail so that the procedures of ASTM Designation D-245 can be applied and working stresses assigned to the specified quality. It is common practice to give each grade a commercial designation such as No. 1, etc. This means that the purchaser orders the commercial grade which qualifies for the design values used in design.

Machine Graded Lumber

While most structural lumber has design values assigned on the basis of visual grading to meet a minimum quality specification, there is a growing trend toward the non-destructive testing of lumber by machine. In this method a piece of lumber is passed flat-wise through a series of loading rollers and the stiffness, or modulus of elasticity, is automatically recorded. Through correlation with previously established test data, bending strength and other strength properties are assigned to each piece tested. At present, machine grading is supplemented by visual grading particularly in the assignment of horizontal or longitudinal shear values.

National Design Specification

The principal reference for the working stresses for commercial grades of structural lumber is the National Design Specification® for Wood Construction (NDS®) available from the National Forest Products Association, Washington, D.C. The design value information in this specification is taken from the published rules written by the various grading rules writing agencies. When these values are used, each piece of lumber is required to be identified by the grade mark of a lumber grading or inspection agency recognized as being competent.

The NDS provides for design of single member uses of lumber and other structural timbers, and also for repetitive member uses of lumber where load sharing is known to exist between repetitive framing members, which are spaced not more than 24 inches, are not less than 3 in number and are jointed by floor, roof or other load-distributing elements adequate to support the design load. For repetitive member uses, the design values in bending are higher than those for single member uses, as provided in the NDS.

PROPERTIES OF STRUCTURAL LUMBER

Adjustments of Design Values for Duration of Loading

Normal Duration of Loading:

The design values listed in the National Design Specification and most other wood engineering references are for normal duration of loading. Normal load duration contemplates fully stressing a member to the tabulated normal duration design value by the application of the full maximum normal design load for a duration of approximately ten years (either continuously or cumulatively) and/or the application of 90 percent of this full maximum normal load continuously throughout the remainder of the life of the structure, without encroaching on the factor of safety. See Figure 6.
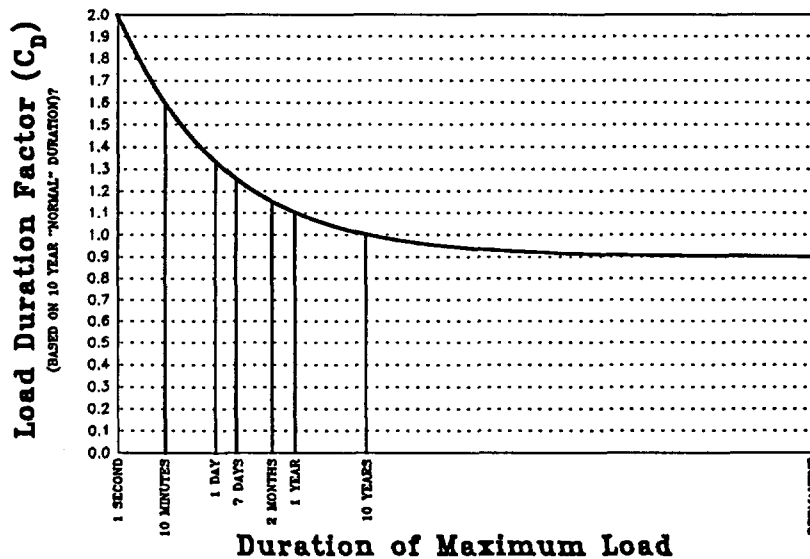
Figure 6.   Adjustment of Working Stresses For Various Durations of Load.*

PROPERTIES OF STRUCTURAL LUMBER

Adjustments for Other Durations of Loading:

Since tests have shown that wood has the property of carrying substantially greater maximum loads for short durations than for long durations of loading, the design values for normal loading, except modulus of elasticity and compression perpendicular-to-grain, are adjusted as follows for other durations of loads:

When a member is fully stressed to the design value by application of the full maximum load permanently, or for a total of more than 10 hears either continuously or for cumulative periods of full maximum load, use 90 percent of the design value given for normal loading conditions.

Likewise, when the duration of the full maximum load does not exceed the following durations, adjust the design values for normal loading durations, except modulus of elasticity and compression perpendicular-to-grain, to a new stress level by increasing them:

15 percent for two months duration, as for snow,

25 percent for seven days duration,

60 percent for 10 minutes duration, as for wind or earthquake,

100 percent for impact.

Design values for normal loading conditions may thus be used without regard for impact if the stress induced by impact does not exceed the design value for normal loading.

The impact load duration increase factor does not apply when the member has been pressure-treated with water-borne preservatives to the heavy retentions required for "marine" exposure, nor when the member has been pressure-treated with fire retardant chemicals.

Combinations of Loads of Different Durations

The preceding adjustments are not cumulative in the sense that the required size of a member cannot be determined for a load of particular duration without consideration of the total load resulting from that load together with the other loads of longer durations when applied simultaneously. In cases where combinations of loads of different durations are applied simultaneously, the size of member is usually determined for the total of all loads applied simultaneously and the adjusted design values for that load which has the shortest duration in the combination of loads. However, in some instances, this procedure may cause the member to be overstressed by loads of longer duration. To insure that the overstress will not occur the following procedure may be used:

PROPERTIES OF STRUCTURAL LUMBER

1. Determine the magnitude of each load that will occur on a structural member and accumulate subtotals of combinations of these loads of progressively shorter durations.

2. Divide each of these subtotals by the load duration factor of the load having the shortest duration in the combination of loads under consideration.

Shortest Duration in the Combination of Loads Being Considered	Load Duration Factor
Permanent	0.90
Normal	1.00
Two Months	1.15
Seven Days	1.25
Wind or Earthquake	1.60
Impact	2.00

3. The largest value thus obtained indicates which is the critical combination and the loading to be used in determining the structural element.

Connections

The impact load duration factor shall not apply to connections. Connection design values shall be adjusted by applicable load duration factors which are less than or equal to 1.6, except when the load capacity of the connection is controlled by strength of the metal fastener.

WOOD BEAMS

Notations

Except where otherwise noted, the following symbols are used in the formulas for beams:

A	= area of cross section, in^2
b	= breadth of rectangular bending member, inches
C_D	= load duration factor
C_F	= size factor for sawn lumber
C_{fu}	= flat use factor for dimension lumber
C_L	= beam stability factor
C_V	= volume factor for structural glued laminated timber
COV_E	= coefficient of variation in modulus of elasticity
c	= distance from neutral axis to extreme fiber, inches
d	= depth of bending member, inches
d_n	= depth of member remaining at a notch, inches
E, E'	= tabulated and allowable modulus of elasticity, psi
F_b, F_b'	= tabulated and allowable bending design value, psi
F_{bE}	= critical buckling design value for bending members, psi
f_b	= actual bending stress, psi
F_c, F_c'	= tabulated and allowable compression design value parallel to grain, psi
F_{cE}	= critical buckling design value for compression members, psi
f_c	= actual compression stress parallel to grain, psi
$F_{c\perp}, F_{c\perp}'$	= tabulated and allowable compression design value perpendicular to grain, psi
F_t, F_t'	= tabulated and allowable tension design value parallel to grain, psi
f_t	= actual tension stress parallel to grain, psi
F_v, F_v'	= tabulated and allowable shear design value parallel to grain (horizontal shear), psi
f_v	= actual shear stress parallel to grain, psi
I	= moment of inertia, in^4
K_{bE}	= Euler buckling coefficient for beams
L	= span length of bending member, feet
ℓ	= span length of bending member, inches
ℓ_e	= effective span length of bending member, inches
ℓ_u	= laterally unsupported span length of bending member, inches
M	= maximum bending moment, inch-pounds
P	= total concentrated load or total axial load, lbs
P/A	= axial load per unit of cross-sectional area, psi
psi	= pounds per square inch
Q	= statical moment of an area about the neutral axis, in^3
R_B	= slenderness ratio of bending member
S	= section modulus, in^3
V	= shear force, lbs
W	= total uniform load, pounds
w	= uniform load in pounds per unit of length
x	= distance from beam support face to load, inches
Δ	= deflection due to load, inches

Beam Diagrams and Formulas

Pages 41 through 57 provide a series of shear and moment diagrams with accompanying formulas for beams under various conditions of static loading.

WOOD BEAMS

To determine the beam size required for a given span and load this equation may be written as follows:

$$S = \frac{3wL^2}{2F_b}$$

To determine the allowable span for a given size of beam and load per linear foot, the equation takes the following form:

$$L = \sqrt{\frac{2F_b S}{3W}}$$

To determine the allowable load per linear foot for a given span and size of beam, the equation may be written as follows:

$$w = \frac{2F_b S}{3L^2}$$

The preceding equations apply only to the condition illustrated in Figure 7. For other conditions of loading, the formula for the induced bending moment will be changed as indicated in the series of diagrams and formulas on pages 41 through 57. However, for rectangular sections, the formula for resisting moment remains the same.

Lateral Stability of Beams

Beams which are relatively deep in comparison to width may be unstable under the application of loads. Such instability is due to the tendency of the compression edge of the beam to buckle causing the beam to deflect laterally. The following general rules may be applied in providing lateral restraint for sawn lumber bending members. If the ratio of depth to breadth, d/b, based on nominal dimensions is:

(a) 2 to 1; no lateral support shall be required.

(b) 3 to 1 or 4 to 1; the ends shall be held in position, as by full depth solid blocking, bridging, hangers, nailing or bolting to other framing members, or other acceptable means.

(c) 5 to 1; one edge shall be held in line for its entire length.

(d) 6 to 1; bridging, full depth solid blocking or cross bracing shall be installed at intervals not exceeding 8 feet unless both edges are held in line or unless the compression edge of the member is supported throughout its length to prevent lateral displacement, as by adequate sheathing or subflooring, and the ends at points of bearing have lateral support to prevent rotation.

(e) 7 to 1; both edges shall be held in line for their entire length.

WOOD BEAMS

A more precise method of beam design which accounts for lateral stability is given below. The slenderness ratio for a bending member shall be calculated by the following formula:

$$R_B = \sqrt{\frac{\ell_e d}{b^2}}$$

The slenderness ratio, R_B, for bending members shall not exceed 50.

The effective span length, ℓ_e, for single span or cantilever bending members shall be determined as follows:

	CONDITION	$\ell_u/d < 7$	$\ell_u/d \geq 7$
Cantilever	uniformly distributed load	$\ell_e = 1.33\ell_u$	$\ell_e = 0.90\ell_u + 3d$
	concentrated load at unsupported end	$\ell_e = 1.87\ell_u$	$\ell_e = 1.44\ell_u + 3d$
Single Span Beam	uniformly distributed load	$\ell_e = 2.06\ell_u$	$\ell_e = 1.63\ell_u + 3d$
	concentrated load at center with no intermediate lateral support	$\ell_e = 1.80\ell_u$	$\ell_e = 1.37\ell_u + 3d$
	equal end moments	$\ell_e = 1.84\ell_u$	$\ell_e = 1.84\ell_u$

The NDS outlines additional load and support conditions for determining the effective length, ℓ_e, for bending members. For single span or cantilever bending members with loading conditions not specified above, a conservative value is:

$\ell_e = 2.06\ell_u$ when $\ell_u/d < 7$
$\ell_e = 1.63\ell_u + 3d$ when $7 \leq \ell_u/d \leq 14.3$
$\ell_e = 1.84\ell_u$ when $\ell_u/d > 14.3$

The tabulated bending design value, F_b, shall be multiplied by all applicable adjustment factors to determine the allowable bending design value, F_b'. The beam stability factor, C_L, shall be calculated as follows:

$$C_L = \frac{1+(F_{bE}/F_b^*)}{1.9} - \sqrt{\left[\frac{1+(F_{bE}/F_b^*)}{1.9}\right]^2 - \frac{F_{bE}/F_b^*}{0.95}}$$

in which
F_b^* = tabulated bending design value multiplied by all applicable adjustment factors except C_{fu}, C_V (see NDS section 2.3), and C_L
F_{bE} = $K_{bE}E'/R_B^2$
K_{bE} = 0.438 for visually graded lumber and MEL
K_{bE} = 0.609 for products with $COV_E \leq 0.11$ (See NDS Appendix F.2)

When the compression edge of a bending member is supported throughout its length to prevent lateral displacement, and the ends at points of bearing have lateral support to prevent rotation, $C_L = 1.0$.

The resisting moment of a slender beam is calculated as $M = F_b'S$ (see page 30) but shall not exceed the full design value, $F_b S$, including the duration of load modification (p. 13) and size factor modification (p. 33).

WOOD BEAMS

Design for Bending and Axial Loading Combined

Loading conditions on a beam, or other member, are sometimes of a nature which induces bending and axial tension or compression in the member at the same time. When this condition is expected to exist, the member must be designed to resist the combined forces without exceeding the allowable unit stresses.

Bending and Axial Tension
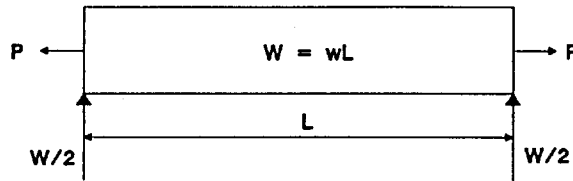
Figure 8. Bending and Axial Tension Combined

From Figure 8, the induced tension stress f_t = P/A and the induced unit bending stress f_b = M/S. The member is in equilibrium when:

$$\frac{f_t}{F_t'} + \frac{f_b}{F_b*} \leq 1.0 \quad and \quad \frac{f_b - f_t}{F_b**} \leq 1.0$$

in which
F_b* = tabulated bending design value multiplied by all applicable adjustment factors except C_L
F_b** = tabulated bending design value multiplied by all applicable adjustment factors except C_V

Bending and Axial Compression
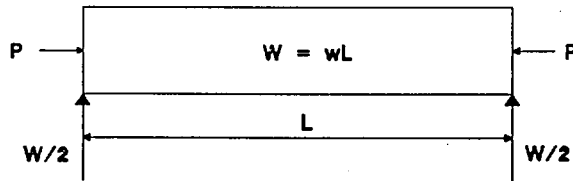
Figure 9. Bending and Axial Compression Combined

From Figure 9, the induced unit compression stress f_c = P/A and the induced unit bending stress f_b = M/S. This member is in equilibrium when:

$$\left[\frac{f_c}{F_c'}\right]^2 + \frac{f_{b1}}{F_{b1}'[1 - (f_c/F_{cE1})]} \leq 1.0$$

f_{b1}, F_{b1}' and F_{cE1} and the appropriate application of the above equation are as defined on page 200.

WOOD BEAMS

Wood Beams - Load Tables

The tables for beam loads are based on solid wood beams of rectangular cross section, surfaced 4 sides to standard dressed dimensions, as given on pages 25 and 26. The compression edge is supported throughout the beam length to prevent lateral displacement and lateral support is provided at each end at points of bearing to prevent rotation. Beams are single span and are loaded uniformly for their entire lengths. The data are presented with span lengths in feet for the various sizes of beams with load capacities based on a range of bending stress, F_b values. Data provided for each span and nominal size of beam are as follows:

W = total load in pounds, uniformly distributed, based on F_b

w = load per linear foot of span, W/L

F_v = minimum horizontal shear design value, psi, required to resist the horizontal shear stress induced by load W

E = required modulus of elasticity design value, psi, if deflection under load W is limited to $\ell/360$

Use of Tables

To use the tables, secure from appropriate reference (see page 28), the bending design value, F_b, appropriately adjusted for duration of load, service condition, size factor or other applicable modification factors, and refer tot he span length involved. If the total load W is known read down the column under the appropriate F_b heading to find a matching design load W and then red across the page to see the required beam size. If the beam size is known read across the page to the column under the appropriate F_b heading to find the design load W.

Before selecting a size of beam it is advisable to check the board measure, bm, in several sizes which qualify in order to find the one which had the least amount of lumber and thus is the most efficient.

After determining he required beam size, or design load, W, in the manner just described, it is necessary to check the horizontal shear, F_v, and the modulus of elasticity, E, to make sure that the induced or required values do not exceed the respective values allowed for the species and grade of lumber to be used.

It is good practice to consult the local lumber supplier(s) before finalizing a beam design, to determine what sizes, species and grades are on hand or can be readily secured.

Use of the tables is illustrated in the two examples which follow.

Example 1. Assume a span of 14'- 0" for a species and grade of lumber having a fiber bending stress, F_b, value of 1400 psi to carry a total load of 8000 pounds. The problem is to determine the size of beam required.

Turn to the page on which the 14'- 0" span is listed and, under the column headed 1400, read down until the total load of 8000 pounds is reached. Then read to the left to note the size of beam required. In this case, the required size is a nominal 6 by 12 member having a total load capacity, W, of 8082 pounds or a load per foot, w, of 577 pounds.

WOOD COLUMNS

Notations

Except where otherwise noted, the following symbols are used in the formulas for columns and other compression members:

A	=	area of cross section, in^2
C_D	=	load duration factor
C_M	=	wet service factor
C_t	=	temperature factor
d	=	least dimension of rectangular compression member, inches
d_1, d_2	=	cross-sectional dimensions of rectangular compression member in planes of lateral support, inches
E, E'	=	tabulated and allowable modulus of elasticity, psi
F_b, F_b'	=	tabulated and allowable bending design value, psi
F_{b1}'	=	allowable edgewise bending design value, psi
F_{bE}	=	critical buckling design value for bending members, psi
f_b	=	actual bending stress, psi
f_{b1}	=	actual edgewise bending stress, psi
F_c, F_c'	=	tabulated and allowable compression design value parallel to grain, psi
F_{cE}	=	critical buckling design value for compression members, psi
F_{cE1}	=	critical buckling design value for compression members in planes of lateral support, psi
f_c	=	actual compression stress parallel to grain, psi
K_{cE}	=	Euler buckling coefficient for columns
K_x	=	spaced column fixity coefficient
ℓ	=	distance between points of lateral support of compression member, inches
ℓ_e/d	=	slenderness ratio of compression member
ℓ_1, ℓ_2	=	distances between points of lateral support of compression member in planes 1 and 2, inches
ℓ_3	=	distance from center of spacer block to centroid of group of split ring or shear plate connectors in end block for a spaced column, inches
psi	=	pounds per square inch

WOOD COLUMNS

Solid Columns

The tabulated compression design value, F_c, shall be multiplied by all applicable adjustment factors to determine the allowable compression design value, F_c', for square or rectangular simple, solid columns. The column stability factor, C_P, shall be calculated as follows:

$$C_P = \frac{1+(F_{cE}/F_c^*)}{2c} - \sqrt{\left[\frac{1+(F_{cE}/F_c^*)}{2c}\right]^2 - \frac{F_{cE}/F_c^*}{c}}$$

in which

F_c^*	=	tabulated compression design value multiplied by all applicable adjustment factors except C_P
F_{cE}	=	$K_{cE}\, E'/(\ell_e/d)^2$
K_{cE}	=	0.3 for visually graded lumber and MEL
K_{cE}	=	0.418 for products with $COV_E \leq 0.11$ (see NDS Appendix F.2)
c	=	0.8 for sawn lumber
c	=	0.85 for round timber piles
c	=	0.9 for glued laminated timber

When a compression member is supported throughout its length to prevent lateral displacement in all directions, $C_P = 1.0$.

Limitation on ℓ_e/d Ratio

The slenderness ratio for solid columns, ℓ_e/d, shall not exceed 50, except that during construction ℓ_e/d shall not exceed 75.

