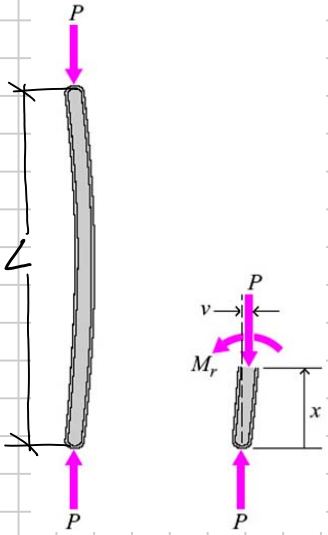
COLUMNS

Note Title 1/16/2008



DIFFERENTIAL EQUATION FOR ELASTIC CURVE:

$$EI\frac{d^2v}{dx^2} = M_r = -Pv \qquad \rightarrow = k^2$$

$$\frac{d^2v}{dx^2} + \frac{P}{EI}\cdot v = 0$$

SECOND ORDER HOMOGENEOUS DIFFERENTIAL EQUATION

ASSUMED: $v = A\sin kx + B\cos kx$

$$\left(-k^2 + \frac{P}{EI}\right)(A\sin kx + B\cos kx) = 0$$

BOUNDARY CONDITIONS: $v = 0$ at $x = 0$

$v = 0$ at $x = L$

$A\sin 0 + B\cos 0 = 0 \rightarrow B = 0$

$A\sin kL + B\cos kL = 0 \rightarrow A\sin kL = 0$

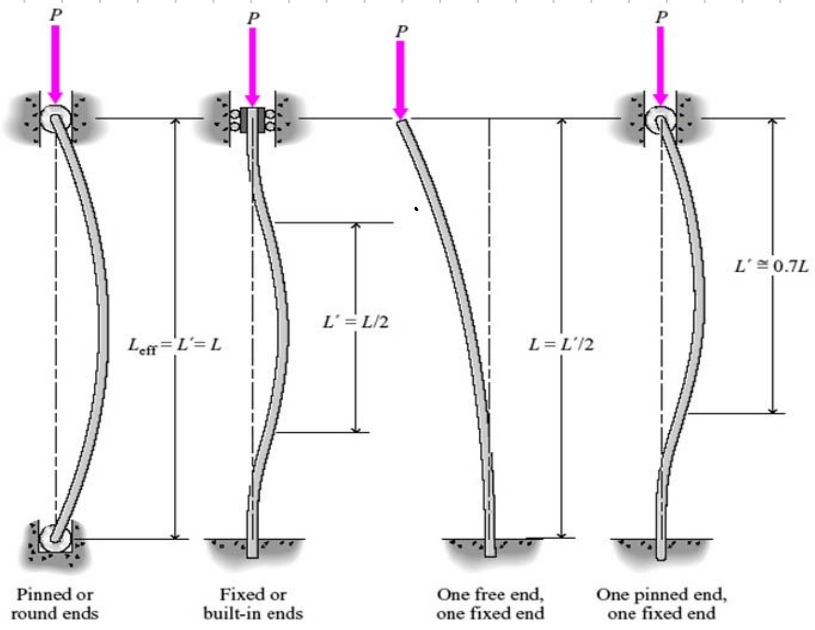
$\neq 0$ $\quad = 0$ for $kL = n\cdot\pi$

with $n = 1, 2, 3, \ldots$

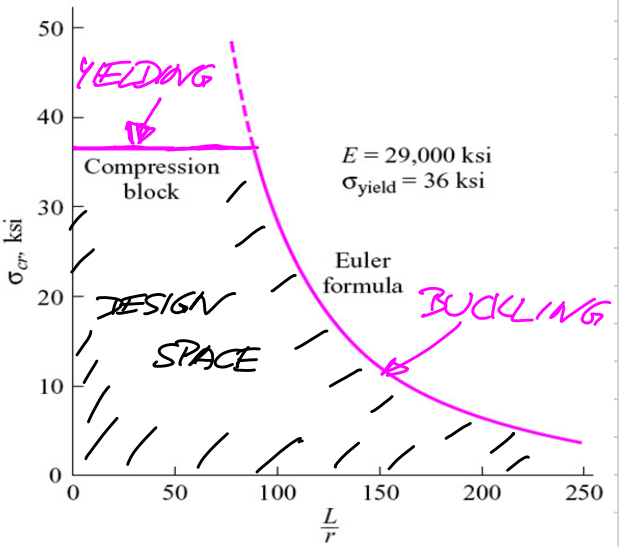
$$k\cdot L = \sqrt{\frac{P}{EI}}\cdot L = n\pi$$

$$P = \frac{n^2\pi^2 EI}{L^2} \quad \text{with } n = 1, 2, 3, \ldots$$

$$\boxed{P_{crit} = \frac{\pi^2 EI}{L^2}}$$



SHAPES AT ONSET OF BUCKLING



COLUMN LIMIT STATES