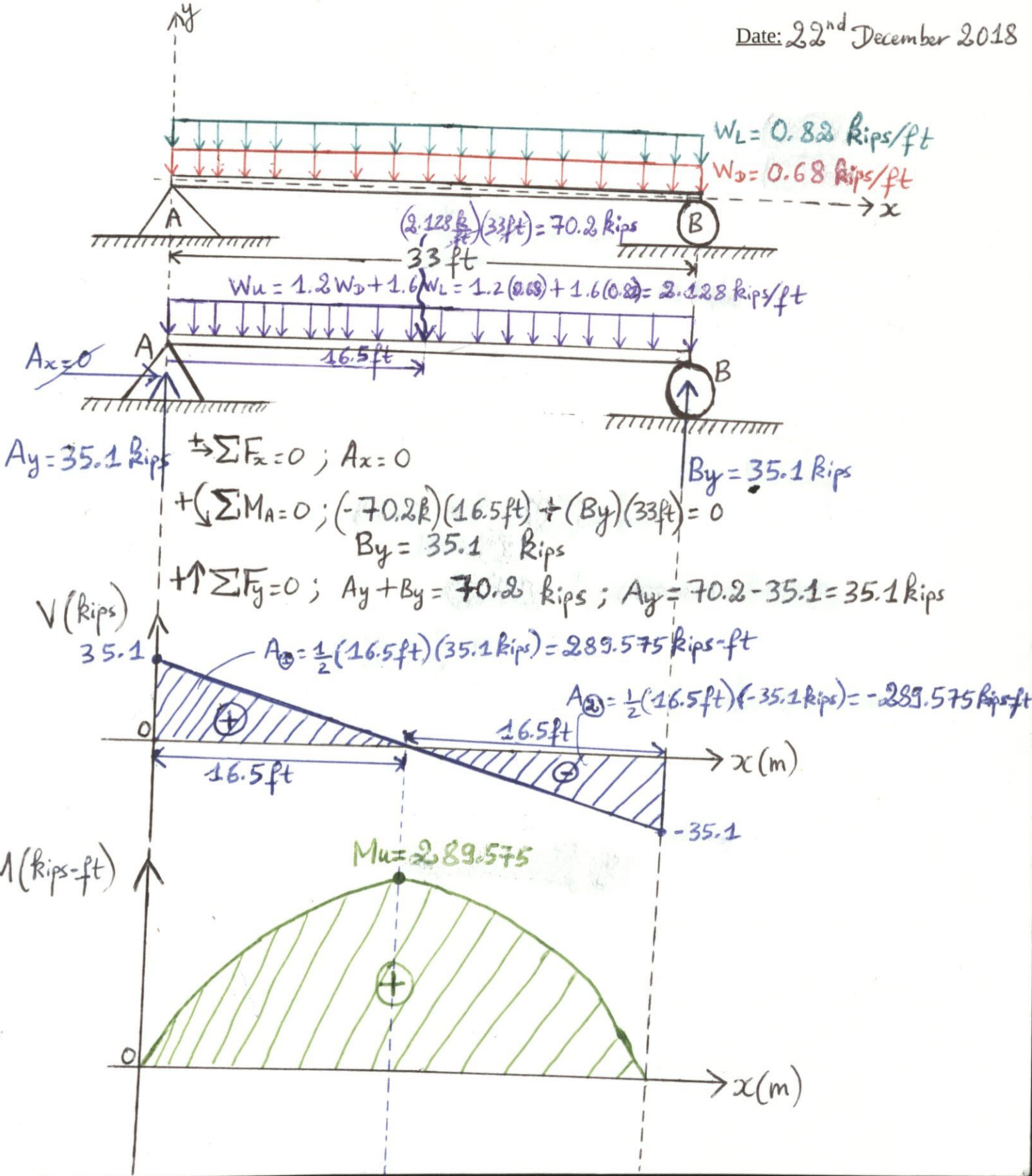
DTY Tutoring, inc.
Email: dtytutoring@gmail.com
Website:www.dtytutoring.com