Column Fixity

The effective column length, ℓ_e, for a solid column shall be determined in accordance with good engineering practice. The formulas for solid columns are based on pin-end conditions but may also be applied to square-end conditions. Where column end conditions provide less stability than pin-end conditions, the effective length of the column for design purposes shall be increased accordingly. Where column end conditions provide greater stability than pin-end conditions, such as may occur for a truss compression chord or when a column is continuous through more than one story, the increased degree of fixity should be evaluated and the effective length of the column for design purposes may be reduced accordingly. Actual column length shall be permitted to be multiplied by the appropriate buckling length coefficient specified in NDS Appendix G to determine effective column length, $\ell_e = (K_e)(\ell)$.

For solid columns with rectangular cross section, the slenderness ratio, ℓ_e/d, shall be taken as the larger of the ratios ℓ_{e1}/d_1 or ℓ_{e2}/d_2 (see Figure 12) where each ratio has been adjusted by the appropriate buckling length coefficient, K_e, from NDS Appendix G.

Round Columns

The design load for a column of round cross section may be taken as the same as that for a square column of the same cross-sectional area. Thus, the d used in determining the ℓ_e/d ratio should be 0.886 times the diameter of the round column.

WOOD COLUMNS

Tapered Round Columns

For design of a column with rectangular cross section, tapered at one or both ends, the representative dimension, d, for each face of the column shall be derived as follows:

$$d = d_{min} + (d_{max} - d_{min}) \left[a - 0.15 \left(1 - \frac{d_{min}}{d_{max}} \right) \right]$$

in which

d_{min} = the minimum dimension for that face of the column
d_{max} = the maximum dimension for that face of the column

Support Conditions

Large end fixed, small end unsupported or simply supported   a = 0.70

Small end fixed, large end unsupported or simply supported   a = 0.30

Both ends simply supported:
     Tapered toward one end   a = 0.50
     Tapered toward both ends   a = 0.70

For all other support conditions:

$$d = d_{min} + (d_{max} - d_{min})(1/3)$$

Calculations of f_c and C_P shall be based on the representative dimension, d. In addition, f_c at any cross section in the tapered column shall not exceed the tabulated compression design value parallel to grain multiplied by all applicable adjustment factors except the column stability factor, $f_c \leq (F_c)(C_D)(C_M)(C_t)$.

Built-Up Columns with Mechanical Fastenings

Arrangement of laminations joined by nails, bolts or other mechanical fastenings into a built-up column assembly will not make a column fully equal in strength to a one-piece member of comparable material and dimensions. The following provisions apply to nailed or bolted built-up columns with 2 to 5 laminations in which each lamination has a rectangular cross section and is at least 1-1/2" thick. The provisions also require that all laminations have the same depth (face width), d, that faces of adjacent laminations are in contact and all laminations are full column length. Adequate nailing or bolting shall be required in accordance with NDS criteria (sections 15.3.3 or 15.3.4). When individual laminations are of different species, grades, or thicknesses, the lesser allowable compression parallel to grain design value, F_c', and modulus of elasticity, E', for the weakest lamination shall apply.

The column stability factor, C_P, shall be calculated in accordance with provisions found on page 203. The column stability factor, C_P, shall be modified (multiplied) by 0.60 for built-up columns nailed in accordance with NDS section 15.3.3 or by 0.75 for built-up columns bolted in accordance with NDS section 15.3.4. The effective column length, ℓ_e, and slenderness ratio, ℓ_e/d, shall be determined in accordance with provisions found on page 203.

WOOD COLUMNS

Spaced Columns

Spaced columns are formed of two or more individual solid members with their longitudinal axes parallel, separated at the ends and at one or more intermediate points of their length by blocking and joined at the ends by split ring or shear plate connectors capable of developing the required shear resistance. As a result of the end fixity developed by the split ring or shear plate connectors and spacer blocks, the maximum unit stress, F_c', for members of spaced columns may be greater than that allowed for simple solid columns having the same ℓ_e/d ratio. A greater ℓ_e/d ratio may also be accepted for the members of spaced columns. The design load for a spaced column shall be the sum of the design loads for each of its individual members.

Spaced columns are classified as to degree of end fixity; i.e., end condition "a" or end condition "b". The magnitude of the spaced column fixity factor, K_x, is determined by the end condition. This is illustrated in Figure 14.
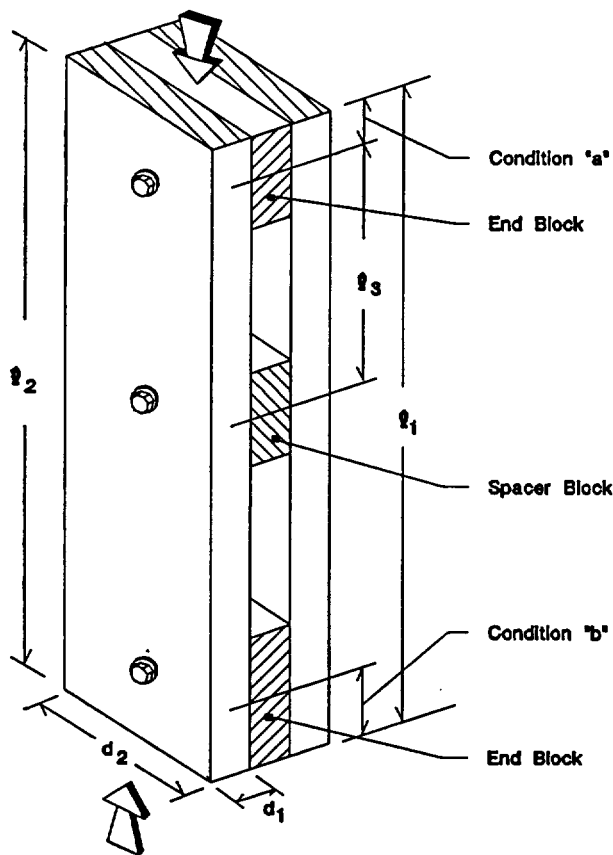
Condition "a": end distance $\leq \ell_1/20$; $K_x=2.5$

ℓ_1 and ℓ_2 = distance between points of lateral support in planes 1 and 2, measured from center to center of lateral supports for continuous spaced columns, and measured from end to end for simple spaced columns, inches.

ℓ_3 = distance from center of spacer block to centroid of the group of split ring or shear plate connectors in end blocks, inches.

d_1 and d_2 = cross-sectional dimensions of individual rectangular compression members in planes of lateral support, inches.

Condition "b": $\ell_1/20 <$ end distance $\leq \ell_1/10$; $K_x=3.0$.

Figure 14. Spaced Column Joined by Split Ring or Shear Plate Connectors

WOOD COLUMNS

Spacer and End Block Provisions

When a single spacer block is located within the middle tenth of the column length, ℓ_1, split ring or shear plate connectors shall not be required for this block. If there are two or more spacer blocks, split ring or shear plate connectors shall be required and the distance between two adjacent blocks shall not exceed 1/2 the distance between centers of split ring or shear plate connectors in the end blocks.

For spaced columns used as compression members of a truss, a panel point which is stayed laterally shall be considered as the end of the spaced column, and the portion of the web members, between the individual pieces making up a spaced column, shall be permitted to be considered as the end blocks.

Dimensions for Spacer and End Blocks

Thickness of spacer and end blocks shall not be less than that of individual members of the spaced column nor shall thickness, width, and length of spacer and end blocks be less than required for split ring or shear plate connectors of a size and number capable of carrying the load computed in 15.2.2.5. Blocks thicker than a side member do not appreciably increase load capacity.

Connectors in End Blocks

To obtain spaced column action the split ring or shear plate connectors in each mutually contacting surface of end block and individual member at each end of a spaced column shall provide the appropriate load capacity specified in the NDS.

Design of Spaced Columns

The effective column length, ℓ_e, for a spaced column shall be determined in accordance with good engineering practice. Actual column length shall be permitted to be multiplied by the appropriate buckling length coefficient specified in NDS Appendix G to determine effective column length, $\ell_e = (K_e)(\ell)$, except that the effective column length, ℓ_e, shall not be less than the actual column length, ℓ.

For individual members of a spaced column (see Figure 14):

(a) ℓ_1/d_1 shall not exceed 80, where ℓ_1 is the distance between lateral supports that provide restraint perpendicular to the wide faces of the individual members.

(b) ℓ_2/d_2 shall not exceed 50, where ℓ_2 is the distance between lateral supports that provide restraint in a direction parallel to the wide faces of the individual members.

(c) ℓ_3/d_1 shall not exceed 40, where ℓ_3 is the distance between the center of the spacer block and the centroid of the group of split ring or shear plate connectors in an end block.

The column stability factor shall be calculated as follows:

$$C_P = \frac{1+(F_{cE}/F_c^*)}{2c} - \sqrt{\left[\frac{1+(F_{cE}/F_c^*)}{2c}\right]^2 - \frac{F_{cE}/F_c^*}{c}}$$

in which

F_c^* = tabulated compression design value multiplied by all applicable adjustment factors except C_P (see 2.3)

F_{cE} = $K_{cE} K_x E' / (\ell_e/d)^2$

K_{cE} = 0.3 for visually graded lumber and machine evaluated lumber (MEL)

K_{cE} = 0.418 for products with $COV_E \leq 0.11$ (see NDS Appendix F.2)

WOOD COLUMNS

K_x = 2.5 for fixity condition "a"
K_x = 3.0 for fixity condition "b"
c = 0.8 for sawn lumber
c = 0.9 for glued laminated timber

When individual members of a spaced column are of different species, grades, or thicknesses, the lesser allowable compression parallel to grain design value, F_c', for the weaker member shall apply to both members.

The allowable compression parallel to grain design value, F_c', for a spaced column shall not exceed the allowable compression parallel to grain design value, F_c', for the individual members evaluated as solid columns without regard to fixity in accordance with page 203 using the column slenderness ratio ℓ_2/d_2 (see Figure 14).

Combined Axial and Bending Loading

The equations on page 34 for combined flexure and axial loading apply to spaced columns only for uniaxial bending in a direction parallel to the wide face of the individual member (dimension d_2 in Figure 14). Such members are in equilibrium when:

$$\left[\frac{f_c}{F_c'}\right]^2 + \frac{f_{b1}}{F_{b1}'[1-(f_c/F_{cE1})]} \leq 1.0$$

in which
$f_c < F_{cE1}$ = $K_{cE} E' / (\ell_{e1}/d_1)^2$

f_{b1} = actual edgewise bending stress (bending load applied to narrow face of member)
d_1 = wide face dimension
d_2 = narrow face dimension

Effective column length, ℓ_{e1} shall be determined in accordance with page 203. F_c' and F_{cE1} shall be determined in accordance with page 203 using the slenderness ratio, ℓ_e/d, applicable to the plane being checked. F_{b1}' shall be determined in accordance with page 32. The load duration factor, C_D, associated with the shortest duration load in a combination of loads shall be permitted to be used to calculate F_c' and F_{b1}'. All applicable load combinations shall be evaluated to determine the critical load combination (see pages 14 and 15).

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	4000	3979	3914	3790	3588	3285	3094	2884	2665	2445	2234	2038	1858	1695	1549	1419	1303	1199	1106	1023	949	882	822	767	718	673
	3800	3781	3722	3612	3432	3162	2992	2802	2600	2396	2197	2010	1836	1679	1537	1409	1295	1193	1101	1019	945	879	819	765	716	671
	3600	3583	3530	3432	3274	3035	2884	2714	2530	2342	2156	1978	1812	1660	1522	1398	1286	1185	1095	1014	941	876	816	763	714	669
	3400	3385	3338	3252	3112	2904	2770	2619	2454	2282	2110	1943	1785	1639	1506	1385	1275	1177	1088	1009	937	872	813	760	711	667
	3200	3187	3145	3069	2948	2767	2650	2518	2371	2216	2058	1903	1754	1615	1487	1370	1264	1168	1081	1002	932	867	809	757	709	665
	3000	2988	2952	2886	2781	2625	2525	2409	2281	2143	2000	1857	1719	1588	1465	1353	1250	1157	1072	995	925	862	805	753	706	662
	2800	2790	2758	2701	2611	2479	2393	2294	2183	2062	1935	1805	1678	1556	1440	1333	1234	1144	1061	986	918	856	800	749	702	659
2100000	2600	2591	2564	2516	2439	2327	2255	2172	2077	1973	1862	1746	1631	1518	1411	1309	1215	1129	1049	976	910	850	794	744	698	656
	2400	2393	2370	2329	2265	2172	2112	2042	1963	1875	1779	1679	1576	1475	1376	1281	1193	1110	1034	964	900	841	787	738	693	651
	2200	2194	2175	2140	2088	2011	1963	1906	1841	1768	1688	1602	1513	1423	1334	1248	1166	1088	1016	950	888	831	779	731	687	646
	2000	1995	1979	1951	1908	1847	1808	1762	1710	1651	1586	1515	1440	1362	1284	1207	1133	1062	994	931	873	819	768	722	679	640
	1800	1796	1783	1761	1727	1678	1647	1612	1571	1525	1473	1416	1355	1291	1224	1158	1092	1028	967	909	854	803	755	711	670	632
	1600	1597	1587	1569	1543	1505	1482	1455	1424	1389	1349	1305	1257	1206	1152	1097	1041	986	931	879	829	782	738	696	657	621
	1400	1397	1390	1376	1357	1329	1312	1292	1269	1243	1214	1182	1146	1107	1066	1022	977	931	886	841	797	755	715	677	641	607
	1200	1198	1193	1183	1169	1149	1137	1123	1107	1089	1068	1046	1020	993	963	931	897	862	826	790	754	718	683	650	618	587
	3600	3582	3527	3423	3254	3000	2839	2660	2470	2277	2089	1911	1747	1597	1462	1341	1232	1135	1048	970	900	837	780	728	682	639
	3400	3384	3335	3243	3095	2872	2731	2571	2399	2222	2047	1879	1722	1578	1447	1329	1223	1128	1042	965	896	833	777	726	679	637
	3200	3186	3143	3062	2933	2740	2616	2475	2322	2161	2000	1843	1695	1557	1431	1316	1213	1119	1035	959	891	830	774	723	677	635
	3000	2988	2950	2880	2768	2602	2495	2373	2237	2094	1947	1802	1663	1532	1411	1301	1200	1109	1027	953	886	825	770	720	674	633
	2800	2789	2756	2696	2600	2459	2367	2262	2145	2019	1887	1755	1626	1503	1389	1283	1186	1098	1018	945	879	820	765	716	671	630
2000000	2600	2591	2562	2511	2430	2311	2234	2145	2045	1935	1819	1701	1583	1470	1362	1262	1169	1084	1007	936	872	813	760	712	667	627
	2400	2392	2368	2325	2257	2158	2094	2020	1936	1843	1743	1639	1533	1430	1331	1237	1149	1068	994	925	863	806	754	706	663	623
	2200	2193	2173	2137	2081	2000	1948	1887	1818	1741	1657	1567	1475	1383	1293	1207	1125	1049	978	912	852	797	746	700	657	618
	2000	1995	1978	1948	1903	1838	1796	1748	1692	1629	1560	1486	1407	1328	1248	1170	1095	1024	958	896	839	786	737	692	651	613
	1800	1796	1782	1759	1722	1671	1638	1600	1557	1507	1452	1392	1328	1261	1193	1125	1058	994	933	876	822	772	725	682	642	605
	1600	1597	1586	1567	1540	1500	1475	1446	1413	1376	1333	1287	1236	1182	1126	1069	1012	956	902	849	800	753	710	669	631	596
	1400	1397	1389	1375	1354	1325	1307	1285	1261	1234	1202	1168	1130	1089	1045	1000	953	907	860	815	771	729	689	652	616	583

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
																l/d										
	3600	3582	3523	3412	3232	2960	2790	2602	2405	2208	2018	1841	1679	1532	1401	1283	1178	1084	1000	926	858	798	743	694	649	609
	3400	3384	3331	3234	3076	2837	2687	2519	2340	2158	1981	1813	1657	1516	1388	1273	1170	1078	995	921	855	795	741	692	647	607
	3200	3185	3139	3054	2916	2709	2577	2429	2268	2103	1938	1780	1632	1496	1373	1261	1160	1070	989	916	850	791	738	689	645	605
	3000	2987	2947	2873	2754	2575	2461	2332	2190	2040	1890	1743	1604	1474	1355	1247	1150	1061	982	910	846	787	734	686	643	603
	2800	2789	2754	2690	2588	2436	2339	2227	2103	1971	1835	1701	1571	1449	1335	1232	1137	1051	974	903	840	782	730	683	640	601
	2600	2590	2560	2506	2420	2292	2210	2115	2009	1893	1773	1651	1532	1419	1312	1213	1122	1039	964	895	833	777	726	679	636	598
	2400	2392	2366	2320	2248	2142	2074	1995	1905	1807	1702	1595	1487	1383	1284	1191	1104	1025	952	886	825	770	720	674	632	594
1900000	2200	2193	2172	2134	2074	1987	1932	1867	1793	1711	1622	1529	1435	1341	1250	1164	1083	1007	938	874	816	762	713	669	628	590
	2000	1994	1977	1945	1897	1828	1783	1731	1672	1605	1532	1453	1372	1290	1209	1131	1056	986	921	860	804	752	705	662	622	585
	1800	1795	1781	1756	1718	1663	1628	1587	1541	1488	1430	1366	1299	1229	1159	1090	1023	959	898	842	789	740	695	653	614	579
	1600	1596	1585	1566	1536	1494	1467	1436	1401	1361	1316	1266	1213	1156	1098	1039	981	925	870	818	769	724	681	641	604	570
	1400	1397	1389	1374	1352	1320	1301	1278	1252	1223	1189	1153	1112	1069	1023	976	928	880	833	787	744	702	663	626	591	559
	1200	1198	1192	1181	1165	1143	1129	1113	1095	1074	1051	1025	996	965	932	896	859	821	783	745	708	672	637	604	573	543
	1000	999	994	987	976	961	952	941	929	916	901	884	865	844	822	797	772	744	716	687	658	629	601	573	546	520
	3400	3383	3327	3224	3054	2798	2638	2461	2275	2089	1910	1743	1589	1451	1326	1215	1116	1027	948	877	813	756	704	657	615	576
	3200	3185	3136	3045	2897	2675	2534	2377	2210	2039	1872	1714	1567	1434	1313	1205	1107	1020	942	872	809	753	701	655	613	575
	3000	2986	2944	2865	2737	2546	2424	2286	2137	1983	1829	1681	1542	1414	1298	1193	1098	1013	936	867	805	749	698	653	611	573
	2800	2788	2751	2683	2574	2411	2307	2188	2057	1919	1779	1643	1513	1392	1280	1179	1087	1004	929	861	800	745	695	650	608	571
	2600	2590	2558	2500	2408	2271	2182	2081	1968	1848	1723	1599	1479	1365	1259	1162	1074	993	920	854	794	740	691	646	605	568
	2400	2391	2364	2315	2238	2124	2051	1966	1871	1767	1658	1548	1438	1333	1234	1142	1058	980	910	846	787	734	686	642	602	565
	2200	2193	2170	2130	2066	1973	1913	1843	1765	1678	1584	1488	1391	1296	1204	1119	1039	965	897	835	779	727	680	637	598	562
1800000	2000	1994	1975	1942	1891	1816	1768	1712	1649	1577	1500	1418	1334	1250	1168	1089	1015	946	882	823	768	718	673	631	592	557
	1800	1795	1780	1754	1713	1654	1616	1573	1523	1466	1404	1337	1267	1195	1123	1053	986	922	862	807	755	707	663	623	586	551
	1600	1596	1584	1564	1532	1487	1458	1425	1387	1344	1296	1243	1187	1128	1068	1007	948	891	837	786	738	693	651	613	577	544
	1400	1397	1388	1372	1349	1315	1294	1270	1242	1210	1175	1135	1092	1047	999	950	900	851	804	758	715	674	635	599	565	534
	1200	1198	1191	1180	1163	1139	1124	1107	1088	1066	1041	1013	982	949	913	876	838	798	759	721	683	647	613	580	549	520
	1000	999	994	986	975	959	949	937	925	910	894	876	856	833	809	783	756	727	698	668	638	609	580	552	526	500
	800	799	796	791	784	774	768	761	753	745	735	724	712	699	685	669	652	634	614	594	574	552	531	510	489	468

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F'_c from table.

