

Example - T-Beam

Compute ω and check that the c value is greater than h_f

$$\omega = \rho \frac{f_y}{f'_c} = 0.0139 \left(\frac{50 \text{ ksi}}{3 \text{ ksi}} \right) = 0.2315$$

$$h_f \leq \frac{1.18\omega d}{\beta_1} \Rightarrow 6 \text{ in.} \leq \frac{1.18(0.2315)(24 \text{ in.})}{0.85} = 7.71 \text{ in.}$$

$$h_f \leq a \Rightarrow 6 \text{ in.} \leq 2.45 \text{ in.}$$

False!

Analysis the beam as a Singly reinforced beam.

Example - L-Beam

Compute a

$$\begin{aligned} a &= \frac{A_s f_y}{0.85 f'_c b} = \frac{(4.0 \text{ in}^2)(50 \text{ ksi})}{0.85(3 \text{ ksi})(32 \text{ in.})} \\ &= 2.451 \text{ in.} \end{aligned}$$

Example - L-Beam

Compute nominal moment

$$\begin{aligned} M_n &= A_s f_y \left(d - \frac{a}{2} \right) \\ &= (4.0 \text{ in}^2)(50 \text{ ksi}) \left(24.0 \text{ in.} - \frac{2.451 \text{ in.}}{2} \right) \\ &= 4554.9 \text{ k-in.} \Rightarrow 379.58 \text{ k-ft.} \end{aligned}$$

Example - L-Beam

Compute ultimate moment

$$\begin{aligned} M_u &= \phi M_n = 0.9(379.58 \text{ k-ft.}) \\ &= 341.62 \text{ k-ft.} \end{aligned}$$

Homework

Work Problems

1. 5.10 parts a and b
2. 5.11 parts a and b
3. 5.12 parts a and b.