

**Table 9-1** Some Representative Column Codes for Centric Loading

Code No.	Source	Material	Compression-Block and/or Intermediate-Range Formulas and Limitations ( $L/r$ is the effective ratio $L/r$ )	Slender Range
1	a	Structural steel with a yield point $\sigma_y$	$0 \leq \frac{L}{r} \leq C_c$ $\sigma_{all} = \frac{\sigma_y}{FS} \left[ 1 - \frac{1}{2} \left( \frac{L/r}{C_c} \right)^2 \right]$ $C_c^2 = \frac{2\pi^2 E}{\sigma_y}$ $FS = \frac{5}{3} + \frac{3}{8} \left( \frac{L/r}{C_c} \right) - \frac{1}{8} \left( \frac{L/r}{C_c} \right)^3$	$\frac{L}{r} \geq C_c$ $\sigma_{all} = \frac{\pi^2 E}{1.92(L/r)^2}$
2	b	2014-T6 (Alclad) Aluminum alloy	$\frac{L}{r} \leq 12$ $\sigma_{all} = 28 \text{ ksi}$ $= 193 \text{ MPa}$ $12 \leq \frac{L}{r} \leq 55$ $\sigma_{all} = \left[ 30.7 - 0.23 \left( \frac{L}{r} \right) \right] \text{ ksi}$ $= \left[ 212 - 1.585 \left( \frac{L}{r} \right) \right] \text{ MPa}$	$\frac{L}{r} \geq 55$ $\sigma_{all} = \frac{54,000}{(L/r)^2} \text{ ksi}$ $= \frac{372(10^3)}{(L/r)^2} \text{ MPa}$
3	b	6061-T6 Aluminum alloy	$\frac{L}{r} \leq 9.5$ $\sigma_{all} = 19 \text{ ksi}$ $= 131 \text{ MPa}$ $9.5 \leq \frac{L}{r} \leq 66$ $\sigma_{all} = \left[ 20.2 - 0.126 \left( \frac{L}{r} \right) \right] \text{ ksi}$ $= \left[ 139 - 0.868 \left( \frac{L}{r} \right) \right] \text{ MPa}$	$\frac{L}{r} \geq 66$ $\sigma_{all} = \frac{51,000}{(L/r)^2} \text{ ksi}$ $= \frac{351(10^3)}{(L/r)^2} \text{ MPa}$
4	c	Timber with a rectangular cross section $b \times d$ where $d < b$	$\frac{L}{d} \leq 11$ $\sigma_{all} = F_c^*$ $11 \leq \frac{L}{d} \leq k$ $\sigma_{all} = F_c \left[ 1 - \frac{1}{3} \left( \frac{L/d}{k} \right)^4 \right]$ $k = 0.671 \sqrt{E/F_c}$	$k \leq \frac{L}{d} \leq 50$ $\sigma_{all} = \frac{0.30E}{(L/d)^2}$

a. *Manual of Steel Construction*, 9th ed., American Institute of Steel Construction, New York, 1989.

b. *Specifications for Aluminum Structures*, Aluminum Association, Inc., Washington, D.C., 1986.

c. *Timber Construction Manual*, 3rd ed., American Institute of Timber Construction, John Wiley & Sons, Inc., New York, 1985.

\* $F_c$  is the allowable stress for a short block in compression parallel to the grain.