Total design load on column = cross-sectional area in square inches times F'_c value.

E	F_c^*	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
												l/d														
	3200	3184	3132	3035	2875	2636	2486	2320	2145	1970	1802	1644	1500	1369	1252	1147	1053	969	895	828	768	713	665	621	581	544
	3000	2986	2940	2856	2718	2512	2381	2235	2079	1920	1764	1615	1478	1352	1239	1136	1045	963	889	823	764	710	662	618	579	543
	2800	2788	2748	2675	2558	2382	2270	2143	2005	1862	1719	1582	1452	1332	1223	1124	1035	955	883	818	759	707	659	616	577	541
	2600	2589	2555	2493	2394	2246	2151	2043	1924	1797	1669	1542	1422	1309	1205	1110	1024	946	875	812	754	702	655	613	574	539
	2400	2391	2362	2310	2227	2104	2025	1934	1833	1724	1610	1496	1386	1281	1183	1092	1010	935	866	804	748	697	651	609	571	536
	2200	2192	2168	2125	2057	1956	1892	1817	1733	1640	1543	1443	1343	1247	1156	1072	993	921	855	795	741	691	646	605	567	533
	2000	1994	1974	1939	1883	1803	1751	1691	1623	1547	1465	1379	1292	1207	1124	1046	972	904	842	784	732	683	639	599	562	529
1700000	1800	1795	1779	1751	1707	1644	1603	1556	1502	1442	1375	1305	1231	1157	1084	1014	947	883	825	770	720	674	631	592	557	524
	1600	1596	1583	1561	1528	1479	1448	1413	1371	1325	1273	1217	1158	1096	1034	973	913	856	803	752	705	661	621	584	549	517
	1400	1397	1387	1371	1345	1310	1287	1261	1231	1196	1158	1116	1070	1022	972	921	870	821	773	728	685	644	607	572	539	509
	1200	1198	1191	1179	1160	1135	1119	1101	1080	1056	1029	999	966	931	893	854	814	773	733	695	657	621	587	555	525	497
	1000	998	994	985	973	956	945	933	919	904	886	867	845	821	795	768	739	709	678	648	617	587	558	531	504	479
	800	799	796	791	783	772	766	759	750	741	731	719	706	692	676	659	641	621	601	580	558	536	514	493	471	451
	600	599	598	595	591	585	581	577	573	568	563	557	550	543	535	526	517	506	495	484	471	458	445	431	417	403
	3200	3183	3127	3023	2850	2592	2431	2256	2075	1897	1728	1572	1430	1303	1189	1088	998	918	846	783	725	674	628	586	548	514
	3000	2985	2936	2846	2697	2474	2333	2178	2015	1852	1694	1546	1411	1288	1177	1079	991	912	842	779	722	671	625	584	546	512
	2800	2787	2745	2667	2540	2349	2229	2093	1948	1800	1655	1517	1388	1270	1164	1068	982	905	836	774	718	668	623	582	544	511
	2600	2589	2553	2486	2379	2219	2116	2000	1874	1742	1610	1482	1362	1250	1148	1056	972	897	830	769	714	664	620	579	542	509
	2400	2390	2360	2304	2214	2081	1996	1898	1790	1675	1557	1441	1330	1226	1129	1041	960	888	822	762	709	660	616	576	539	506
	2200	2192	2166	2120	2046	1938	1868	1787	1697	1599	1497	1393	1293	1196	1106	1022	946	876	812	755	702	655	611	572	536	503
	2000	1993	1972	1934	1875	1788	1732	1667	1593	1512	1426	1337	1247	1161	1078	1000	928	861	801	745	694	648	606	567	532	500
1600000	1800	1795	1778	1747	1700	1632	1588	1537	1479	1414	1343	1269	1193	1117	1043	972	905	843	786	733	684	640	599	561	527	496
	1600	1596	1582	1559	1522	1470	1437	1398	1354	1303	1248	1188	1126	1062	998	936	876	820	766	717	671	629	590	554	521	490
	1400	1397	1387	1369	1342	1303	1278	1250	1217	1180	1139	1094	1045	994	942	890	838	788	741	696	654	614	577	543	512	483
	1200	1198	1190	1177	1158	1130	1113	1093	1070	1045	1015	983	948	910	870	829	788	746	706	667	629	594	560	529	500	472
	1000	998	993	984	971	953	941	928	913	896	877	856	833	807	779	750	719	688	656	625	594	564	535	508	481	457
	800	799	796	790	782	771	764	756	747	737	725	713	699	683	666	648	628	608	586	564	541	519	496	474	453	432
	600	599	598	594	590	584	580	576	571	566	560	554	546	538	530	520	510	499	487	475	461	447	433	419	404	389

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification®* for *Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of $F_c{}'$ from table.

Total design load on column = cross-sectional area in square inches times $F_c{}'$ value.

E	F_c^*	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	3000	2984	2932	2834	2672	2430	2279	2115	1945	1778	1620	1473	1341	1221	1115	1020	936	861	794	734	680	632	589	549	514	482
	2800	2786	2741	2657	2519	2312	2181	2037	1885	1733	1586	1448	1321	1206	1103	1011	928	855	789	730	677	629	586	547	512	480
	2600	2588	2549	2478	2361	2187	2076	1951	1818	1681	1546	1418	1298	1189	1089	1000	920	848	783	725	673	626	584	545	510	478
	2400	2390	2357	2297	2200	2055	1962	1857	1742	1621	1500	1382	1271	1168	1073	987	909	839	776	720	668	622	580	542	508	476
	2200	2191	2164	2114	2034	1916	1840	1752	1656	1552	1446	1340	1238	1142	1053	971	897	829	768	713	663	617	576	539	505	474
1500000	2000	1993	1970	1930	1865	1770	1709	1639	1559	1473	1382	1290	1199	1111	1029	952	881	817	758	705	656	612	572	535	502	471
	1800	1794	1776	1743	1693	1618	1570	1515	1452	1382	1307	1229	1150	1073	998	928	862	801	745	694	647	605	565	530	497	467
	1600	1595	1581	1556	1517	1460	1423	1381	1333	1279	1219	1156	1090	1024	959	897	837	781	729	681	636	595	558	523	491	462
	1400	1396	1386	1366	1337	1295	1269	1238	1202	1162	1117	1069	1017	964	909	856	804	754	707	662	621	583	547	514	484	456
	1200	1197	1189	1176	1155	1125	1106	1085	1060	1032	1000	965	927	887	845	802	759	717	676	637	600	565	532	502	473	447
	1000	998	993	983	969	949	937	923	906	888	867	844	819	791	761	730	698	665	633	601	569	539	511	483	458	434
	800	799	795	789	781	768	761	752	743	732	719	705	690	673	655	635	614	592	569	546	523	500	477	454	433	412
	600	599	597	594	589	583	579	574	569	563	557	550	542	533	524	514	502	490	478	464	450	435	420	405	390	375
	400	400	399	397	395	392	391	389	387	385	382	379	376	373	369	365	361	356	351	345	339	333	327	320	312	305
	2800	2785	2736	2645	2494	2268	2127	1974	1816	1660	1512	1375	1251	1140	1040	952	873	803	741	685	635	590	549	513	480	449
	2600	2587	2545	2468	2341	2149	2029	1896	1755	1614	1478	1349	1232	1125	1029	943	866	797	736	681	631	587	547	511	478	448
	2400	2389	2354	2288	2182	2024	1923	1809	1687	1561	1437	1319	1208	1107	1015	932	857	790	730	676	628	584	544	508	476	446
	2200	2191	2161	2107	2020	1890	1807	1713	1609	1500	1390	1282	1180	1085	998	918	846	782	723	670	623	580	541	506	473	444
	2000	1992	1968	1924	1854	1750	1683	1606	1521	1429	1333	1238	1146	1058	977	902	833	771	715	663	617	575	537	502	470	442
1400000	1800	1794	1774	1739	1684	1602	1550	1489	1421	1346	1266	1185	1104	1025	951	881	817	758	704	654	610	569	532	498	467	438
	1600	1595	1580	1552	1510	1448	1408	1362	1309	1250	1186	1119	1051	983	917	854	795	740	690	643	600	561	525	492	462	434
	1400	1396	1385	1364	1332	1286	1257	1223	1184	1140	1092	1040	985	929	874	819	767	717	671	627	587	550	516	484	455	429
	1200	1197	1189	1174	1151	1119	1098	1075	1047	1017	982	944	903	860	816	772	728	685	644	606	569	535	503	474	446	421
	1000	998	992	982	967	945	932	916	898	878	855	830	802	772	741	708	674	640	607	574	543	513	485	458	433	410
	800	799	795	789	779	766	758	748	738	726	712	697	680	662	642	621	598	575	551	526	502	479	456	433	412	392
	600	599	597	594	588	581	577	572	567	560	553	546	537	528	517	506	494	481	467	452	437	422	406	390	375	359
	400	400	399	397	395	392	390	388	386	383	381	377	374	370	366	362	357	352	346	340	334	327	320	312	305	297

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F$_c$ from the *National Design Specification® for Wood Construction.* Modify F$_c$ for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F$_c$' from table.

Total design load on column = cross-sectional area in square inches times F$_c$' value.

E	F$_c$*	l/d																										
		2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1300000	2800	2784	2731	2631	2465	2216	2064	1902	1738	1580	1433	1299	1178	1071	976	892	817	751	692	639	592	550	512	478	447	419
	2600	2586	2541	2456	2316	2106	1975	1833	1686	1541	1404	1277	1162	1058	966	884	811	746	688	636	589	548	510	476	445	417
	2400	2388	2350	2279	2162	1987	1877	1755	1625	1495	1369	1251	1142	1043	954	875	803	740	683	632	586	545	508	474	444	416
	2200	2190	2158	2099	2004	1861	1769	1667	1556	1442	1328	1220	1118	1025	940	863	795	733	677	627	582	542	505	472	442	414
	2000	1992	1966	1918	1841	1726	1652	1568	1476	1378	1279	1182	1089	1002	922	850	783	724	670	621	577	537	501	469	439	412
	1800	1793	1772	1734	1673	1584	1526	1459	1385	1304	1220	1135	1053	974	900	832	769	712	661	614	571	532	497	465	436	409
	1600	1595	1578	1548	1502	1433	1389	1338	1281	1217	1149	1078	1007	938	872	809	751	698	649	604	563	526	491	460	432	406
	1400	1396	1383	1361	1326	1276	1244	1206	1163	1115	1063	1007	949	891	834	779	727	678	633	591	552	517	484	454	426	401
	1200	1197	1188	1172	1147	1111	1089	1063	1033	999	961	920	876	830	784	739	694	651	611	573	537	504	473	445	419	395
	1000	998	992	980	964	940	925	908	889	866	841	814	783	751	717	682	647	612	578	546	515	485	458	432	408	385
	800	799	795	788	777	763	754	744	732	719	704	687	669	649	627	604	580	555	530	505	480	456	433	411	390	370
	600	599	597	593	587	580	575	570	564	557	549	541	531	521	509	497	483	469	454	439	423	406	390	374	358	342
	400	400	399	397	395	391	389	387	385	382	379	375	372	368	363	358	353	347	341	335	328	320	312	304	296	287
	200	200	200	199	199	198	197	197	196	196	195	194	194	193	192	191	190	188	187	186	185	183	181	180	178	176
1200000	2600	2585	2536	2442	2287	2054	1912	1761	1608	1462	1325	1200	1089	990	902	824	755	693	639	590	547	508	473	441	413	387
	2400	2387	2345	2267	2138	1944	1823	1692	1556	1423	1296	1179	1072	977	892	816	748	688	635	587	544	506	471	439	411	385
	2200	2189	2154	2090	1984	1825	1724	1613	1495	1377	1261	1153	1053	962	880	807	741	682	630	583	541	503	468	437	409	384
	2000	1991	1962	1910	1825	1697	1616	1524	1425	1322	1219	1121	1028	943	865	795	732	675	624	578	537	499	466	435	407	382
	1800	1793	1770	1728	1661	1561	1497	1424	1342	1256	1168	1081	998	919	847	780	720	666	616	572	531	495	462	432	405	380
	1600	1594	1576	1544	1492	1416	1367	1311	1247	1178	1106	1032	959	889	823	762	705	654	606	564	525	489	457	428	401	377
	1400	1396	1382	1357	1319	1263	1228	1186	1139	1086	1029	970	909	849	791	736	685	637	593	553	516	482	451	423	397	373
	1200	1197	1187	1169	1142	1103	1078	1049	1015	978	936	891	844	797	749	702	657	615	575	538	503	472	442	415	390	368
	1000	998	991	979	960	934	918	899	877	852	825	794	761	726	690	653	617	582	548	515	485	456	429	404	381	360
	800	799	794	787	775	759	750	738	725	710	694	675	655	633	609	584	558	532	506	480	456	431	409	387	366	347
	600	599	597	593	586	578	573	567	560	552	544	534	524	512	500	486	471	456	440	423	406	389	372	356	340	324
	400	400	399	397	394	390	388	386	383	380	377	373	369	364	359	354	348	342	335	328	320	312	303	295	286	276
	200	200	200	199	199	198	197	197	196	196	195	194	193	192	191	190	189	187	186	185	183	181	179	178	176	173

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 2 to 30

See instructions for use of tables on page 210. Obtain design values for E and F_c^* from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1800	1792	1767	1720	1646	1534	1462	1381	1293	1201	1110	1021	938	861	790	727	669	617	571	529	491	457	426	398	373	350
	1600	1594	1574	1538	1481	1395	1341	1278	1208	1133	1056	980	906	836	771	711	657	607	563	522	486	452	422	395	370	347
	1400	1395	1380	1353	1311	1248	1208	1161	1109	1051	990	926	864	803	745	691	640	594	552	513	478	446	417	391	366	344
	1200	1196	1186	1166	1136	1092	1064	1031	994	952	907	858	808	758	709	662	617	576	537	501	468	438	410	385	361	340
	1000	998	990	977	956	927	909	888	863	835	805	771	735	697	659	621	584	549	515	483	453	425	400	376	354	333
1100000	800	798	794	785	773	755	744	731	717	700	682	661	638	614	588	561	534	507	480	454	429	405	383	361	342	323
	600	599	596	592	585	576	570	563	556	547	538	527	515	502	488	473	457	440	423	405	387	370	352	336	320	304
	400	400	398	396	393	390	387	384	381	378	374	370	366	360	355	349	342	335	328	319	311	302	293	283	274	264
	200	200	200	199	198	197	197	196	196	195	194	193	192	191	190	189	187	186	185	183	181	179	177	175	173	170
	2000	1989	1955	1889	1782	1620	1519	1410	1297	1186	1080	982	894	814	743	680	624	574	529	489	453	421	392	366	343	321
	1800	1791	1763	1712	1627	1500	1420	1330	1235	1139	1045	956	873	799	731	670	616	568	524	485	450	418	390	364	341	320
	1600	1593	1571	1531	1466	1370	1308	1238	1161	1081	1000	922	847	778	715	658	606	560	518	480	446	415	387	362	339	318
	1400	1395	1378	1348	1300	1229	1184	1131	1073	1009	943	877	813	752	694	641	593	549	509	473	440	410	383	358	336	315
	1200	1196	1184	1162	1128	1079	1047	1010	968	921	871	819	767	715	665	618	575	534	497	463	432	403	377	353	331	311
1000000	1000	997	989	974	952	919	898	874	846	815	780	743	704	664	624	585	548	512	479	448	419	393	369	346	325	306
	800	798	793	784	770	750	738	723	707	688	667	643	618	591	563	535	506	478	451	425	400	377	355	335	316	298
	600	599	596	591	583	573	566	559	551	541	530	518	505	490	474	457	440	421	403	384	366	348	330	314	298	283
	400	400	398	396	393	388	386	383	379	376	371	367	361	356	349	342	335	327	318	309	300	290	280	270	260	250
	200	200	200	199	198	197	197	196	195	194	193	192	191	190	189	188	186	184	183	181	179	177	174	172	169	167
	1600	1592	1568	1522	1449	1337	1267	1188	1105	1019	936	857	784	717	657	602	554	510	471	436	405	376	351	328	307	287
	1400	1394	1376	1342	1287	1206	1153	1094	1028	960	890	821	756	696	640	589	543	502	464	431	400	372	347	325	304	285
	1200	1196	1182	1158	1119	1062	1026	983	936	884	829	774	719	667	617	571	529	490	455	423	394	367	343	321	301	283
	1000	997	988	971	945	908	884	856	824	789	750	709	667	625	584	545	508	473	441	411	384	359	336	315	296	278
900000	800	798	792	782	766	743	729	713	694	672	648	622	593	564	534	504	474	446	419	393	369	346	326	306	289	272
	600	599	596	590	581	570	562	554	544	533	520	506	491	475	457	438	419	399	380	360	342	324	306	290	275	260
	400	400	398	396	392	387	384	381	377	372	368	362	356	350	342	334	326	317	307	297	287	276	266	255	244	234
	200	200	200	199	198	197	196	195	195	194	193	192	190	189	187	186	184	182	180	178	176	173	171	168	165	162

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	4000	673	632	594	560	529	500	473	449	426	405	386	367	350	335	320	306	293	281	270	259	249
	3800	671	630	593	559	528	499	473	448	426	405	385	367	350	334	320	306	293	281	269	259	249
	3600	669	629	592	558	527	498	472	447	425	404	385	366	350	334	319	305	293	280	269	258	248
	3400	667	627	590	557	526	497	471	447	424	403	384	366	349	333	319	305	292	280	269	258	248
	3200	665	625	589	555	524	496	470	446	423	403	383	365	349	333	318	305	292	280	269	258	248
	3000	662	623	587	553	523	495	469	445	422	402	383	365	348	332	318	304	291	279	268	258	248
	2800	659	620	584	551	521	493	467	443	421	401	382	364	347	332	317	304	291	279	268	257	247
2100000	2600	656	617	582	549	519	491	466	442	420	400	381	363	346	331	317	303	290	279	267	257	247
	2400	651	613	578	546	517	489	464	440	419	398	379	362	346	330	316	302	290	278	267	256	246
	2200	646	609	575	543	514	487	462	438	417	397	378	361	344	329	315	302	289	277	266	256	246
	2000	640	603	570	539	510	483	459	436	415	395	376	359	343	328	314	300	288	276	265	255	245
	1800	632	596	564	534	506	479	455	433	412	392	374	357	341	326	312	299	287	275	264	254	244
	1600	621	587	556	527	500	474	451	429	408	389	371	355	339	324	310	298	285	274	263	253	243
	1400	607	575	546	518	492	467	445	423	404	385	368	351	336	322	308	295	283	272	261	251	242
	1200	587	558	531	505	481	458	436	416	397	379	362	347	332	318	305	292	281	270	259	249	240
	3600	639	600	565	532	503	475	450	427	405	385	367	349	333	318	304	291	279	267	256	246	237
	3400	637	599	564	531	502	474	449	426	405	385	366	349	333	318	304	291	279	267	256	246	236
	3200	635	597	562	530	500	473	448	425	404	384	366	348	332	318	304	290	278	267	256	246	236
	3000	633	595	560	528	499	472	447	424	403	383	365	348	332	317	303	290	278	266	256	246	236
	2800	630	593	558	527	498	471	446	423	402	382	364	347	331	316	303	290	277	266	255	245	236
2000000	2600	627	590	556	524	496	469	445	422	401	381	363	346	331	316	302	289	277	266	255	245	235
	2400	623	586	553	522	493	467	443	420	400	380	362	345	330	315	301	288	276	265	254	244	235
	2200	618	582	549	519	491	465	441	419	398	379	361	344	329	314	300	288	276	264	254	244	234
	2000	613	577	545	515	488	462	438	416	396	377	359	343	327	313	299	287	275	264	253	243	234
	1800	605	571	540	511	484	458	435	414	393	375	357	341	326	311	298	286	274	263	252	242	233
	1600	596	563	533	504	478	454	431	410	390	372	355	339	324	310	296	284	272	261	251	241	232
	1400	583	552	523	496	471	448	426	405	386	368	351	336	321	307	294	282	271	260	250	240	231