Date: 22nd December 2018



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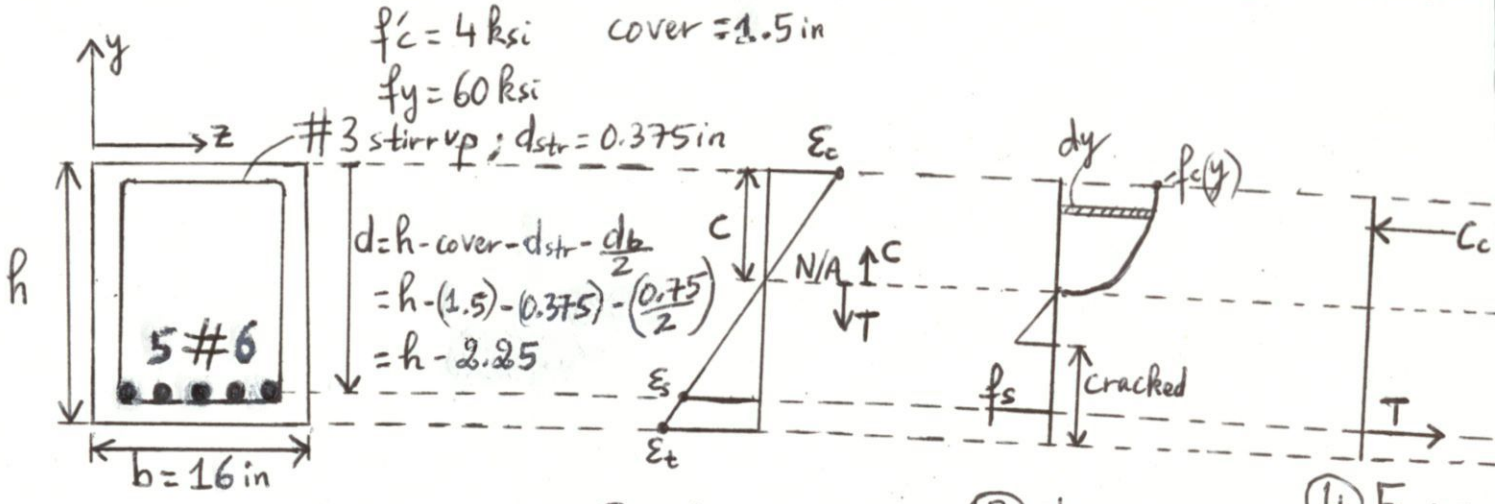

$\pm \rightarrow \Sigma F_x = 0$

$T = C_c$

$T = A_s f_y = (2.2 in^2)(60 ksi) = 132 kips$

$C_c = 0.85 f'_c a b$

#6 bars $\rightarrow A_b = 0.44 in^2$; $A_s = (5)(0.44 in^2) = 2.2 in^2$

$f'_c = 4{,}000 psi \leq 4{,}000 psi \Rightarrow \beta_1 = 0.85$

$$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{(2.2 in^2)(60 ksi)}{0.85(4 ksi)(16 in)} = 2.426470588 in$$

$$M_N = A_s f_y \left[d - \frac{a}{2}\right] = (2.2 in^2)(60 ksi)\left[(h - 2.25) - \left(\frac{2.426}{2}\right)\right] = 132h - 457.1470588$$

$$M_u = 289.575 kips\text{-}ft \left(\frac{12 in}{1 ft}\right) = 3{,}474.9 kips\text{-}in$$

$$\phi M_N = M_u \Rightarrow M_N = \frac{M_u}{\phi} = \frac{3{,}474.9 kips\text{-}in}{0.9 \rightarrow \text{Tension controlled}} = 3{,}861 kips\text{-}in$$

Solve for h

$M_N = 3{,}861 kips\text{-}in = 132h - 457.1470588$

$$\boxed{h = 32.7 in \approx 33 in}$$