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ARCH 331  |  PROBLEM 18-3  |  30 NOV 91 PUB

Find the load:

COLUMN:
LENGTH 30'
K = 1.0
f_y = 36 ksi
E = 29,000 ksi
F.S. 3
NO BRACING

W10 x 33
I_x = 170 in^4
I_y = 36.6 in^4
A = 9.71 in

TOTAL AREA = 2(9.71) + 2(12) = 43.42 in^2
I_x = 2(170) + 2\left(\frac{12 \cdot (12)^3}{12}\right) + 2\left(12 \cdot (9.73 + .5)^2\right) = 1032.80 in^4 \quad \text{controls}
I_y = 2(36.6) + 2\left(\frac{12\cdot (12)^3}{12}\right) + 2(9.71(6)^2) = 1060.32 in^4

\sigma_x = \frac{1032.8}{43.42} = 24.07 in

\sigma_{cr} = \frac{\pi^2 EA}{(K F / r)^2} = \frac{\pi^2 29,000 (43.42)}{(1(360)/4.877)^2} = 0.828 \text{k}

\sigma_y = f_y A = 36 (43.42) = 1563 \text{k} \quad \text{controls}

P_{allow} = 1563 / 3 = 521 \text{k}