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification®for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	3600	609	572	538	507	478	452	428	406	385	366	349	332	317	303	289	277	265	254	244	234	225
	3400	607	570	537	506	477	451	428	405	385	366	348	332	317	302	289	277	265	254	244	234	225
	3200	605	569	535	505	476	451	427	405	384	365	348	331	316	302	289	276	265	254	243	234	225
	3000	603	567	534	503	475	449	426	404	383	365	347	331	316	302	288	276	264	253	243	233	224
	2800	601	565	532	502	474	448	425	403	383	364	346	330	315	301	288	275	264	253	243	233	224
	2600	598	562	530	500	472	447	423	402	382	363	346	330	314	300	287	275	263	253	242	233	224
1900000	2400	594	559	527	497	470	445	422	400	380	362	345	329	314	300	287	274	263	252	242	232	223
	2200	590	556	524	495	468	443	420	399	379	361	344	328	313	299	286	274	262	252	241	232	223
	2000	585	551	520	491	465	440	418	397	377	359	342	326	312	298	285	273	262	251	241	231	222
	1800	579	546	515	487	461	437	415	394	375	357	340	325	310	297	284	272	261	250	240	231	222
	1600	570	538	509	482	457	433	411	391	372	355	338	323	308	295	282	270	259	249	239	230	221
	1400	559	529	501	475	450	428	407	387	368	351	335	320	306	293	280	269	258	247	238	228	220
	1200	543	515	489	465	442	420	400	381	363	347	331	316	303	290	278	266	256	245	236	227	218
	3400	576	541	509	480	453	428	406	385	365	347	330	315	300	287	274	262	251	241	231	222	213
	3200	575	540	508	479	452	428	405	384	365	347	330	314	300	286	274	262	251	241	231	222	213
	3000	573	538	507	478	451	427	404	383	364	346	329	314	299	286	273	262	251	240	231	221	213
	2800	571	536	505	476	450	426	403	382	363	345	329	313	299	286	273	261	250	240	230	221	213
	2600	568	534	503	475	448	424	402	381	362	345	328	313	298	285	273	261	250	240	230	221	212
	2400	565	532	501	473	447	423	401	380	361	344	327	312	298	284	272	260	249	239	230	220	212
1800000	2200	562	528	498	470	445	421	399	379	360	342	326	311	297	284	271	260	249	239	229	220	212
	2000	557	525	495	467	442	419	397	377	358	341	325	310	296	283	270	259	248	238	228	219	211
	1800	551	520	491	464	439	416	395	375	356	339	323	308	295	282	269	258	247	237	228	219	210
	1600	544	513	485	459	435	412	391	372	354	337	321	307	293	280	268	257	246	236	227	218	210
	1400	534	505	478	453	429	407	387	368	351	334	319	304	291	278	266	255	245	235	226	217	209
	1200	520	493	468	444	421	401	381	363	346	330	315	301	288	276	264	253	243	233	224	215	207
	1000	500	476	453	431	410	391	372	355	339	324	310	296	284	272	261	250	240	231	222	213	205
	800	468	448	428	410	392	375	358	343	328	314	301	289	277	266	255	245	236	227	218	210	202

l/d

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	3200	544	511	481	453	428	405	383	363	345	328	312	297	284	271	259	248	237	227	218	209	201
	3000	543	510	480	452	427	404	382	363	344	327	312	297	283	270	259	247	237	227	218	209	201
	2800	541	508	478	451	426	403	381	362	344	327	311	296	283	270	258	247	237	227	218	209	201
	2600	539	506	477	450	425	402	380	361	343	326	310	296	282	270	258	247	236	227	217	209	201
	2400	536	504	475	448	423	400	379	360	342	325	310	295	282	269	257	246	236	226	217	208	200
	2200	533	501	472	446	421	399	378	359	341	324	309	294	281	268	257	246	235	226	217	208	200
	2000	529	498	469	443	419	397	376	357	339	323	308	293	280	268	256	245	235	225	216	208	200
1700000	1800	524	493	466	440	416	394	374	355	338	321	306	292	279	267	255	244	234	224	215	207	199
	1600	517	488	461	436	413	391	371	353	335	319	304	291	277	265	254	243	233	224	215	206	198
	1400	509	480	454	430	408	387	367	349	332	317	302	288	276	264	252	242	232	222	214	205	198
	1200	497	470	445	422	401	381	362	345	328	313	299	286	273	261	250	240	230	221	212	204	196
	1000	479	455	432	411	391	372	355	338	322	308	294	281	269	258	247	237	228	219	210	202	195
	800	451	430	411	393	375	358	342	327	313	299	287	275	263	253	242	233	224	215	207	199	192
	600	403	388	374	360	346	333	320	308	296	284	273	263	252	243	234	225	217	209	201	194	187
	3200	514	482	454	428	404	382	361	342	325	309	294	280	267	255	244	233	223	214	206	197	190
	3000	512	481	453	427	403	381	361	342	325	309	294	280	267	255	244	233	223	214	205	197	189
	2800	511	480	451	426	402	380	360	341	324	308	293	279	267	255	243	233	223	214	205	197	189
	2600	509	478	450	424	401	379	359	340	323	307	293	279	266	254	243	232	223	213	205	197	189
	2400	506	476	448	423	399	378	358	339	322	307	292	278	266	254	242	232	222	213	205	196	189
	2200	503	474	446	421	398	376	357	338	321	306	291	278	265	253	242	232	222	213	204	196	188
	2000	500	471	443	419	396	375	355	337	320	305	290	277	264	252	241	231	221	212	204	196	188
1600000	1800	496	467	440	416	393	372	353	335	319	303	289	276	263	251	241	230	221	212	203	195	188
	1600	490	462	436	412	390	370	351	333	317	302	287	274	262	250	240	229	220	211	202	195	187
	1400	483	456	431	407	386	366	347	330	314	299	285	272	260	249	238	228	219	210	202	194	186
	1200	472	447	423	401	380	361	343	326	311	296	283	270	258	247	236	226	217	209	200	193	185
	1000	457	433	411	391	371	353	336	320	306	292	278	266	255	244	234	224	215	207	199	191	184
	800	432	412	393	375	357	341	326	311	297	284	272	260	249	239	229	220	212	203	196	188	181
	600	389	375	360	346	333	319	306	294	282	271	260	250	240	231	222	213	205	198	191	184	177

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction.* Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	3000	482	452	425	401	378	358	339	321	305	290	276	263	251	239	229	219	210	201	193	185	178
	2800	480	451	424	400	378	357	338	320	304	289	275	262	250	239	228	219	209	201	192	185	178
	2600	478	449	423	399	377	356	337	320	304	289	275	262	250	239	228	218	209	200	192	185	177
	2400	476	448	421	397	375	355	336	319	303	288	274	261	249	238	228	218	209	200	192	184	177
	2200	474	446	420	396	374	354	335	318	302	287	273	261	249	238	227	217	208	200	192	184	177
	2000	471	443	417	394	372	352	334	317	301	286	273	260	248	237	227	217	208	199	191	184	177
	1800	467	440	415	391	370	350	332	315	300	285	272	259	247	236	226	216	207	199	191	183	176
1500000	1600	462	436	411	388	367	348	330	313	298	284	270	258	246	235	225	216	207	198	190	183	176
	1400	456	430	406	384	364	345	327	311	296	282	269	256	245	234	224	214	206	197	189	182	175
	1200	447	422	400	378	359	340	323	308	293	279	266	254	243	232	222	213	204	196	188	181	174
	1000	434	411	390	370	351	334	318	302	288	275	263	251	240	230	220	211	202	194	187	180	173
	800	412	393	374	356	339	323	308	294	281	269	257	246	235	226	216	208	199	192	184	177	171
	600	375	360	346	331	318	305	292	280	268	257	247	237	227	218	210	202	194	187	180	173	167
	400	305	297	289	281	273	264	256	248	240	232	224	217	209	202	195	189	182	176	170	164	159
	2800	449	422	397	374	353	334	316	300	284	270	257	245	234	223	213	204	196	187	180	173	166
	2600	448	421	396	373	352	333	315	299	284	270	257	245	233	223	213	204	195	187	180	172	166
	2400	446	419	395	372	351	332	315	298	283	269	256	244	233	223	213	204	195	187	179	172	166
	2200	444	417	393	371	350	331	314	297	283	269	256	244	233	222	212	203	195	187	179	172	165
	2000	442	415	391	369	349	330	313	296	282	268	255	243	232	222	212	203	194	186	179	172	165
	1800	438	413	389	367	347	328	311	295	281	267	254	242	231	221	211	202	194	186	178	171	165
1400000	1600	434	409	386	364	344	326	309	294	279	266	253	241	230	220	211	202	193	185	178	171	164
	1400	429	404	382	361	341	323	307	291	277	264	251	240	229	219	210	201	192	185	177	170	164
	1200	421	398	376	356	337	320	304	289	275	262	249	238	227	218	208	199	191	184	176	169	163
	1000	410	388	367	348	331	314	299	284	271	258	246	235	225	215	206	198	190	182	175	168	162
	800	392	372	354	337	320	305	291	277	265	253	242	231	221	212	203	195	187	180	173	166	160
	600	359	344	330	316	302	289	277	265	254	243	233	223	214	206	198	190	183	176	169	163	157
	400	297	288	280	271	263	254	246	237	229	221	214	206	199	192	185	179	172	166	161	155	150

l/d

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c^* from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	2800	419	393	370	348	329	311	294	279	265	251	239	228	217	208	198	190	182	174	167	160	154
	2600	417	392	369	347	328	310	293	278	264	251	239	228	217	207	198	190	182	174	167	160	154
	2400	416	391	368	346	327	309	293	278	264	251	238	227	217	207	198	189	181	174	167	160	154
	2200	414	389	366	345	326	308	292	277	263	250	238	227	216	207	198	189	181	174	167	160	154
	2000	412	387	365	344	325	307	291	276	262	249	237	226	216	206	197	189	181	173	166	160	153
	1800	409	385	363	342	323	306	290	275	261	248	237	226	215	206	197	188	180	173	166	159	153
	1600	406	382	360	340	321	304	288	274	260	247	236	225	214	205	196	188	180	172	165	159	153
1300000	1400	401	378	357	337	319	302	286	272	258	246	234	224	213	204	195	187	179	172	165	158	152
	1200	395	372	352	333	315	299	283	269	256	244	233	222	212	203	194	186	178	171	164	158	152
	1000	385	364	345	326	310	294	279	266	253	241	230	220	210	201	192	184	177	170	163	157	151
	800	370	351	333	317	301	286	273	260	248	237	226	216	207	198	190	182	175	168	161	155	149
	600	342	327	313	299	286	273	261	249	239	228	219	210	201	193	185	178	171	164	158	152	147
	400	287	278	270	261	252	243	234	226	218	210	202	195	188	181	174	168	162	156	151	146	141
	200	176	174	172	170	167	165	162	159	157	154	151	148	145	142	139	136	132	129	126	123	120
	2600	387	363	341	322	303	287	271	257	244	232	221	210	201	192	183	175	168	161	154	148	142
	2400	385	362	340	321	303	286	271	257	244	232	221	210	200	191	183	175	168	161	154	148	142
	2200	384	360	339	320	302	285	270	256	243	231	220	210	200	191	183	175	167	160	154	148	142
	2000	382	359	338	319	301	284	269	255	243	231	220	209	200	191	182	174	167	160	154	148	142
	1800	380	357	336	317	299	283	268	255	242	230	219	209	199	190	182	174	167	160	153	147	142
	1600	377	354	334	315	298	282	267	253	241	229	218	208	198	190	181	174	166	159	153	147	141
1200000	1400	373	351	331	313	296	280	265	252	239	228	217	207	198	189	181	173	166	159	153	147	141
	1200	368	346	327	309	293	277	263	250	238	226	216	206	196	188	180	172	165	158	152	146	140
	1000	360	340	321	304	288	273	260	247	235	224	213	204	195	186	178	171	164	157	151	145	139
	800	347	329	312	296	281	267	254	242	231	220	210	201	192	184	176	169	162	155	149	144	138
	600	324	309	295	281	268	256	244	233	223	213	204	195	187	179	172	165	159	153	147	141	136
	400	276	267	258	249	240	231	222	214	206	198	190	183	176	170	163	157	152	146	141	136	131
	200	173	171	169	166	164	161	158	155	152	149	146	143	140	136	133	130	127	123	120	117	114

l/d

UNIT AXIAL STRESSES - SIMPLE SOLID COLUMNS - l/d from 30 to 50

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1100000	1800	350	329	309	292	276	261	247	234	222	211	201	192	183	175	167	160	153	147	141	135	130
	1600	347	327	308	290	274	259	246	233	221	211	201	191	182	174	167	159	153	146	141	135	130
	1400	344	324	305	288	272	258	244	232	220	210	200	190	182	174	166	159	152	146	140	135	129
	1200	340	320	302	285	270	256	242	230	219	208	198	189	181	173	165	158	152	145	140	134	129
	1000	333	315	297	281	266	252	240	228	217	206	197	188	179	171	164	157	151	145	139	133	128
	800	323	306	289	274	260	247	235	224	213	203	194	185	177	169	162	155	149	143	138	132	127
	600	304	289	275	262	250	238	227	217	207	198	189	181	173	166	159	153	146	141	135	130	125
	400	264	254	245	236	226	218	209	201	193	185	178	171	164	158	152	146	141	136	131	126	121
	200	170	168	165	162	160	157	153	150	147	144	140	137	133	130	127	123	120	117	113	110	107
1000000	2000	321	301	284	267	252	238	226	214	203	193	184	175	167	159	152	146	140	134	128	123	119
	1800	320	300	282	266	251	238	225	213	203	193	183	175	167	159	152	146	139	134	128	123	118
	1600	318	298	281	265	250	237	224	213	202	192	183	174	166	159	152	145	139	133	128	123	118
	1400	315	296	279	263	249	235	223	212	201	191	182	174	166	158	151	145	139	133	128	123	118
	1200	311	293	276	261	247	234	221	210	200	190	181	173	165	157	151	144	138	133	127	122	117
	1000	306	289	273	258	244	231	219	208	198	188	180	171	164	156	150	143	137	132	127	122	117
	800	298	282	266	252	239	227	216	205	195	186	177	169	162	155	148	142	136	131	126	121	116
	600	283	269	255	243	231	220	209	199	190	181	173	166	159	152	146	140	134	129	124	119	115
	400	250	240	230	221	212	203	195	187	179	171	165	158	152	146	140	135	129	125	120	116	111
	200	167	164	161	158	155	151	148	144	141	137	134	130	127	123	119	116	113	109	106	103	100
900000	1600	287	270	254	240	226	214	202	192	182	173	165	157	150	143	137	131	125	120	115	111	106
	1400	285	268	253	238	225	213	202	191	182	173	164	157	149	143	137	131	125	120	115	111	106
	1200	283	266	250	236	223	211	200	190	181	172	164	156	149	142	136	130	125	120	115	110	106
	1000	278	262	247	234	221	209	199	188	179	171	162	155	148	141	135	129	124	119	114	110	106
	800	272	257	243	229	217	206	196	186	177	169	161	153	146	140	134	128	123	118	113	109	105
	600	260	247	234	222	211	200	191	181	173	165	158	151	144	138	132	127	121	117	112	108	104
	400	234	224	214	205	196	187	179	171	164	157	151	144	138	133	128	123	118	113	109	105	101
	200	162	159	155	152	148	145	141	137	133	130	126	122	119	115	111	108	105	101	98	95	92

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction.* Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
2100000	4000	3992	3967	3923	3857	3764	3637	3472	3263	3015	2742	2464	2198	1956	1741	1553	1390	1249	1127	1021	928	847	776	713
	3800	3793	3770	3730	3671	3588	3476	3329	3143	2921	2672	2414	2163	1931	1723	1540	1381	1242	1121	1016	925	845	774	712
	3600	3593	3573	3538	3485	3411	3312	3183	3019	2820	2596	2358	2124	1903	1703	1526	1370	1234	1115	1012	921	842	771	709
	3400	3394	3376	3345	3298	3233	3146	3032	2889	2714	2513	2297	2079	1872	1680	1509	1358	1225	1108	1006	917	838	769	707
	3200	3195	3179	3151	3110	3053	2977	2879	2754	2601	2424	2230	2030	1836	1655	1490	1344	1214	1100	1000	912	834	765	705
	3000	2995	2981	2957	2921	2872	2806	2721	2614	2482	2327	2155	1974	1795	1625	1468	1327	1202	1091	993	906	829	762	702
	2800	2796	2784	2763	2732	2689	2633	2561	2469	2357	2223	2073	1912	1748	1591	1443	1308	1188	1080	984	899	824	757	698
	2600	2597	2586	2568	2541	2505	2458	2396	2319	2225	2112	1982	1841	1695	1551	1413	1286	1171	1067	974	891	818	752	694
	2400	2397	2388	2373	2350	2320	2280	2229	2165	2086	1992	1883	1762	1634	1504	1378	1260	1151	1051	962	882	810	746	689
	2200	2198	2190	2177	2158	2133	2100	2058	2006	1942	1865	1774	1673	1563	1449	1336	1228	1126	1033	947	870	801	739	683
	2000	1998	1992	1981	1966	1945	1918	1885	1842	1791	1729	1656	1573	1482	1385	1286	1189	1096	1010	929	856	790	730	675
	1800	1798	1793	1785	1772	1756	1735	1708	1675	1634	1586	1529	1463	1389	1310	1226	1142	1059	981	907	838	775	718	666
	1600	1599	1595	1588	1578	1565	1549	1528	1503	1472	1435	1392	1342	1284	1221	1154	1083	1013	944	878	815	757	703	654
	1400	1399	1396	1391	1384	1374	1361	1346	1327	1304	1277	1246	1209	1166	1119	1067	1011	954	896	839	784	732	683	638
	1200	1199	1197	1193	1188	1181	1172	1161	1147	1131	1112	1090	1064	1035	1001	964	923	880	834	789	743	698	656	615
2000000	3600	3593	3572	3534	3479	3401	3295	3157	2982	2772	2538	2294	2056	1836	1639	1465	1314	1182	1067	968	880	804	737	677
	3400	3394	3375	3342	3292	3224	3131	3010	2857	2671	2461	2238	2016	1808	1619	1451	1303	1174	1061	963	877	801	734	675
	3200	3195	3178	3149	3105	3045	2964	2859	2726	2564	2377	2175	1971	1776	1596	1434	1290	1164	1054	957	872	797	731	673
	3000	2995	2980	2955	2917	2865	2795	2704	2590	2450	2286	2106	1921	1739	1569	1414	1276	1153	1046	951	867	793	728	670
	2800	2796	2783	2761	2728	2683	2623	2546	2448	2329	2188	2030	1863	1697	1538	1392	1259	1141	1036	943	861	789	724	667
	2600	2596	2585	2566	2538	2500	2449	2384	2302	2201	2081	1945	1798	1648	1502	1365	1239	1126	1024	934	854	783	720	663
	2400	2397	2388	2371	2348	2315	2273	2219	2151	2067	1966	1851	1724	1592	1460	1333	1215	1108	1010	923	846	776	714	659
	2200	2197	2190	2176	2156	2130	2095	2050	1994	1926	1843	1748	1641	1527	1410	1296	1187	1086	994	910	835	768	708	654
	2000	1998	1991	1980	1964	1942	1914	1878	1833	1778	1712	1635	1547	1451	1351	1250	1152	1059	973	894	823	758	700	647
	1800	1798	1793	1784	1771	1754	1731	1703	1667	1624	1573	1512	1442	1364	1281	1195	1109	1026	947	874	807	745	689	639
	1600	1599	1594	1587	1577	1564	1546	1524	1497	1464	1425	1379	1325	1265	1198	1128	1056	984	914	848	786	729	676	628
	1400	1399	1396	1390	1383	1372	1359	1343	1323	1299	1270	1236	1197	1152	1101	1047	989	930	871	813	758	706	658	613

