ARCH 324 - Structures 2, Winter 2009

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<http://hdl.handle.net/2027.42/64938> 
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\[
\bar{X} = \frac{\sum A d}{\sum A} = \frac{12(5.5) + 10(2.5)}{12 + 10} = 4.136'' \text{ (from bottom)}
\]
\[
I_x = \frac{12(1)^3 + 12(1.564)^3 + 3(5)^3}{12} = 18.64''^4 \text{ (from top)}
\]
\[
I_x = 70.936 \text{ in}^4 \quad \text{< CONTROLS}
\]
\[
I_y = \frac{1(12)^3}{12} + \frac{5(2)^3}{12} = 147.33 \text{ in}^4
\]
\[
A = 12 + 10 = 22
\]
\[
\sqrt{\frac{I_x}{A}} = \sqrt{\frac{70.936}{22}} = 1.7956 \text{ in}
\]
\[
\frac{K_I}{F_x} = \frac{1(120)}{1.7956} = 66.83
\]
\[
I = \frac{1}{4} \pi 3^4 - \frac{1}{4} \pi 2.5^4 = 32.91 \text{ in}^4
\]
\[
A = \pi 3^2 - \pi 2.5^2 = 8.639 \text{ in}^2
\]
\[
\gamma = \sqrt{\frac{I}{A}} = \sqrt{\frac{32.91}{8.639}} = 1.952
\]
\[
\frac{K_A}{\gamma} = \frac{1(120)}{1.952} = 61.458
\]