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ARCH 324 - Structures 2, Winter 2009

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Steel:
\[ F' = 20 \text{ ksi} \]
\[ E_s = 29000 \text{ ksi} \]
Concrete:
\[ F' = 1.8 \text{ ksi} \]
\[ E_c = 34,250 \text{ ksi} \]
\[ n = 8 \text{ (Data Sheet D-23)} \]

By Similar Triangles From Stress Diagram:
\[
\frac{1.8 \text{ ksi}}{x} = \frac{2.5 \text{ ksi}}{18-x} \quad 2.5x = 1.8(18-x) \quad \boxed{x = 7.5''}
\]

\[
R_c = \frac{f_c B x}{2} = \frac{(1.8 \text{ ksi})(12'')(7.5'')} = 81 \text{ k} \]

\[
R_c = R_t = A_s f_s \quad A_s f_s = 81 \text{ k} \quad A_s = 32.4 \text{ in}^2
\]

\[
\text{Now Reduce by } \quad n = 8 \quad A_5 = \frac{32.4 \text{ in}^2}{8} = 4.05 \text{ in}^2
\]

\[
M = R_c (18-x/3) = R_t (18-x/3) = \frac{81 \text{ k} (18'' - 7.5''/3)}{12''/1} = 104.6 \text{ in}^3 \text{ k}
\]