

TABLE 46-C
ALLOWABLE UNIT STRESSES, STRUCTURAL TIMBER
(Pounds per square inch)

<i>Material</i>	<i>K[§] (columns)</i>	<i>Bending and tension</i>	<i>Compression[*]</i>	<i>Shear†</i>	<i>Bearing‡</i>	<i>Modulus of elasticity</i>
Douglas-fir						
Parallel to grain	23.4	1,500	1,200	100	1,500	1,600,000
Across the grain					350	
Oak						
Parallel to grain	23.7	1,300	1,100	110	1,500	1,500,000
Across the grain					500	
Spruce						
Parallel to grain	21.2	1,200	1,100	100	1,200	1,200,000
Across the grain					250	
Longleaf yellow pine						
Parallel to grain	23.4	1,400	1,200	120	1,400	1,600,000
Across the grain					300	

From General Engineering Handbook, O'Rourke (McGraw-Hill Book Co.)

* On lengths not greater than eleven times the least dimension. Otherwise, use column formulas.

† In timber-joint designs, these values may be increased 50 per cent.

‡ These values are for joint design, and for bearings less than 10 in. long.

§ See following notes.

TIMBER, STRUCTURAL GRADE (DRY) Allowable unit stresses in bending, compression, shear, and bearing, as specified by the N L M A, are given in Table 46-C. Allowable unit stresses for timber columns are as follows:

1 Short Columns The safe load, in pounds per square inch of net cross-sectional area, for columns and other members stressed in compression parallel to the grain, with a ratio of unsupported length to least dimension (l/d) not exceeding eleven (short columns), shall not exceed the allowable unit compression stress (c) parallel to grain for short columns, i.e.,

$$\frac{P}{A} = c$$

2 Intermediate Columns For columns with a ratio of unsupported length to least dimension greater than eleven but less than K (intermediate columns), the following formula shall be used until the reduction in allowable stress equals one-third the stress permitted for short columns:

$$\frac{P}{A} = c \left[1 - \frac{1}{3} \left(\frac{l}{Kd} \right) \right]$$

3 Long Columns For columns with a ratio of unsupported length to least dimension greater than K (long columns), the safe load shall be determined by the following formula:

$$\frac{P}{A} = \frac{\pi^2 E}{36(l/d)^2} = \frac{0.274E}{(l/d)^2}$$

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