

### Example Problem 6.2

**Given:** The sections listed below are to be concentrically loaded in compression.

**Wanted:** Determine the  $F_y$  for which the sections will be considered slender.

- a) W 18x35
- b) C 9x13.4
- c) HSS 10x4x1/8
- d) HSS 7.5x0.188
- e) M 4x6

**Solution:**

SEE SCM TABLE B4.1 (pg 16.1-16) FOR  $\lambda_r$  EQUATIONS.

a) W18x35

UNSTIFFENED ELEMENTS: (FLANGES, CASE 3)

$$b_f/2t_f = 7.06 \geq \lambda_r = .56 \sqrt{E/F_y}$$

↑ FROM SECTION PROP TABLES

$$F_y \geq E \left( \frac{.56}{7.06} \right)^2 = \underline{\underline{182.5 \text{ ksi}}}$$

STIFFENED ELEMENT: (WEB, CASE 10)

$$h/t_w = 53.5 \geq 1.49 \sqrt{E/F_y}$$

$$F_y \geq 29000 \text{ ksi} \left( \frac{1.49}{53.5} \right)^2 = \underline{\underline{22.5 \text{ ksi}}}$$

MEMBER IS SLENDER WHEN  $F_y \geq 22.5 \text{ ksi}$  ← ANSWER (a)

b) C9x13.4

UNSTIFFENED FLANGE: (CASE 3)

$$b_f/t_f = \frac{2.43''}{.413''} = 5.88'' \geq .56 \sqrt{\frac{29000}{F_y}}$$

$$F_y \geq 263.0 \text{ ksi}$$

PROBLEM 6.2 (CONTINUED)

2BQ 2/2

C9x13.4, STIFFENED WEB: (CASE 10)

$$h/t_w = \frac{7''}{.238''} \geq 1.49 \sqrt{\frac{29,000}{F_y}}$$

$$F_y \geq 71.3 \text{ KSI}$$

MEMBER IS SLENDER WHEN  $F_y \geq 71.3 \text{ KSI}$  ← ANSWER (b)

c) HSS 10x4x1/8

NO UNSTIFFENED ELEMENTS

USE LARGER  $b/t$  RATIO (10" SIDE/ $t_w$ )

$$b/t = 83.2 \geq 1.40 \sqrt{\frac{29,000}{F_y}} \quad (\text{CASE 12})$$

$$\underline{F_y \geq 8.2 \text{ KSI}} \quad \leftarrow \text{ANSWER (c)}$$

MEMBER IS SLENDER FOR ALL AVAILABLE STEELS!

d) HSS 7.5x.188 (ROUND SECTION... CASE 15)

$$D/t = 40.2 \geq 11 \frac{E}{F_y} \quad (\text{NOTE DIFFERENT EQUATION})$$

↑ FROM TABLE

$$\underline{F_y \geq 79.4 \text{ KSI}} \quad \leftarrow \text{ANSWER (d)}$$

e) M 4x6

UNSTIFFENED, CASE 3,  $\frac{L_c}{r} = 11.9 \geq .56 \sqrt{E/F_y}$

$$F_y \geq 64.2 \text{ KSI}$$

STIFFENED, CASE 10,  $h/t_w = 22.0 \geq 1.49 \sqrt{E/F_y}$

$$F_y \geq 133.0 \text{ KSI}$$

MEMBER IS SLENDER WHEN  $F_y \geq 64.2 \text{ KSI}$  ← ANSWER (e)