CEE08 383 – Design of Steel Frames
Quiz 2
February 14, 2008

Determine the capacity (ΦPn) of a W14x109 of ASTM A992 Grade 50 steel section loaded in axial compression. The column is 24' long and pinned at each end. An additional weak-axis brace is placed at mid-height.

$(KL)_x = 24'$, $(KL)_y = 12'$

PG 4-13

$\frac{24'}{r_x/r_y} = \frac{24}{1.67} = 14.4'$ ← CONTROLS

$\phi P_n \approx 1230\ K$

ALTERNATE

$\left(\frac{KL}{r}\right)_x = \frac{24'(1.0)(12''/ft)}{6.23''} = 46.2$ ← CONTROLS

$\left(\frac{KL}{r}\right)_y = \frac{12'(12''/ft)}{3.73''} = 38.6$

$\phi F_{cr} = 38.45\ KSF$ PG 4-319

$\phi P_n = (38.45\ KSF)(32\ in^2) = 1230\ K$