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
	3600	3593	3570	3531	3472	3389	3276	3128	2941	2719	2474	2225	1986	1767	1573	1404	1257	1129	1019	923	840	766	702	645
	3400	3393	3373	3338	3286	3213	3114	2984	2821	2624	2403	2174	1950	1742	1555	1391	1247	1122	1013	919	836	764	700	643
	3200	3194	3177	3146	3100	3036	2950	2837	2694	2522	2326	2117	1909	1713	1535	1376	1236	1114	1007	914	832	760	697	641
	3000	2995	2979	2952	2912	2857	2782	2685	2563	2413	2241	2053	1863	1680	1511	1358	1223	1104	1000	908	828	757	694	639
	2800	2796	2782	2759	2724	2676	2613	2530	2425	2297	2148	1983	1811	1642	1483	1338	1208	1093	991	901	822	753	691	636
1900000	2600	2596	2585	2564	2535	2494	2440	2371	2283	2175	2047	1904	1751	1598	1451	1315	1190	1079	981	893	816	747	687	633
	2400	2397	2387	2370	2345	2311	2265	2207	2134	2045	1938	1816	1683	1547	1413	1286	1169	1063	968	884	808	742	682	629
	2200	2197	2189	2175	2154	2125	2088	2041	1981	1908	1820	1718	1606	1487	1368	1252	1144	1044	954	872	799	734	676	624
	2000	1998	1991	1979	1962	1939	1909	1870	1823	1764	1693	1611	1518	1418	1314	1211	1113	1020	935	858	788	725	669	618
	1800	1798	1793	1783	1769	1751	1727	1697	1659	1613	1558	1493	1419	1337	1250	1161	1074	990	912	840	774	714	660	611
	1600	1599	1594	1587	1576	1562	1543	1520	1491	1456	1414	1364	1307	1243	1173	1100	1025	952	882	817	755	699	648	601
	1400	1399	1396	1390	1382	1371	1357	1339	1318	1292	1262	1225	1183	1135	1082	1024	964	904	844	786	731	680	632	588
	1200	1199	1197	1193	1187	1179	1169	1156	1141	1123	1101	1076	1047	1013	975	933	888	840	792	744	697	652	610	570
	1000	999	998	995	991	985	979	970	960	948	934	917	898	876	850	822	791	758	723	686	650	613	578	544
	3400	3393	3372	3335	3279	3201	3095	2956	2780	2571	2341	2105	1879	1673	1490	1329	1190	1070	965	874	795	726	665	611
	3200	3194	3175	3143	3094	3025	2933	2812	2659	2475	2269	2054	1843	1647	1471	1316	1180	1062	959	870	792	723	663	609
	3000	2995	2978	2950	2907	2848	2768	2664	2532	2373	2190	1996	1802	1618	1450	1301	1169	1054	953	865	788	720	660	607
	2800	2795	2781	2756	2719	2669	2600	2512	2399	2262	2104	1931	1755	1584	1426	1283	1156	1044	945	859	783	716	657	605
	2600	2596	2584	2562	2531	2488	2430	2355	2261	2145	2009	1858	1701	1545	1397	1262	1140	1032	936	852	777	712	653	602
1800000	2400	2397	2386	2368	2342	2305	2257	2195	2116	2020	1906	1777	1639	1499	1363	1237	1122	1018	925	843	771	706	649	598
	2200	2197	2188	2173	2151	2121	2081	2030	1966	1887	1793	1685	1567	1445	1323	1207	1099	1001	912	833	763	700	644	594
	2000	1998	1990	1978	1960	1935	1903	1862	1811	1748	1672	1584	1486	1381	1274	1170	1071	980	896	821	753	692	638	589
	1800	1798	1792	1782	1768	1748	1722	1690	1650	1600	1541	1471	1392	1306	1216	1125	1037	953	876	805	740	682	630	582
	1600	1598	1594	1586	1575	1559	1540	1515	1484	1446	1401	1348	1287	1219	1145	1069	993	919	849	784	724	669	619	574
	1400	1399	1395	1389	1381	1369	1354	1336	1313	1285	1252	1213	1168	1117	1060	1000	938	876	815	757	702	652	605	562
	1200	1199	1197	1192	1186	1177	1167	1154	1137	1118	1095	1068	1036	1000	959	914	867	818	768	719	672	628	586	547
	1000	999	998	995	990	985	977	968	958	945	929	912	891	867	840	810	777	742	705	667	630	593	557	523
	800	800	798	797	794	790	786	780	773	766	756	746	733	719	703	685	665	643	619	594	567	540	513	487

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
												l/d												
	3200	3194	3174	3139	3087	3013	2914	2784	2619	2423	2207	1985	1773	1579	1406	1255	1124	1010	911	826	751	685	628	577
	3000	2994	2977	2947	2901	2838	2752	2640	2498	2327	2135	1933	1736	1553	1387	1241	1114	1002	906	821	747	683	626	575
	2800	2795	2780	2754	2714	2660	2587	2491	2370	2223	2055	1875	1694	1523	1366	1226	1102	994	899	816	743	679	623	573
	2600	2596	2583	2560	2527	2480	2418	2338	2236	2111	1967	1808	1646	1488	1341	1207	1088	983	891	810	738	675	620	570
	2400	2396	2385	2366	2338	2299	2247	2180	2096	1992	1870	1733	1590	1447	1311	1185	1072	971	881	802	733	671	616	567
	2200	2197	2188	2172	2148	2116	2073	2018	1949	1864	1763	1649	1525	1398	1275	1159	1052	956	870	793	725	665	611	564
	2000	1997	1990	1977	1957	1931	1897	1852	1797	1729	1647	1553	1450	1341	1232	1126	1028	938	856	782	717	658	606	559
1700000	1800	1798	1792	1781	1766	1745	1717	1683	1639	1586	1522	1447	1363	1272	1179	1086	997	914	838	768	706	649	599	553
	1600	1598	1593	1585	1573	1557	1536	1509	1476	1435	1387	1329	1264	1191	1115	1036	959	884	815	750	692	638	590	546
	1400	1399	1395	1389	1379	1367	1351	1331	1307	1277	1242	1199	1151	1096	1036	973	909	845	784	726	673	623	577	536
	1200	1199	1196	1192	1185	1176	1165	1151	1133	1112	1087	1058	1024	985	941	894	844	793	743	693	646	602	560	522
	1000	999	997	994	990	984	976	966	955	941	924	905	883	857	828	796	761	724	685	646	608	571	535	502
	800	800	798	796	793	790	785	779	772	763	753	742	729	713	696	676	655	631	606	579	552	524	496	469
	600	600	599	598	596	594	592	588	584	580	575	569	562	554	545	535	524	512	498	483	467	451	433	415
	3200	3193	3172	3135	3079	3000	2892	2751	2573	2365	2138	1912	1699	1507	1338	1192	1065	957	862	781	710	647	593	545
	3000	2994	2975	2943	2894	2826	2733	2612	2458	2275	2073	1866	1667	1484	1322	1180	1057	950	857	777	706	645	591	543
	2800	2795	2779	2751	2709	2650	2571	2467	2336	2178	2000	1813	1630	1458	1304	1167	1047	942	852	772	703	642	589	541
	2600	2595	2582	2557	2522	2472	2405	2318	2207	2073	1919	1753	1587	1428	1282	1151	1035	933	845	767	699	639	586	539
	2400	2396	2384	2364	2334	2292	2236	2164	2072	1960	1829	1685	1537	1391	1255	1131	1021	923	836	760	694	635	582	536
	2200	2197	2187	2170	2145	2110	2064	2005	1930	1838	1729	1607	1478	1348	1224	1108	1004	910	826	753	688	630	579	533
	2000	1997	1989	1975	1955	1926	1889	1842	1782	1708	1620	1519	1410	1297	1186	1080	982	894	814	743	680	624	574	529
1600000	1800	1798	1791	1780	1763	1741	1712	1674	1627	1569	1500	1420	1330	1235	1139	1045	956	873	799	731	670	616	568	524
	1600	1598	1593	1584	1571	1554	1531	1502	1466	1423	1370	1308	1238	1161	1081	1000	922	847	778	715	658	606	560	518
	1400	1399	1395	1388	1378	1365	1348	1327	1300	1268	1229	1184	1131	1073	1009	943	877	813	752	694	641	593	549	509
	1200	1199	1196	1191	1184	1175	1162	1147	1128	1106	1079	1047	1010	968	921	871	819	767	715	665	618	575	534	497
	1000	999	997	994	989	982	974	964	952	937	919	898	874	846	815	780	743	704	664	624	585	548	512	479
	800	800	798	796	793	789	784	777	770	761	750	738	723	707	688	667	643	618	591	563	535	506	478	451
	600	600	599	598	596	594	591	588	583	579	573	566	559	551	541	530	518	505	490	474	457	440	421	403

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
1500000	3000	2994	2974	2939	2887	2813	2712	2579	2413	2217	2005	1792	1593	1413	1255	1117	999	897	808	732	665	607	556	511
	2800	2794	2777	2747	2702	2638	2552	2439	2297	2127	1939	1746	1560	1390	1238	1106	990	890	803	728	662	604	554	509
	2600	2595	2580	2555	2516	2462	2389	2294	2174	2029	1865	1693	1523	1363	1219	1092	980	882	797	723	658	602	551	507
	2400	2396	2383	2361	2329	2284	2223	2144	2044	1923	1783	1632	1479	1332	1197	1075	968	873	790	718	654	598	549	505
	2200	2197	2186	2168	2141	2103	2054	1989	1907	1807	1691	1561	1427	1294	1169	1055	953	862	782	711	649	594	545	502
	2000	1997	1988	1973	1951	1921	1881	1829	1764	1683	1588	1481	1365	1249	1136	1031	935	848	771	703	642	589	541	499
	1800	1798	1791	1779	1761	1737	1705	1664	1613	1550	1475	1388	1293	1194	1095	1000	912	831	758	692	634	582	536	494
	1600	1598	1593	1583	1569	1550	1526	1495	1456	1408	1350	1283	1208	1127	1044	961	882	808	740	679	624	574	529	489
	1400	1399	1394	1387	1377	1362	1344	1321	1292	1257	1215	1166	1109	1046	979	911	843	778	717	661	609	562	520	481
	1200	1199	1196	1191	1183	1173	1160	1143	1123	1098	1069	1034	994	949	899	846	792	738	685	636	589	546	507	471
	1000	999	997	993	988	981	972	961	948	932	912	890	863	833	799	762	722	682	640	600	560	523	488	455
	800	800	798	796	793	788	783	776	768	758	746	733	717	699	678	655	630	603	575	545	516	487	458	431
	600	600	599	598	596	593	590	587	582	577	571	564	556	547	536	524	511	497	481	464	446	427	408	389
	400	400	400	399	398	397	396	394	392	390	388	385	381	378	374	369	364	358	352	345	338	330	321	312
1400000	2800	2794	2775	2743	2694	2625	2531	2407	2252	2069	1871	1673	1486	1319	1171	1043	932	837	755	683	621	567	519	477
	2600	2595	2579	2551	2509	2451	2371	2267	2136	1979	1805	1626	1454	1296	1155	1031	924	830	749	679	618	564	517	475
	2400	2396	2382	2359	2323	2274	2208	2122	2012	1880	1730	1572	1416	1269	1135	1017	913	823	743	674	614	561	514	473
	2200	2196	2185	2165	2136	2096	2041	1971	1881	1772	1646	1509	1370	1236	1112	1000	901	813	736	669	610	557	511	471
	2000	1997	1988	1971	1948	1915	1871	1814	1743	1655	1552	1437	1316	1197	1083	979	885	801	727	662	604	553	508	468
	1800	1798	1790	1777	1758	1732	1697	1653	1597	1528	1446	1352	1252	1148	1048	953	865	786	716	653	597	547	503	464
	1600	1598	1592	1582	1567	1547	1520	1486	1443	1391	1328	1255	1175	1089	1003	919	840	767	701	641	588	540	497	459
	1400	1399	1394	1386	1375	1360	1340	1315	1283	1245	1199	1144	1083	1016	946	875	806	741	681	626	576	531	490	453
	1200	1199	1196	1190	1182	1171	1156	1139	1116	1090	1057	1019	975	926	873	817	761	706	654	604	559	517	479	444
	1000	999	997	993	987	980	970	958	944	926	905	880	851	818	781	741	700	657	614	573	534	497	463	431
	800	800	798	796	792	787	781	774	765	754	742	727	710	690	667	642	615	586	556	526	495	466	437	410
	600	600	599	598	596	593	590	586	581	575	569	561	552	542	530	517	503	487	470	452	433	413	393	373
	400	400	400	399	398	397	395	394	392	389	387	384	380	376	371	366	361	355	348	340	332	323	314	304

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
	2800	2794	2774	2738	2685	2609	2506	2369	2199	2003	1796	1594	1408	1244	1101	978	873	783	705	638	579	528	483	444
	2600	2594	2577	2547	2502	2438	2350	2235	2091	1921	1737	1553	1380	1224	1087	968	866	777	701	634	577	526	482	443
	2400	2395	2381	2355	2317	2263	2190	2095	1975	1831	1671	1506	1348	1201	1071	957	857	771	696	630	573	524	480	441
	2200	2196	2184	2162	2131	2086	2027	1949	1850	1731	1595	1452	1309	1174	1051	942	846	763	689	626	570	520	477	439
	2000	1997	1987	1969	1943	1907	1859	1797	1718	1621	1509	1387	1262	1140	1027	924	833	753	682	620	565	517	474	436
1300000	1800	1797	1789	1775	1754	1726	1688	1639	1577	1501	1412	1311	1205	1098	996	902	817	740	672	612	559	512	470	433
	1600	1598	1591	1580	1564	1542	1513	1476	1429	1371	1302	1223	1136	1047	958	873	795	724	660	602	551	506	465	429
	1400	1398	1393	1385	1373	1356	1334	1307	1272	1230	1179	1120	1053	982	908	836	767	702	643	589	541	498	459	424
	1200	1199	1195	1189	1180	1168	1153	1133	1109	1079	1044	1002	954	901	844	786	728	672	620	571	527	486	450	416
	1000	999	997	992	986	978	968	955	939	919	896	868	837	800	761	718	674	630	586	545	506	470	436	405
	800	799	798	795	791	786	780	772	762	750	736	720	701	679	655	627	598	567	535	504	473	443	414	388
	600	600	599	597	595	592	589	584	579	573	566	557	548	536	524	510	494	476	458	438	418	397	377	356
	400	400	399	399	398	397	395	393	391	388	386	382	378	374	369	363	357	350	343	334	325	316	306	295
	200	200	200	200	199	199	199	198	198	197	197	196	195	194	193	192	190	189	188	186	184	182	180	178
	2600	2594	2575	2542	2493	2422	2325	2197	2038	1855	1662	1474	1302	1149	1017	904	806	723	651	589	535	488	446	410
	2400	2395	2379	2351	2309	2250	2169	2063	1930	1774	1604	1434	1274	1130	1004	894	799	717	647	585	532	486	445	409
	2200	2196	2182	2159	2124	2076	2010	1923	1814	1683	1537	1387	1241	1107	987	882	790	711	642	581	529	483	443	407
	2000	1996	1985	1966	1938	1898	1845	1776	1688	1582	1460	1331	1201	1079	967	867	779	702	635	577	525	480	440	405
	1800	1797	1788	1773	1750	1719	1677	1623	1554	1470	1372	1264	1152	1043	941	849	766	692	627	570	520	476	437	402
1200000	1600	1598	1591	1579	1561	1537	1505	1463	1411	1347	1270	1184	1092	999	909	825	748	679	617	562	514	471	433	399
	1400	1398	1393	1384	1370	1352	1328	1298	1259	1212	1156	1091	1019	943	866	793	724	661	603	552	505	464	427	394
	1200	1199	1195	1188	1178	1165	1148	1127	1100	1067	1027	981	928	871	811	750	691	635	584	537	494	455	420	388
	1000	999	996	992	985	976	965	950	933	911	885	855	819	780	736	691	645	599	556	514	476	441	408	379
	800	799	798	795	791	785	778	769	758	745	730	712	691	666	639	610	578	545	512	480	448	418	390	364
	600	600	599	597	595	592	588	583	577	571	563	553	542	530	516	500	483	464	443	422	401	380	358	338
	400	400	399	399	398	396	395	393	390	387	384	380	376	371	366	360	353	345	337	327	318	307	296	285
	200	200	200	200	199	199	199	198	198	197	196	195	194	193	192	191	190	188	186	184	182	180	178	175

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
	1800	1797	1787	1770	1745	1711	1664	1603	1526	1432	1325	1209	1094	983	883	792	712	642	581	528	481	439	403	371
	1600	1598	1590	1577	1557	1530	1495	1448	1389	1317	1233	1140	1042	946	856	772	698	631	573	521	475	435	400	368
	1400	1398	1392	1382	1368	1347	1321	1287	1244	1191	1128	1056	978	898	820	746	678	617	561	512	468	430	395	364
	1200	1199	1194	1187	1176	1162	1143	1119	1089	1052	1008	956	898	836	773	710	651	596	546	500	459	422	389	359
	1000	999	996	991	984	974	961	945	925	901	872	838	799	755	708	660	612	566	522	482	444	411	380	352
1100000	800	799	797	794	790	784	776	766	754	739	722	702	678	651	621	589	555	520	486	453	422	392	365	340
	600	600	599	597	594	591	587	581	575	567	559	548	536	522	506	489	469	448	427	404	382	360	339	318
	400	400	399	399	397	396	394	392	389	386	383	378	374	368	362	355	347	339	329	319	308	297	285	273
	200	200	200	200	199	199	199	198	197	197	196	195	194	193	191	190	188	187	185	183	181	178	175	173
	2000	1996	1982	1959	1924	1875	1808	1719	1608	1478	1337	1195	1062	942	836	745	666	598	539	488	443	405	371	340
	1800	1797	1786	1767	1739	1700	1648	1578	1491	1386	1269	1147	1028	918	820	733	657	591	534	484	440	402	368	339
	1600	1597	1589	1574	1553	1522	1482	1429	1363	1282	1188	1088	986	888	798	717	645	582	527	479	436	399	366	337
	1400	1398	1391	1380	1364	1342	1312	1273	1224	1164	1094	1015	932	848	769	696	630	570	518	472	431	394	362	334
	1200	1198	1194	1186	1174	1158	1137	1109	1075	1033	983	926	862	796	730	667	608	554	505	462	423	388	357	329
1000000	1000	999	996	990	982	971	957	939	917	889	856	817	774	726	675	625	576	530	487	447	411	379	350	324
	800	799	797	794	789	782	773	762	749	732	713	689	663	632	599	564	528	492	457	424	393	364	338	314
	600	600	598	596	594	590	585	579	572	564	554	542	528	512	494	475	453	430	407	384	360	338	317	297
	400	400	399	398	397	396	394	391	388	385	381	376	371	364	357	350	341	331	320	309	297	285	272	259
	200	200	200	200	199	199	198	198	197	196	195	194	193	192	191	189	187	185	183	181	178	175	172	169
	1600	1597	1588	1571	1547	1513	1466	1406	1330	1238	1135	1027	922	824	736	658	590	531	480	435	396	362	331	305
	1400	1398	1391	1378	1360	1334	1300	1256	1200	1131	1052	966	877	792	713	641	578	522	473	429	391	358	329	302
	1200	1198	1193	1184	1171	1153	1128	1097	1058	1010	953	888	819	749	682	618	561	509	463	422	385	353	325	299
	1000	999	995	989	980	968	952	931	905	874	836	792	743	690	637	585	536	490	448	410	376	346	319	294
900000	800	799	797	793	787	780	770	757	742	723	701	674	643	609	573	535	497	460	425	392	362	335	310	287
	600	600	598	596	593	589	583	577	569	559	547	534	518	500	479	457	433	409	384	360	336	314	293	273
	400	400	399	398	397	395	393	390	387	383	378	373	367	360	351	342	332	321	309	297	284	270	257	243
	200	200	200	200	199	199	198	198	197	196	195	194	192	191	189	188	185	183	181	178	175	172	168	165

