

PROB # 5-6

Using a W12x58 ($A_g = 17.0 \text{ in}^2$, $r_y = 2.5 \text{ in.}$)

$K = 0.8$ from AISC C-C2.2

$KL = (0.8)(20) = 16 \text{ ft}$

$\frac{KL}{r} = \frac{(12)(16)}{2.51} = 76.49$

$\phi_c F_{cr} = 29.35 \text{ ksi}$

$\frac{F_{cr}}{\Omega_c} = 19.5 \text{ ksi}$

} From AISC Table 4-22
by interpolation

LRFD	ASD
$\phi_c P_n = (29.35)(17.0) = 499 \text{ k}$	$\frac{P_n}{\Omega_c} = (19.5)(17.0) = 331.5 \text{ k}$

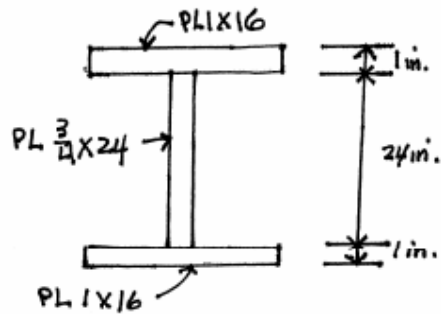
Checking with AISC Table 4-1

$\phi_c P_n = 500 \text{ k}$

$\frac{P_n}{\Omega_c} = 333 \text{ k}$

✓ JCM

PROB# 5-18



$$A = (2)(1 \times 16) + \frac{3}{4} \times 24 = 50 \text{ in.}^2$$

$$I_x = \left(\frac{1}{12}\right)(16)(26)^3 - \left(\frac{1}{12}\right)(15.25)(24)^3 = 5867 \text{ in.}^4$$

$$I_y = (2)\left(\frac{1}{12}\right)(1)(16)^3 + \left(\frac{1}{12}\right)(24)\left(\frac{3}{4}\right)^3 = 684 \text{ in.}^4$$

$$r_x = \sqrt{\frac{5867}{50}} = 10.83 \text{ in.}$$

$$r_y = \sqrt{\frac{684}{50}} = 3.70 \text{ in.}$$

$$\left(\frac{KL}{r}\right)_x = \frac{(12)(20)}{10.83} = 22.16$$

$$\left(\frac{KL}{r}\right)_y = \frac{(12)(14)}{3.70} = 45.41 \leftarrow$$

From AISC Table 4-22

$$\phi_t F_{cr} = 38.68 \text{ ksi} \quad \frac{F_{cr}}{\Omega_c} = 25.72 \text{ ksi}$$

LRFD	ASD
$\phi_t P_n = (38.68)(50) = 1934 \text{ k}$ Let $S =$ service load $1934 = 1.2D + 1.6L$ $1934 = (1.2)\left(\frac{1}{3}S\right) + (1.6)\left(\frac{2}{3}S\right)$ $S = 1318.6 \text{ k}$	$\frac{P_n}{\Omega_c} = (25.72)(50) = 1286 \text{ k}$ Let $S =$ service load $1286 = D + L$ $1286 = \frac{1}{3}S + \frac{2}{3}S$ $S = 1286 \text{ k}$

v g c m c