ARCH 324 - Structures 2, Winter 2009

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1) \( A_s = \# \text{bars (area of 16 bars)} \)
\[ A_s = 3 \times 0.79 = 2.37 \text{ in}^2 \]
^from table p341

2) find limit of \( a \) (depth of the stress block)

\[ a = k_1 \left[ \frac{87}{87 + f_y} \right] d \ (0.75) \]

\[ a = 0.85 \left[ \frac{87}{87 + 60} \right] 18 \ (0.75) \]
\[ a = 6.79'' \]

3) using \( a = \frac{A_s f_y}{0.85 f_c b} \)

\[ a = \frac{A_s f_y}{0.85 f_c b} = \frac{2.37 (60)}{0.85 (3)(12)} = 4.65 < \text{limit so steel is yielding before compressive failure in concrete} \]
1) find moment capacity

\[ \bar{M} = A_s f_y j d = 0.85 f' c a b j d \]

for a rectangular section \( j d = d - a / 2 \)

\[ \bar{M} = M_n = A_s f_y (d - \frac{a}{2}) = 2.37 \times 10^3 \times (18 - 4.65) \]

\[ M_n = 2228.99 \, k\quad M' = 185.75 \, k' \]

5) \( M_u = 0.9 \, M_n \quad M_u = 0.9 \times 185.75 = 167.18 \, k \)