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c^* from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	4000	713	658	608	564	524	489	456	427	401	377	355	335	316	299	283	269	255	243
	3800	712	656	607	563	523	488	456	427	400	376	354	334	316	299	283	269	255	243
	3600	709	655	606	562	522	487	455	426	400	376	354	334	315	298	283	268	255	243
	3400	707	653	604	560	521	486	454	425	399	375	353	333	315	298	282	268	255	242
	3200	705	650	602	559	520	485	453	425	398	375	353	333	315	298	282	268	254	242
	3000	702	648	600	557	518	484	452	424	398	374	352	332	314	297	282	267	254	242
	2800	698	645	598	555	517	482	451	422	397	373	351	332	314	297	281	267	254	242
2100000	2600	694	642	595	553	515	480	449	421	396	372	351	331	313	296	281	267	253	241
	2400	689	637	591	550	512	478	448	420	394	371	350	330	312	296	280	266	253	241
	2200	683	633	587	546	509	476	446	418	393	370	348	329	311	295	279	265	252	240
	2000	675	626	582	542	506	473	443	416	391	368	347	328	310	294	279	265	252	240
	1800	666	619	576	537	501	469	440	413	388	366	345	326	309	292	278	264	251	239
	1600	654	609	568	530	496	464	436	409	385	363	343	324	307	291	276	262	250	238
	1400	638	595	557	521	488	458	430	405	381	360	340	321	305	289	274	261	248	236
	1200	615	577	541	508	477	449	422	398	376	355	336	318	301	286	272	258	246	235
	3600	677	625	578	536	498	465	434	406	381	358	337	318	301	284	270	256	243	231
	3400	675	623	576	535	497	464	433	406	381	358	337	318	300	284	269	256	243	231
	3200	673	621	575	533	496	463	432	405	380	357	336	317	300	284	269	255	243	231
	3000	670	619	573	532	495	462	431	404	379	357	336	317	299	283	269	255	242	231
	2800	667	616	571	530	493	460	430	403	378	356	335	316	299	283	268	255	242	230
2000000	2600	663	613	568	528	491	459	429	402	377	355	334	316	298	282	268	254	242	230
	2400	659	610	565	525	489	457	427	401	376	354	334	315	298	282	267	254	241	230
	2200	654	605	562	522	487	455	425	399	375	353	333	314	297	281	267	253	241	229
	2000	647	600	557	518	484	452	423	397	373	351	331	313	296	280	266	252	240	228
	1800	639	593	551	514	480	449	420	395	371	349	330	311	295	279	265	252	239	228
	1600	628	584	544	508	474	444	417	391	368	347	327	310	293	278	264	250	238	227
	1400	613	572	534	499	468	438	412	387	365	344	325	307	291	276	262	249	237	226

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3600	645	595	550	510	474	442	413	387	363	341	321	303	286	270	256	243	231	220
	3400	643	593	549	509	473	441	412	386	362	340	320	302	286	270	256	243	231	220
	3200	641	592	547	508	472	440	411	385	361	340	320	302	285	270	256	243	231	219
	3000	639	590	546	506	471	439	411	385	361	339	320	301	285	270	255	242	230	219
	2800	636	587	544	505	470	438	410	384	360	339	319	301	284	269	255	242	230	219
1900000	2600	633	585	542	503	468	437	408	383	359	338	318	300	284	269	255	242	230	219
	2400	629	581	539	501	466	435	407	381	358	337	317	300	283	268	254	241	229	218
	2200	624	577	536	498	464	433	405	380	357	336	316	299	282	267	254	241	229	218
	2000	618	573	532	495	461	431	403	378	355	334	315	298	282	267	253	240	228	217
	1800	611	566	526	490	458	428	401	376	353	333	314	296	280	266	252	239	228	217
	1600	601	559	520	485	453	424	397	373	351	331	312	295	279	264	251	238	227	216
	1400	588	548	511	478	447	419	393	369	348	328	310	293	277	263	249	237	226	215
	1200	570	533	499	467	438	411	387	364	343	324	306	290	275	260	247	235	224	213
	1000	544	511	481	452	426	401	378	356	337	318	301	285	271	257	244	233	222	211
	3400	611	564	521	483	449	419	391	366	343	323	304	287	271	256	243	230	219	208
	3200	609	562	520	482	448	418	390	366	343	322	304	286	271	256	243	230	219	208
	3000	607	560	518	481	447	417	390	365	342	322	303	286	270	256	242	230	218	208
	2800	605	558	517	479	446	416	389	364	342	321	303	285	270	255	242	230	218	208
	2600	602	556	515	478	445	415	388	363	341	321	302	285	269	255	242	229	218	207
1800000	2400	598	553	512	476	443	413	386	362	340	320	301	284	269	254	241	229	218	207
	2200	594	549	509	473	441	412	385	361	339	319	300	284	268	254	241	228	217	207
	2000	589	545	506	470	438	409	383	359	337	318	299	283	267	253	240	228	217	206
	1800	582	540	501	467	435	407	381	357	336	316	298	282	266	252	239	227	216	206
	1600	574	533	496	462	431	403	378	355	334	314	296	280	265	251	238	226	215	205
	1400	562	523	488	455	426	399	374	351	331	312	294	278	263	250	237	225	214	204
	1200	547	510	477	446	418	392	369	347	327	308	291	276	261	248	235	223	213	203
	1000	523	491	461	433	407	383	361	340	321	303	287	272	258	245	232	221	211	201
	800	487	461	436	412	389	368	348	329	311	295	280	266	252	240	228	217	207	198

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	|\ l/d 46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3200	577	532	492	456	424	395	369	346	324	305	287	271	256	242	229	218	207	197
	3000	575	531	491	455	423	395	369	345	324	304	287	270	255	242	229	217	207	196
	2800	573	529	489	454	422	394	368	345	323	304	286	270	255	241	229	217	206	196
	2600	570	527	487	452	421	393	367	344	323	303	286	270	255	241	228	217	206	196
	2400	567	524	485	451	419	391	366	343	322	303	285	269	254	241	228	216	206	196
	2200	564	521	483	449	418	390	365	342	321	302	284	268	254	240	228	216	205	195
	2000	559	517	480	446	415	388	363	340	320	301	283	267	253	239	227	216	205	195
1700000	1800	553	513	476	443	413	386	361	338	318	299	282	266	252	239	226	215	204	195
	1600	546	506	471	438	409	383	358	336	316	298	281	265	251	238	225	214	204	194
	1400	536	498	464	433	404	379	355	333	314	295	279	264	249	236	224	213	203	193
	1200	522	487	455	425	398	373	350	329	310	292	276	261	247	235	223	212	201	192
	1000	502	470	441	413	388	365	343	323	305	288	272	258	244	232	220	210	200	190
	800	469	443	418	395	372	351	332	314	297	281	266	252	240	228	217	206	197	188
	600	415	397	379	362	344	328	312	296	282	268	255	243	231	220	210	201	192	183
	3200	545	502	464	430	400	373	348	326	306	287	270	255	241	228	216	205	195	185
	3000	543	501	463	429	399	372	348	325	305	287	270	255	241	228	216	205	195	185
	2800	541	499	462	428	398	371	347	325	305	286	270	254	240	227	216	205	194	185
	2600	539	497	460	427	397	370	346	324	304	286	269	254	240	227	215	204	194	185
	2400	536	495	458	425	396	369	345	323	303	285	269	254	240	227	215	204	194	184
	2200	533	492	456	424	394	368	344	322	303	285	268	253	239	226	215	204	194	184
	2000	2000	489	453	421	392	366	343	321	301	284	267	252	238	226	214	203	193	184
1600000	1800	524	485	450	418	390	364	341	320	300	282	266	251	238	225	213	203	193	183
	1600	518	480	446	415	387	362	339	318	298	281	265	250	237	224	213	202	192	183
	1400	509	473	440	410	383	358	336	315	296	279	263	249	235	223	212	201	191	182
	1200	497	463	432	403	377	353	331	311	293	276	261	247	234	221	210	200	190	181
	1000	479	448	419	393	369	346	325	306	289	273	258	244	231	219	208	198	188	180
	800	451	425	400	377	355	335	316	298	282	266	252	239	227	216	205	195	186	177
	600	403	384	366	348	330	314	298	283	269	255	243	231	220	209	199	190	181	173

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction.* Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3000	511	471	435	404	375	350	326	306	287	269	254	239	226	214	203	192	183	174
	2800	509	469	434	403	374	349	326	305	286	269	253	239	226	213	202	192	182	173
	2600	507	468	433	401	373	348	325	304	286	268	253	238	225	213	202	192	182	173
	2400	505	466	431	400	372	347	324	304	285	268	252	238	225	213	202	191	182	173
	2200	502	464	429	398	371	346	323	303	284	267	252	238	224	212	201	191	182	173
	2000	499	461	427	396	369	344	322	302	283	266	251	237	224	212	201	191	181	173
	1800	494	457	424	394	367	343	321	300	282	265	250	236	223	211	200	190	181	172
1500000	1600	489	453	420	391	364	340	319	299	281	264	249	235	222	211	200	190	180	172
	1400	481	446	415	387	361	337	316	297	279	263	248	234	221	210	199	189	180	171
	1200	471	438	408	381	356	333	312	293	276	260	246	232	220	208	198	188	179	170
	1000	455	425	398	372	349	327	307	289	272	257	243	230	218	206	196	186	177	169
	800	431	405	381	358	337	317	299	282	266	252	238	226	214	203	193	184	175	167
	600	389	370	351	333	316	299	284	269	255	242	230	218	208	198	188	179	171	164
	400	312	302	292	282	271	261	250	240	230	220	211	202	193	185	177	170	163	156
	2800	477	439	406	377	350	326	305	285	268	251	237	223	211	199	189	179	170	162
	2600	475	438	405	376	349	326	304	285	267	251	236	223	211	199	189	179	170	162
	2400	473	436	404	374	348	325	303	284	266	251	236	223	210	199	189	179	170	162
	2200	471	434	402	373	347	324	302	283	266	250	235	222	210	199	188	179	170	162
	2000	468	432	400	371	346	322	301	282	265	249	235	222	209	198	188	178	169	161
	1800	464	429	397	369	344	321	300	281	264	248	234	221	209	198	187	178	169	161
1400000	1600	459	425	394	367	342	319	298	280	263	247	233	220	208	197	187	177	169	160
	1400	453	420	390	363	338	316	296	278	261	246	232	219	207	196	186	177	168	160
	1200	444	413	384	358	334	313	293	275	259	244	230	217	206	195	185	176	167	159
	1000	431	402	375	350	328	308	289	271	256	241	228	215	204	193	183	174	166	158
	800	410	385	361	339	318	299	282	265	250	236	224	212	201	191	181	172	164	156
	600	373	354	335	317	300	284	269	254	241	228	217	206	195	186	177	169	161	154
	400	304	294	283	272	261	251	240	230	220	210	201	192	183	175	168	160	153	147

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F$_c$ from the *National Design Specification® for Wood Construction*. Modify F$_c$ for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F$_c$' from table.

Total design load on column = cross-sectional area in square inches times F$_c$' value.

E	F$_c$*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
																		l/d	
	2800	444	409	378	351	326	304	283	265	249	234	220	208	196	185	176	167	158	151
	2600	443	408	377	350	325	303	283	265	248	233	220	207	196	185	176	167	158	150
	2400	441	407	376	349	324	302	282	264	248	233	219	207	196	185	175	166	158	150
	2200	439	405	375	348	323	301	282	264	247	233	219	207	195	185	175	166	158	150
	2000	436	403	373	346	322	300	281	263	247	232	218	206	195	184	175	166	158	150
	1800	433	400	371	344	320	299	280	262	246	231	218	206	194	184	174	165	157	150
	1600	429	397	368	342	319	297	278	261	245	230	217	205	194	183	174	165	157	149
1300000	1400	424	393	364	339	316	295	276	259	243	229	216	204	193	183	173	164	156	149
	1200	416	386	359	335	312	292	274	257	241	227	214	203	192	182	172	164	156	148
	1000	405	377	352	328	307	288	270	254	239	225	212	201	190	180	171	162	155	147
	800	388	363	340	318	299	281	264	248	234	221	209	198	188	178	169	161	153	146
	600	356	337	318	300	284	268	253	239	226	214	203	193	183	174	165	158	150	143
	400	295	284	273	262	250	239	229	218	208	199	190	181	173	165	158	151	144	138
	200	178	175	173	170	167	164	160	157	153	150	146	142	138	134	130	126	122	118
	2600	410	378	349	324	301	280	262	245	230	216	203	192	181	171	162	154	146	139
	2400	409	377	348	323	300	280	261	244	229	215	203	191	181	171	162	154	146	139
	2200	407	375	347	322	299	279	261	244	229	215	203	191	180	171	162	154	146	139
	2000	405	373	346	321	298	278	260	243	228	215	202	191	180	170	162	153	146	139
	1800	402	371	344	319	297	277	259	242	228	214	202	190	180	170	161	153	145	138
	1600	399	369	341	317	295	276	258	241	227	213	201	190	179	170	161	153	145	138
1200000	1400	394	365	338	315	293	274	256	240	225	212	200	189	178	169	160	152	145	138
	1200	388	360	334	311	290	271	254	238	224	211	199	188	178	168	159	151	144	137
	1000	379	352	328	306	286	267	251	235	222	209	197	186	176	167	158	150	143	136
	800	364	340	318	298	279	262	246	231	218	206	194	184	174	165	157	149	142	135
	600	338	319	300	283	266	251	237	223	211	200	189	179	170	162	154	146	139	133
	400	285	273	261	250	238	227	216	206	196	187	178	170	162	154	147	141	134	128
	200	175	173	170	167	163	160	156	152	148	144	140	136	132	128	124	120	116	112

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "a" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
1100000	1800	371	342	316	294	273	255	238	223	209	197	185	175	165	156	148	140	133	127
	1600	368	340	315	292	272	254	237	222	208	196	185	174	165	156	148	140	133	127
	1400	364	337	312	290	270	252	236	221	207	195	184	174	164	155	147	140	133	126
	1200	359	333	309	287	268	250	234	219	206	194	183	173	163	155	147	139	132	126
	1000	352	326	304	283	264	247	231	217	204	192	181	171	162	154	146	138	132	125
	800	340	317	295	276	258	242	227	214	201	190	179	169	160	152	144	137	131	124
	600	318	299	281	264	248	233	220	207	196	185	175	166	157	149	142	135	129	123
	400	273	261	248	237	225	214	203	193	184	174	166	158	150	143	137	130	124	119
	200	173	170	166	163	159	155	151	147	143	139	134	130	126	122	117	113	109	105
1000000	2000	340	314	290	269	250	233	218	204	191	180	169	159	151	142	135	128	122	116
	1800	339	312	289	268	249	232	217	203	191	179	169	159	150	142	135	128	122	116
	1600	337	311	287	267	248	231	216	202	190	179	168	159	150	142	134	128	121	115
	1400	334	308	285	265	247	230	215	202	189	178	168	158	149	141	134	127	121	115
	1200	329	305	283	263	245	228	214	200	188	177	167	157	149	141	134	127	121	115
	1000	324	300	278	259	242	226	212	199	187	176	166	156	148	140	133	126	120	114
	800	314	292	272	254	237	222	208	196	184	173	164	155	146	139	132	125	119	113
	600	297	278	260	244	229	215	202	191	180	170	160	152	144	137	130	123	118	112
	400	259	246	234	222	210	199	189	179	170	161	153	146	138	132	125	120	114	109
	200	169	166	162	158	154	150	145	141	136	132	127	123	119	114	110	106	102	98
900000	1600	305	281	260	241	224	209	195	183	171	161	152	143	135	128	121	115	109	104
	1400	302	279	258	240	223	208	194	182	171	161	151	143	135	128	121	115	109	104
	1200	299	276	256	238	221	207	193	181	170	160	151	142	134	127	121	114	109	104
	1000	294	273	253	235	219	205	192	180	169	159	150	141	134	127	120	114	108	103
	800	287	266	248	231	216	202	189	177	167	157	148	140	132	126	119	113	108	102
	600	273	255	239	223	209	196	184	173	163	154	146	138	131	124	118	112	106	101
	400	243	230	218	206	195	184	174	165	156	148	140	133	126	120	114	109	104	99
	200	165	161	157	152	148	143	138	134	129	124	119	115	110	106	102	98	94	91

