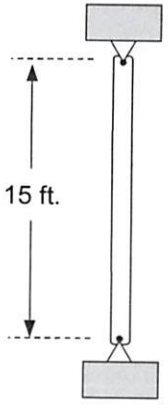
Classroom Problem 4.4-1: A **W12 x 45** of **A992** steel (F_y = 50 *ksi* and F_u = 65 *ksi*) is 15 ft. long and pinned at the ends. Investigate the column for local stability.



FROM TABLE 1-1 (1-26)

$A = 13.1\ in^2$ $r_y = 1.95\ in$ $r_x = 5.15\ in$

$b_f = 8.05\ in$ $t_f = 0.575\ in$ $d = 12.1\ in$

$k_{DES} = 1.08\ in$ $t_w = 0.335\ in$

FLANGE INSTABILITY UNSTIFFENED

$$\lambda = \frac{b_f}{2t_f} = \frac{8.05\ in}{2(0.575\ in)} = 7.00$$

$$\lambda_r = 0.56\sqrt{\frac{E}{F_y}}$$

$$= 0.56\sqrt{\frac{29{,}000\ ksi}{50\ ksi}} = 13.49$$

$\lambda = 7.00 < \lambda_r$ O.K.

WEB INSTABILITY STIFFENED ELEMENT

$$\lambda = \frac{h}{t_w} = \frac{d - 2k_{DES}}{t_w} = \frac{12.1\ in - 2(1.08\ in)}{0.335\ in} = 29.67$$

$$\lambda_r = 1.49\sqrt{\frac{E}{F_y}}$$

$$= 35.88$$

$\lambda = 29.67 < \lambda_r$ O.K.