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
	4000	3993	3972	3936	3882	3808	3708	3578	3413	3212	2981	2730	2476	2232	2007	1804	1624	1465	1327	1205	1098	1004	921	848
	3800	3794	3775	3743	3694	3628	3539	3423	3277	3098	2890	2661	2425	2195	1980	1784	1609	1455	1318	1198	1093	1000	918	845
	3600	3594	3578	3549	3506	3446	3368	3266	3137	2978	2793	2586	2369	2154	1950	1762	1593	1442	1309	1191	1087	995	914	842
	3400	3395	3380	3354	3316	3264	3194	3105	2992	2853	2689	2504	2307	2108	1916	1737	1574	1428	1298	1183	1081	990	910	838
	3200	3196	3182	3160	3126	3080	3020	2942	2844	2723	2580	2416	2239	2056	1878	1709	1553	1412	1286	1173	1073	984	905	834
	3000	2996	2985	2965	2935	2895	2843	2776	2691	2587	2463	2320	2163	1998	1834	1676	1528	1393	1271	1162	1064	977	899	830
	2800	2797	2787	2769	2744	2709	2664	2607	2535	2447	2341	2217	2080	1933	1784	1638	1500	1372	1255	1149	1054	969	893	824
2100000	2600	2597	2588	2573	2552	2522	2484	2435	2375	2300	2211	2107	1988	1860	1727	1594	1466	1346	1235	1134	1042	959	885	818
	2400	2398	2390	2377	2359	2334	2302	2261	2211	2149	2075	1988	1888	1778	1662	1544	1427	1316	1211	1115	1027	948	876	811
	2200	2198	2192	2181	2166	2145	2118	2085	2044	1993	1933	1861	1779	1687	1588	1484	1381	1279	1183	1093	1010	934	864	801
	2000	1998	1993	1984	1972	1955	1933	1906	1873	1832	1784	1726	1660	1585	1503	1415	1325	1236	1149	1066	988	916	850	790
	1800	1799	1794	1787	1777	1764	1746	1725	1698	1667	1629	1584	1532	1472	1406	1335	1259	1182	1106	1032	961	895	833	776
	1600	1599	1596	1590	1582	1571	1558	1541	1521	1497	1468	1434	1394	1349	1298	1241	1181	1117	1053	989	926	867	810	757
	1400	1399	1397	1392	1386	1378	1368	1356	1341	1322	1301	1276	1247	1214	1176	1134	1088	1038	987	934	882	830	780	732
	1200	1199	1198	1194	1190	1184	1177	1168	1157	1144	1129	1112	1091	1068	1042	1012	979	943	905	864	823	781	739	699
	3600	3594	3577	3546	3500	3438	3354	3245	3108	2939	2743	2528	2305	2087	1883	1697	1531	1384	1255	1141	1040	952	874	804
	3400	3395	3379	3352	3312	3256	3183	3087	2967	2819	2645	2452	2248	2045	1852	1675	1515	1372	1245	1133	1035	947	870	801
	3200	3195	3181	3157	3122	3073	3009	2926	2822	2693	2541	2369	2185	1998	1818	1649	1495	1357	1234	1125	1028	942	866	798
	3000	2996	2984	2963	2932	2889	2834	2762	2672	2562	2430	2279	2115	1945	1778	1620	1473	1341	1221	1115	1020	936	861	794
	2800	2797	2786	2768	2741	2704	2657	2595	2519	2425	2312	2181	2037	1885	1733	1586	1448	1321	1206	1103	1011	928	855	789
2000000	2600	2597	2588	2572	2549	2518	2478	2426	2361	2282	2187	2076	1951	1818	1681	1546	1418	1298	1189	1089	1000	920	848	783
	2400	2397	2390	2376	2357	2331	2297	2253	2200	2134	2055	1962	1857	1742	1621	1500	1382	1271	1168	1073	987	909	839	776
	2200	2198	2191	2180	2164	2142	2114	2078	2034	1981	1916	1840	1752	1656	1552	1446	1340	1238	1142	1053	971	897	829	768
	2000	1998	1993	1984	1970	1952	1930	1901	1865	1822	1770	1709	1639	1559	1473	1382	1290	1199	1111	1029	952	881	817	758
	1800	1799	1794	1787	1776	1762	1743	1721	1693	1659	1618	1570	1515	1452	1382	1307	1229	1150	1073	998	928	862	801	745
	1600	1599	1595	1590	1581	1570	1556	1538	1517	1491	1460	1423	1381	1333	1279	1219	1156	1090	1024	959	897	837	781	729
	1400	1399	1396	1392	1386	1377	1366	1353	1337	1318	1295	1269	1238	1202	1162	1117	1069	1017	964	909	856	804	754	707

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c^* from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
																		l/d						
	3600	3594	3575	3543	3495	3428	3339	3223	3075	2896	2689	2464	2236	2016	1813	1630	1468	1325	1200	1090	993	908	833	767
	3400	3395	3378	3349	3307	3248	3169	3067	2938	2781	2597	2394	2184	1979	1786	1610	1453	1314	1191	1083	988	904	830	764
	3200	3195	3180	3155	3118	3066	2998	2909	2797	2660	2498	2317	2126	1936	1755	1587	1436	1301	1181	1075	982	899	826	761
	3000	2996	2983	2961	2928	2883	2824	2747	2651	2533	2392	2233	2062	1888	1719	1561	1416	1286	1170	1067	975	894	821	757
	2800	2796	2785	2766	2738	2699	2648	2583	2501	2400	2279	2141	1990	1834	1679	1531	1394	1269	1157	1056	967	887	816	753
1900000	2600	2597	2587	2571	2546	2513	2470	2415	2346	2261	2159	2041	1910	1772	1631	1495	1367	1249	1141	1044	957	879	810	748
	2400	2397	2389	2375	2354	2327	2291	2245	2187	2117	2032	1933	1822	1701	1577	1454	1335	1224	1122	1030	946	870	803	742
	2200	2198	2191	2179	2162	2139	2109	2071	2024	1966	1897	1816	1723	1621	1514	1404	1297	1195	1100	1012	932	859	794	735
	2000	1998	1992	1983	1969	1950	1925	1895	1857	1811	1755	1690	1615	1531	1440	1346	1251	1159	1072	990	915	846	783	726
	1800	1798	1794	1786	1775	1760	1740	1716	1686	1650	1607	1555	1496	1429	1355	1277	1196	1116	1037	963	893	828	769	714
	1600	1599	1595	1589	1580	1568	1553	1535	1512	1484	1451	1412	1367	1315	1258	1195	1129	1061	994	928	865	806	751	699
	1400	1399	1396	1392	1385	1376	1365	1351	1333	1313	1289	1260	1227	1189	1146	1099	1047	994	938	883	829	776	727	680
	1200	1199	1197	1194	1189	1182	1174	1164	1152	1137	1120	1100	1077	1051	1021	987	950	910	867	824	780	736	693	653
	1000	1000	998	996	992	988	982	975	967	958	946	933	918	900	881	858	834	807	777	746	713	680	647	613
	3400	3394	3377	3346	3301	3238	3154	3045	2906	2738	2542	2331	2116	1908	1716	1543	1390	1255	1136	1032	941	860	789	726
	3200	3195	3179	3153	3113	3058	2984	2889	2769	2622	2450	2260	2063	1870	1689	1523	1375	1243	1127	1025	935	856	786	723
	3000	2996	2982	2958	2924	2876	2813	2731	2627	2500	2350	2182	2005	1827	1657	1500	1358	1230	1117	1017	929	851	782	720
	2800	2796	2784	2764	2734	2693	2638	2568	2480	2372	2243	2097	1939	1778	1621	1473	1337	1215	1106	1008	922	845	777	716
	2600	2597	2586	2569	2543	2508	2462	2403	2329	2238	2128	2003	1865	1722	1578	1441	1314	1197	1092	998	914	839	772	712
1800000	2400	2397	2388	2374	2352	2322	2284	2234	2173	2097	2006	1901	1783	1657	1529	1404	1285	1176	1075	985	903	830	765	707
	2200	2198	2190	2178	2160	2135	2103	2063	2012	1950	1876	1789	1691	1583	1472	1360	1252	1150	1055	969	891	821	757	700
	2000	1998	1992	1982	1967	1947	1921	1888	1848	1798	1738	1668	1588	1499	1404	1307	1211	1118	1031	950	876	809	748	692
	1800	1798	1794	1785	1773	1757	1737	1711	1679	1640	1593	1538	1475	1403	1326	1244	1161	1079	1000	926	857	793	735	682
	1600	1599	1595	1588	1579	1566	1550	1530	1506	1476	1441	1399	1350	1295	1234	1168	1099	1030	961	895	832	774	719	669
	1400	1399	1396	1391	1384	1375	1362	1348	1329	1307	1281	1251	1215	1174	1128	1078	1024	968	911	854	800	747	698	652
	1200	1199	1197	1193	1188	1181	1173	1162	1149	1134	1115	1094	1069	1040	1008	972	932	890	846	801	756	711	669	628
	1000	1000	998	995	992	987	981	974	965	955	943	929	912	894	872	849	822	793	762	729	695	661	627	593
	800	800	799	797	795	792	788	784	778	772	764	756	746	735	722	708	692	675	655	635	612	589	565	540

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c^* from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
												l/d												
	3200	3195	3178	3150	3107	3048	2970	2867	2737	2579	2396	2198	1995	1800	1620	1457	1312	1184	1072	974	888	812	745	686
	3000	2995	2981	2956	2919	2868	2800	2711	2600	2463	2303	2126	1943	1762	1592	1436	1297	1173	1064	967	883	808	742	683
	2800	2796	2783	2762	2730	2686	2627	2552	2457	2340	2202	2047	1883	1718	1559	1412	1279	1160	1053	960	876	803	738	680
	2600	2596	2586	2567	2540	2502	2453	2389	2309	2211	2094	1960	1816	1667	1522	1385	1258	1144	1041	950	869	797	733	676
	2400	2397	2388	2372	2349	2317	2276	2223	2157	2075	1977	1864	1740	1609	1478	1352	1233	1125	1027	939	860	790	727	671
	2200	2197	2190	2177	2157	2131	2097	2053	1999	1932	1852	1759	1654	1542	1426	1312	1203	1102	1009	925	849	781	720	665
	2000	1998	1992	1981	1965	1943	1916	1881	1837	1784	1719	1644	1558	1464	1365	1265	1167	1074	988	908	836	771	712	658
1700000	1800	1798	1793	1784	1772	1755	1732	1705	1670	1629	1578	1519	1451	1375	1293	1208	1122	1039	961	887	819	757	701	650
	1600	1599	1595	1588	1578	1564	1547	1526	1500	1468	1429	1384	1332	1273	1208	1138	1067	996	926	860	798	740	687	638
	1400	1399	1396	1391	1383	1373	1360	1344	1325	1301	1273	1240	1202	1158	1108	1055	998	940	881	824	769	717	668	623
	1200	1199	1197	1193	1188	1180	1171	1160	1146	1129	1109	1086	1059	1029	994	955	913	868	822	776	730	685	642	602
	1000	999	998	995	991	986	980	972	963	952	939	924	906	886	863	837	809	778	745	711	675	640	605	571
	800	800	799	797	795	791	787	783	777	770	762	753	742	730	717	701	684	665	645	623	599	575	549	524
	600	600	599	598	597	595	593	590	587	584	579	574	569	563	556	548	539	529	519	507	494	481	466	451
	3200	3194	3177	3146	3101	3038	2953	2842	2701	2531	2336	2129	1922	1726	1547	1388	1247	1124	1016	922	840	768	704	648
	3000	2995	2980	2953	2913	2858	2785	2689	2568	2421	2250	2064	1875	1692	1523	1370	1234	1114	1009	917	835	764	701	645
	2800	2796	2782	2759	2725	2678	2615	2533	2430	2304	2156	1992	1822	1653	1495	1349	1218	1102	1000	910	830	760	698	642
	2600	2596	2585	2565	2536	2495	2442	2373	2287	2180	2054	1912	1761	1608	1462	1325	1200	1089	990	902	824	755	693	639
	2400	2397	2387	2370	2345	2312	2267	2210	2138	2049	1944	1823	1692	1556	1423	1296	1179	1072	977	892	816	748	688	635
	2200	2197	2189	2175	2154	2126	2090	2043	1984	1911	1825	1724	1613	1495	1377	1261	1153	1053	962	880	807	741	682	630
	2000	1998	1991	1979	1962	1940	1910	1872	1825	1767	1697	1616	1524	1425	1322	1219	1121	1028	943	865	795	732	675	624
1600000	1800	1798	1793	1783	1770	1751	1728	1698	1661	1615	1561	1497	1424	1342	1256	1168	1081	998	919	847	780	720	666	616
	1600	1599	1594	1587	1576	1562	1544	1521	1492	1458	1416	1367	1311	1247	1178	1106	1032	959	889	823	762	705	654	606
	1400	1399	1396	1390	1382	1371	1357	1340	1319	1294	1263	1228	1186	1139	1086	1029	970	909	849	791	736	685	637	593
	1200	1199	1197	1193	1187	1179	1169	1157	1142	1124	1103	1078	1049	1015	978	936	891	844	797	749	702	657	615	575
	1000	999	998	995	991	986	979	970	960	949	934	918	899	877	852	825	794	761	726	690	653	617	582	548
	800	800	799	797	794	791	787	781	775	768	759	750	738	725	710	694	675	655	633	609	584	558	532	506
	600	600	599	598	597	595	593	590	586	582	578	573	567	560	552	544	534	524	512	500	486	471	456	440

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
1500000	3000	2995	2978	2950	2907	2848	2768	2664	2532	2373	2190	1996	1802	1618	1450	1301	1169	1054	953	865	788	720	660	607
	2800	2795	2781	2756	2719	2669	2600	2512	2399	2262	2104	1931	1755	1584	1426	1283	1156	1044	945	859	783	716	657	605
	2600	2596	2584	2562	2531	2488	2430	2355	2261	2145	2009	1858	1701	1545	1397	1262	1140	1032	936	852	777	712	653	602
	2400	2397	2386	2368	2342	2305	2257	2195	2116	2020	1906	1777	1639	1499	1363	1237	1122	1018	925	843	771	706	649	598
	2200	2197	2188	2173	2151	2121	2081	2030	1966	1887	1793	1685	1567	1445	1323	1207	1099	1001	912	833	763	700	644	594
	2000	1998	1990	1978	1960	1935	1903	1862	1811	1748	1672	1584	1486	1381	1274	1170	1071	980	896	821	753	692	638	589
	1800	1798	1792	1782	1768	1748	1722	1690	1650	1600	1541	1471	1392	1306	1216	1125	1037	953	876	805	740	682	630	582
	1600	1598	1594	1586	1575	1559	1540	1515	1484	1446	1401	1348	1287	1219	1145	1069	993	919	849	784	724	669	619	574
	1400	1399	1395	1389	1381	1369	1354	1336	1313	1285	1252	1213	1168	1117	1060	1000	938	876	815	757	702	652	605	562
	1200	1199	1197	1192	1186	1177	1167	1154	1137	1118	1095	1068	1036	1000	959	914	867	818	768	719	672	628	586	547
	1000	999	998	995	990	985	977	968	958	945	929	912	891	867	840	810	777	742	705	667	630	593	557	523
	800	800	798	797	794	790	786	780	773	766	756	746	733	719	703	685	665	643	619	594	567	540	513	487
	600	600	599	598	597	595	592	589	585	581	576	571	564	557	549	539	529	518	505	491	476	461	444	427
	400	400	400	399	398	398	396	395	394	392	390	387	385	382	379	375	371	366	362	356	350	344	337	330
1400000	2800	2795	2780	2753	2713	2658	2584	2486	2363	2214	2044	1863	1682	1510	1354	1214	1091	983	889	807	735	672	616	567
	2600	2596	2582	2560	2526	2479	2416	2334	2230	2104	1957	1798	1634	1476	1329	1196	1078	973	882	801	730	668	613	564
	2400	2396	2385	2366	2337	2298	2245	2177	2091	1986	1862	1724	1579	1436	1300	1175	1062	961	873	794	725	664	609	561
	2200	2197	2188	2171	2147	2115	2071	2016	1946	1859	1757	1641	1516	1389	1265	1149	1043	947	861	785	718	658	605	558
	2000	1997	1990	1976	1957	1930	1895	1850	1794	1725	1642	1547	1442	1332	1223	1117	1019	929	848	775	709	651	600	553
	1800	1798	1792	1781	1765	1744	1716	1681	1637	1583	1518	1442	1357	1265	1171	1078	989	906	830	761	699	643	593	548
	1600	1598	1593	1585	1573	1556	1535	1508	1474	1433	1383	1325	1259	1186	1108	1029	951	877	808	743	685	632	584	540
	1400	1399	1395	1389	1379	1367	1351	1331	1306	1275	1239	1196	1147	1092	1031	967	903	839	778	720	666	617	572	531
	1200	1199	1196	1192	1185	1176	1164	1150	1132	1111	1086	1056	1021	982	938	890	839	788	737	688	641	596	555	517
	1000	999	997	994	990	983	976	966	954	940	923	904	881	855	826	793	757	720	681	642	604	566	531	497
	800	800	798	796	793	789	785	779	771	763	753	741	727	712	694	675	653	629	603	576	548	520	493	466
	600	600	599	598	596	594	591	588	584	580	574	568	561	553	544	534	523	510	496	481	465	449	431	413
	400	400	400	399	398	397	396	395	393	391	389	387	384	380	377	373	368	364	358	352	346	339	331	323

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
														l/d										
	2800	2795	2778	2749	2706	2645	2564	2456	2321	2159	1976	1787	1602	1431	1278	1142	1024	922	832	755	687	627	575	528
	2600	2595	2581	2556	2519	2468	2399	2309	2195	2056	1898	1730	1562	1402	1257	1127	1013	913	826	750	683	624	572	526
	2400	2396	2384	2363	2332	2289	2231	2156	2061	1946	1811	1664	1514	1368	1232	1109	1000	903	818	744	678	620	569	524
	2200	2197	2187	2169	2143	2107	2060	1999	1921	1826	1714	1590	1458	1327	1202	1087	984	891	809	736	672	615	565	521
	2000	1997	1989	1974	1953	1924	1886	1837	1775	1698	1608	1504	1393	1278	1166	1061	963	876	797	727	665	610	561	517
	1800	1798	1791	1779	1762	1739	1709	1670	1622	1562	1490	1408	1316	1219	1122	1027	938	857	782	716	656	603	555	512
	1600	1598	1593	1584	1570	1552	1529	1499	1462	1417	1362	1299	1226	1148	1066	985	906	832	763	701	644	593	547	506
1300000	1400	1399	1395	1388	1378	1364	1347	1324	1297	1264	1224	1177	1123	1062	998	931	864	799	738	681	629	581	537	498
	1200	1199	1196	1191	1184	1174	1161	1146	1126	1103	1075	1042	1004	960	913	861	809	755	703	654	607	563	523	487
	1000	999	997	994	989	982	973	963	950	935	916	895	870	841	809	773	735	695	655	614	575	538	503	470
	800	800	798	796	793	789	783	777	769	760	749	736	721	704	684	662	638	612	585	556	527	498	470	443
	600	600	599	598	596	594	591	587	583	578	572	565	558	549	539	528	515	501	486	470	453	435	416	397
	400	400	400	399	398	397	396	394	393	391	388	385	382	379	375	370	366	360	354	348	341	333	325	316
	200	200	200	200	200	199	199	199	198	198	197	197	196	195	194	193	192	191	190	189	187	186	184	182
	2600	2595	2580	2553	2512	2455	2379	2279	2152	2000	1830	1654	1482	1323	1181	1056	946	851	769	697	634	579	531	488
	2400	2396	2383	2360	2326	2278	2214	2131	2026	1898	1752	1597	1441	1294	1160	1041	935	843	762	692	630	576	528	486
	2200	2196	2185	2166	2138	2099	2046	1978	1892	1787	1665	1531	1393	1260	1135	1022	922	833	755	686	625	572	525	483
	2000	1997	1988	1972	1949	1917	1875	1820	1751	1667	1567	1455	1337	1218	1105	1000	905	820	745	678	619	567	521	480
	1800	1798	1790	1778	1759	1734	1700	1657	1603	1537	1458	1367	1269	1167	1067	972	884	804	733	669	612	561	516	476
	1600	1598	1592	1582	1568	1548	1522	1490	1449	1398	1337	1267	1188	1105	1019	936	857	784	717	657	602	554	510	471
1200000	1400	1399	1394	1387	1376	1361	1342	1317	1287	1250	1206	1153	1094	1028	960	890	821	756	696	640	589	543	502	464
	1200	1199	1196	1190	1182	1171	1158	1140	1119	1093	1062	1026	983	936	884	829	774	719	667	617	571	529	490	455
	1000	999	997	993	988	980	971	960	945	928	908	884	856	824	789	750	709	667	625	584	545	508	473	441
	800	800	798	796	792	788	782	775	766	756	743	729	713	694	672	648	622	593	564	534	504	474	446	419
	600	600	599	598	596	593	590	586	581	576	570	562	554	544	533	520	506	491	475	457	438	419	399	380
	400	400	400	399	398	397	396	394	392	390	387	384	381	377	372	368	362	356	350	342	334	326	317	307
	200	200	200	200	200	199	199	199	198	198	197	196	195	195	194	193	192	190	189	187	186	184	182	180

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 2 to 46

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
1100000	1800	1797	1789	1775	1755	1727	1690	1642	1581	1507	1419	1320	1215	1109	1007	912	826	749	681	620	567	519	477	439
	1600	1598	1592	1581	1565	1543	1514	1478	1432	1375	1307	1229	1144	1055	967	883	804	733	668	610	559	513	472	435
	1400	1398	1394	1385	1373	1357	1336	1309	1275	1233	1183	1125	1059	989	916	844	775	710	651	597	548	504	465	430
	1200	1199	1195	1189	1180	1169	1153	1134	1111	1081	1047	1006	958	906	850	792	735	679	627	578	533	493	456	422
	1000	999	997	993	987	979	968	955	940	921	898	871	840	804	765	723	679	635	592	551	512	475	442	411
	800	799	798	795	791	786	780	772	763	751	737	721	703	681	657	631	602	571	540	508	477	448	419	392
	600	600	599	597	595	592	589	585	580	573	566	558	549	538	525	511	496	479	460	441	421	400	380	360
	400	400	399	399	398	397	395	393	391	389	386	382	379	374	369	364	358	351	344	336	327	317	307	297
	200	200	200	200	199	199	199	198	198	197	197	196	195	194	193	192	191	189	188	186	184	182	180	178
1000000	2000	1996	1985	1966	1938	1898	1845	1776	1688	1582	1460	1331	1201	1079	967	867	779	702	635	577	525	480	440	405
	1800	1797	1788	1773	1750	1719	1677	1623	1554	1470	1372	1264	1152	1043	941	849	766	692	627	570	520	476	437	402
	1600	1598	1591	1579	1561	1537	1505	1463	1411	1347	1270	1184	1092	999	909	825	748	679	617	562	514	471	433	399
	1400	1398	1393	1384	1370	1352	1328	1298	1259	1212	1156	1091	1019	943	866	793	724	661	603	552	505	464	427	394
	1200	1199	1195	1188	1178	1165	1148	1127	1100	1067	1027	981	928	871	811	750	691	635	584	537	494	455	420	388
	1000	999	996	992	985	976	965	950	933	911	885	855	819	780	736	691	645	599	556	514	476	441	408	379
	800	799	798	795	791	785	778	769	758	745	730	712	691	666	639	610	578	545	512	480	448	418	390	364
	600	600	599	597	595	592	588	583	577	571	563	553	542	530	516	500	483	464	443	422	401	380	358	338
	400	400	399	399	398	396	395	393	390	387	384	380	376	371	366	360	353	345	337	327	318	307	296	285
	200	200	200	200	199	199	199	198	198	197	196	195	194	193	192	191	190	188	186	184	182	180	178	175
900000	1600	1597	1590	1576	1556	1529	1492	1445	1385	1311	1225	1130	1032	935	844	762	687	622	564	513	468	428	393	362
	1400	1398	1392	1382	1367	1346	1319	1284	1240	1186	1122	1048	970	889	810	736	669	608	553	504	461	423	389	358
	1200	1199	1194	1187	1176	1161	1142	1117	1086	1049	1003	950	891	829	765	702	643	588	538	492	452	415	383	353
	1000	999	996	991	983	973	960	944	924	899	869	834	794	750	702	653	605	559	515	475	438	404	374	346
	800	799	797	794	789	783	775	765	753	738	720	700	675	648	617	584	550	515	480	447	416	387	360	335
	600	600	599	597	594	591	586	581	575	567	558	547	534	520	504	486	466	445	423	400	378	356	334	314
	400	400	399	399	397	396	394	392	389	386	382	378	373	367	361	354	346	337	328	317	306	295	283	270
	200	200	200	200	199	199	199	198	197	197	196	195	194	193	191	190	188	186	185	182	180	178	175	172

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l=unsupported length of column in inches and d=applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	4000	848	782	724	672	625	583	545	510	479	450	424	400	378	358	339	322	306	291
	3800	845	780	722	670	624	582	544	509	478	449	423	399	377	357	339	321	305	291
	3600	842	777	720	668	622	580	543	508	477	449	423	399	377	357	338	321	305	290
	3400	838	775	718	666	620	579	541	507	476	448	422	398	376	356	338	321	305	290
	3200	834	771	715	664	619	577	540	506	475	447	421	397	376	356	337	320	304	290
	3000	830	768	712	662	616	575	538	505	474	446	420	397	375	355	337	320	304	289
	2800	824	763	708	658	614	573	536	503	472	445	419	396	374	354	336	319	303	289
2100000	2600	818	758	704	655	611	571	534	501	471	443	418	395	373	353	335	318	303	288
	2400	811	752	699	651	607	568	532	499	469	442	416	393	372	352	334	318	302	287
	2200	801	744	692	645	603	564	528	496	467	439	415	392	371	351	333	317	301	287
	2000	790	735	685	639	597	559	525	493	464	437	412	390	369	350	332	315	300	286
	1800	776	723	675	631	590	554	520	489	460	434	410	387	367	348	330	314	299	285
	1600	757	708	662	620	582	546	513	483	455	430	406	384	364	346	328	312	297	283
	1400	732	688	646	606	570	536	505	476	449	424	402	380	361	342	325	310	295	281
	1200	699	659	622	587	553	522	493	466	441	417	395	375	356	338	322	306	292	278
	3600	804	743	688	638	594	554	518	485	455	428	403	380	359	340	322	306	291	277
	3400	801	740	685	636	592	553	517	484	454	427	402	380	359	340	322	306	290	276
	3200	798	737	683	634	591	551	515	483	453	426	402	379	358	339	322	305	290	276
	3000	794	734	680	632	589	549	514	482	452	425	401	378	358	339	321	305	290	276
	2800	789	730	677	629	586	547	512	480	451	424	400	378	357	338	320	304	289	275
	2600	783	725	673	626	584	545	510	478	449	423	399	377	356	337	320	304	289	275
2000000	2400	776	720	668	622	580	542	508	476	448	421	397	375	355	336	319	303	288	274
	2200	768	713	663	617	576	539	505	474	446	420	396	374	354	335	318	302	287	273
	2000	758	705	656	612	572	535	502	471	443	417	394	372	352	334	317	301	286	273
	1800	745	694	647	605	565	530	497	467	440	415	391	370	350	332	315	300	285	272
	1600	729	681	636	595	558	523	491	462	436	411	388	367	348	330	313	298	284	270
	1400	707	662	621	583	547	514	484	456	430	406	384	364	345	327	311	296	282	269

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3600	767	708	655	608	565	527	493	461	433	407	383	362	342	323	307	291	276	263
	3400	764	705	653	606	564	526	492	461	432	406	383	361	341	323	306	291	276	263
	3200	761	703	651	604	562	525	491	460	431	406	382	361	341	323	306	290	276	262
	3000	757	700	648	602	561	523	489	458	430	405	381	360	340	322	305	290	275	262
	2800	753	696	645	600	559	521	488	457	429	404	381	359	340	322	305	289	275	262
	2600	748	692	642	597	556	519	486	456	428	403	380	358	339	321	304	289	275	261
	2400	742	687	638	593	553	517	484	454	426	401	378	357	338	320	303	288	274	261
1900000	2200	735	681	633	589	550	514	481	452	425	400	377	356	337	319	303	287	273	260
	2000	726	674	627	584	546	510	478	449	422	398	375	355	335	318	302	286	272	259
	1800	714	664	619	578	540	506	474	446	419	395	373	353	334	316	300	285	271	259
	1600	699	652	609	569	533	500	469	441	416	392	370	350	332	314	299	284	270	257
	1400	680	636	596	558	524	492	463	436	411	388	367	347	329	312	296	282	268	256
	1200	653	614	577	543	511	481	453	428	404	382	361	342	325	309	293	279	266	254
	1000	613	581	550	520	491	465	439	416	394	373	354	336	319	303	289	275	262	250
	3400	726	670	620	576	536	499	467	437	410	386	363	343	324	306	290	276	262	249
	3200	723	668	618	574	534	498	466	436	409	385	363	342	323	306	290	275	262	249
	3000	720	665	616	572	533	497	465	435	409	384	362	342	323	306	290	275	261	249
	2800	716	662	614	570	531	495	463	434	408	383	361	341	322	305	289	275	261	248
	2600	712	658	611	567	529	493	462	433	406	382	360	340	322	304	289	274	260	248
	2400	707	654	607	564	526	491	460	431	405	381	359	339	321	304	288	273	260	247
	2200	700	649	603	561	523	489	458	429	403	380	358	338	320	303	287	273	259	247
1800000	2000	692	642	597	556	519	485	455	427	401	378	356	337	319	302	286	272	259	246
	1800	682	634	590	551	514	481	451	424	399	376	355	335	317	300	285	271	258	245
	1600	669	624	582	543	508	476	447	420	395	373	352	333	315	299	284	270	256	244
	1400	652	609	570	533	500	469	441	415	391	369	349	330	313	297	282	268	255	243
	1200	628	589	553	520	488	460	433	408	385	364	344	326	309	293	279	265	253	241
	1000	593	560	529	499	471	445	421	398	376	356	338	320	304	289	275	262	250	238
	800	540	516	491	468	444	422	401	381	362	344	327	311	296	282	269	256	245	234

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	l/d																	
		46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3200	686	633	586	544	506	472	441	413	387	364	343	324	306	289	274	260	247	235
	3000	683	631	584	542	504	470	440	412	387	364	342	323	305	289	274	260	247	235
	2800	680	628	582	540	503	469	439	411	386	363	342	322	305	289	273	260	247	235
	2600	676	625	579	538	501	467	437	410	385	362	341	322	304	288	273	259	246	234
	2400	671	621	576	535	499	465	436	408	383	361	340	321	303	287	272	259	246	234
	2200	665	616	572	532	496	463	434	407	382	359	339	320	303	287	272	258	245	234
	2000	658	610	567	528	493	460	431	404	380	358	338	319	302	286	271	257	245	233
1700000	1800	650	603	561	523	488	457	428	402	378	356	336	317	300	284	270	256	244	232
	1600	638	594	553	517	483	452	424	399	375	353	334	315	299	283	269	255	243	231
	1400	623	581	543	508	476	446	419	394	371	350	331	313	296	281	267	254	241	230
	1200	602	564	529	496	466	438	412	388	366	346	327	309	293	278	264	252	240	228
	1000	571	538	507	478	451	425	401	379	358	339	321	304	289	274	261	248	237	226
	800	524	499	474	450	427	405	384	364	345	328	312	296	282	268	255	244	232	222
	600	451	435	419	402	386	369	353	338	323	308	294	281	269	257	245	235	225	215
	3200	648	598	553	513	477	445	416	389	365	343	323	305	288	273	258	245	233	222
	3000	645	596	551	512	476	444	415	388	365	343	323	305	288	272	258	245	233	221
	2800	642	593	549	510	474	443	414	388	364	342	322	304	287	272	258	245	232	221
	2600	639	590	547	508	473	441	413	387	363	341	322	303	287	271	257	244	232	221
	2400	635	587	544	506	471	439	411	385	362	340	321	303	286	271	257	244	232	221
	2200	630	583	541	503	468	437	409	384	360	339	320	302	285	270	256	243	231	220
	2000	624	578	537	499	466	435	407	382	359	338	319	301	284	269	255	243	231	220
1600000	1800	616	572	531	495	462	432	405	380	357	336	317	299	283	268	255	242	230	219
	1600	606	564	525	489	457	428	401	377	354	334	315	298	282	267	253	241	229	218
	1400	593	553	516	482	451	423	397	373	351	331	313	296	280	265	252	239	228	217
	1200	575	538	503	472	442	415	390	368	346	327	309	293	277	263	250	238	226	216
	1000	548	515	485	456	429	404	381	360	340	321	304	288	273	260	247	235	224	213
	800	506	480	456	431	409	387	366	347	329	312	296	281	267	254	242	231	220	210
	600	440	423	406	389	372	356	340	324	309	295	281	268	256	244	233	223	213	204

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*											l/d							
		46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	3000	607	560	518	481	447	417	390	365	342	322	303	286	270	256	242	230	218	208
	2800	605	558	517	479	446	416	389	364	342	321	303	285	270	255	242	230	218	208
	2600	602	556	515	478	445	415	388	363	341	321	302	285	269	255	242	229	218	207
	2400	598	553	512	476	443	413	386	362	340	320	301	284	269	254	241	229	218	207
	2200	594	549	509	473	441	412	385	361	339	319	300	284	268	254	241	228	217	207
	2000	589	545	506	470	438	409	383	359	337	318	299	283	267	253	240	228	217	206
	1800	582	540	501	467	435	407	381	357	336	316	298	282	266	252	239	227	216	206
1500000	1600	574	533	496	462	431	403	378	355	334	314	296	280	265	251	238	226	215	205
	1400	562	523	488	455	426	399	374	351	331	312	294	278	263	250	237	225	214	204
	1200	547	510	477	446	418	392	369	347	327	308	291	276	261	248	235	223	213	203
	1000	523	491	461	433	407	383	361	340	321	303	287	272	258	245	232	221	211	201
	800	487	461	436	412	389	368	348	329	311	295	280	266	252	240	228	217	207	198
	600	427	410	392	375	358	341	325	309	294	280	267	254	243	231	221	211	202	193
	400	330	322	313	305	296	286	277	267	258	248	239	230	221	212	204	196	188	181
	2800	567	523	484	449	417	389	364	341	320	300	283	267	252	239	226	215	204	194
	2600	564	521	482	447	416	388	363	340	319	300	282	266	252	238	226	214	204	194
	2400	561	518	480	446	415	387	362	339	318	299	282	266	251	238	225	214	203	193
	2200	558	515	478	444	413	385	360	338	317	298	281	265	251	237	225	214	203	193
	2000	553	512	474	441	411	384	359	336	316	297	280	264	250	237	224	213	203	193
	1800	548	507	471	438	408	381	357	335	314	296	279	263	249	236	224	212	202	192
1400000	1600	540	501	466	434	405	378	354	333	313	294	278	262	248	235	223	212	201	192
	1400	531	493	459	428	400	374	351	330	310	292	276	261	247	234	222	211	200	191
	1200	517	482	450	421	394	369	346	326	307	289	273	258	245	232	220	209	199	190
	1000	497	466	436	409	384	361	340	320	302	285	269	255	242	229	218	207	197	188
	800	466	440	415	391	369	348	329	311	294	278	263	250	237	225	214	204	195	186
	600	413	395	377	359	342	325	309	294	279	265	253	240	229	218	208	199	190	181
	400	323	315	306	296	287	277	267	257	247	238	228	219	210	202	194	186	178	171

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c^*	l/d																	
		46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
	2800	528	487	451	418	389	362	338	317	297	279	263	248	234	222	210	200	190	180
	2600	526	486	449	417	388	361	338	316	297	279	263	248	234	222	210	199	189	180
	2400	524	483	447	415	386	360	337	315	296	278	262	247	234	221	210	199	189	180
	2200	521	481	445	414	385	359	336	315	295	278	262	247	233	221	209	199	189	180
	2000	517	478	443	411	383	358	334	313	294	277	261	246	233	220	209	198	188	179
	1800	512	474	440	409	381	356	333	312	293	276	260	245	232	220	208	198	188	179
	1600	506	469	435	405	378	353	331	310	291	274	259	244	231	219	207	197	187	178
1300000	1400	498	462	430	401	374	350	328	308	289	272	257	243	230	218	207	196	187	178
	1200	487	453	422	394	369	345	324	304	286	270	255	241	228	216	205	195	186	177
	1000	470	439	411	385	361	338	318	299	282	266	252	238	226	214	203	193	184	175
	800	443	417	392	369	348	328	309	292	275	260	247	234	222	211	200	191	182	173
	600	397	378	360	342	325	308	292	277	263	250	237	226	215	205	195	186	177	169
	400	316	307	297	287	277	267	256	246	236	227	217	208	199	191	183	175	168	161
	200	182	180	178	176	174	171	168	166	163	160	156	153	150	146	143	139	135	132
	2600	488	450	416	386	359	335	313	293	274	258	243	229	216	205	194	184	175	166
	2400	486	448	415	385	358	334	312	292	274	257	242	229	216	205	194	184	175	166
	2200	483	446	413	383	357	333	311	291	273	257	242	228	216	204	193	184	175	166
	2000	480	443	411	381	355	331	310	290	272	256	241	228	215	204	193	183	174	166
	1800	476	440	408	379	353	330	308	289	271	255	241	227	215	203	193	183	174	165
	1600	471	436	405	376	351	328	307	287	270	254	240	226	214	202	192	182	173	165
1200000	1400	464	431	400	372	347	325	304	285	268	253	238	225	213	202	191	182	173	164
	1200	455	423	394	367	343	321	301	283	266	250	236	223	211	200	190	181	172	164
	1000	441	411	384	359	336	315	296	278	262	247	234	221	209	199	188	179	171	162
	800	419	393	369	346	326	306	289	272	257	243	229	217	206	196	186	177	169	161
	600	380	360	342	324	306	290	275	260	247	234	222	211	200	191	181	173	165	158
	400	307	297	287	276	266	255	244	234	224	214	205	196	187	179	171	164	157	151
	200	180	178	176	173	171	168	165	162	159	155	152	148	145	141	137	133	130	126

UNIT AXIAL STRESSES - SPACED COLUMNS, CONDITION "b" - l/d from 46 to 80

See instructions for use of tables on page 210. Obtain design values for E and F_c from the *National Design Specification® for Wood Construction*. Modify F_c for different load duration, if applicable (see page 13). Calculate l/d where l = unsupported length of column in inches and d = applicable least actual dimension of column cross section. Determine value of F_c' from table.

Total design load on column = cross-sectional area in square inches times F_c' value.

E	F_c*	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
1100000	1800	439	406	376	349	325	303	284	266	250	235	221	209	197	187	177	168	160	152
	1600	435	403	373	347	323	302	282	265	248	234	220	208	197	186	176	167	159	152
	1400	430	398	370	344	320	299	280	263	247	232	219	207	196	185	176	167	159	151
	1200	422	392	364	339	317	296	278	261	245	231	218	206	195	184	175	166	158	150
	1000	411	382	356	333	311	292	274	257	242	228	215	204	193	183	174	165	157	149
	800	392	367	344	323	303	284	267	252	237	224	212	201	190	180	171	163	155	148
	600	360	340	322	304	287	271	256	242	229	217	206	195	185	176	168	160	152	145
	400	297	286	275	264	253	242	231	221	211	201	192	183	175	167	160	153	146	140
	200	178	176	173	170	167	164	161	158	154	150	147	143	139	135	131	127	123	119
1000000	2000	405	373	346	321	298	278	260	243	228	215	202	191	180	170	162	153	146	139
	1800	402	371	344	319	297	277	259	242	228	214	202	190	180	170	161	153	145	138
	1600	399	369	341	317	295	276	258	241	227	213	201	190	179	170	161	153	145	138
	1400	394	365	338	315	293	274	256	240	225	212	200	189	178	169	160	152	145	138
	1200	388	360	334	311	290	271	254	238	224	211	199	188	178	168	159	151	144	137
	1000	379	352	328	306	286	267	251	235	222	209	197	186	176	167	158	150	143	136
	800	364	340	318	298	279	262	246	231	218	206	194	184	174	165	157	149	142	135
	600	338	319	300	283	266	251	237	223	211	200	189	179	170	162	154	146	139	133
	400	285	273	261	250	238	227	216	206	196	187	178	170	162	154	147	141	134	128
	200	175	173	170	167	163	160	156	152	148	144	140	136	132	128	124	120	116	112
900000	1600	362	334	309	287	267	249	233	218	205	192	181	171	162	153	145	138	131	124
	1400	358	331	307	285	265	248	232	217	204	192	181	170	161	153	145	137	130	124
	1200	353	327	303	282	263	246	230	216	202	191	180	170	160	152	144	137	130	124
	1000	346	321	299	278	260	243	227	213	201	189	178	168	159	151	143	136	129	123
	800	335	312	291	272	254	238	223	210	198	186	176	166	158	149	142	135	128	122
	600	314	295	277	260	244	230	216	204	193	182	172	163	155	147	139	133	126	121
	400	270	258	246	234	222	211	200	190	181	172	163	155	148	141	134	128	122	117
	200	172	169	165	162	158	154	150	146	142	137	133	129	124	120	116	112	108	104