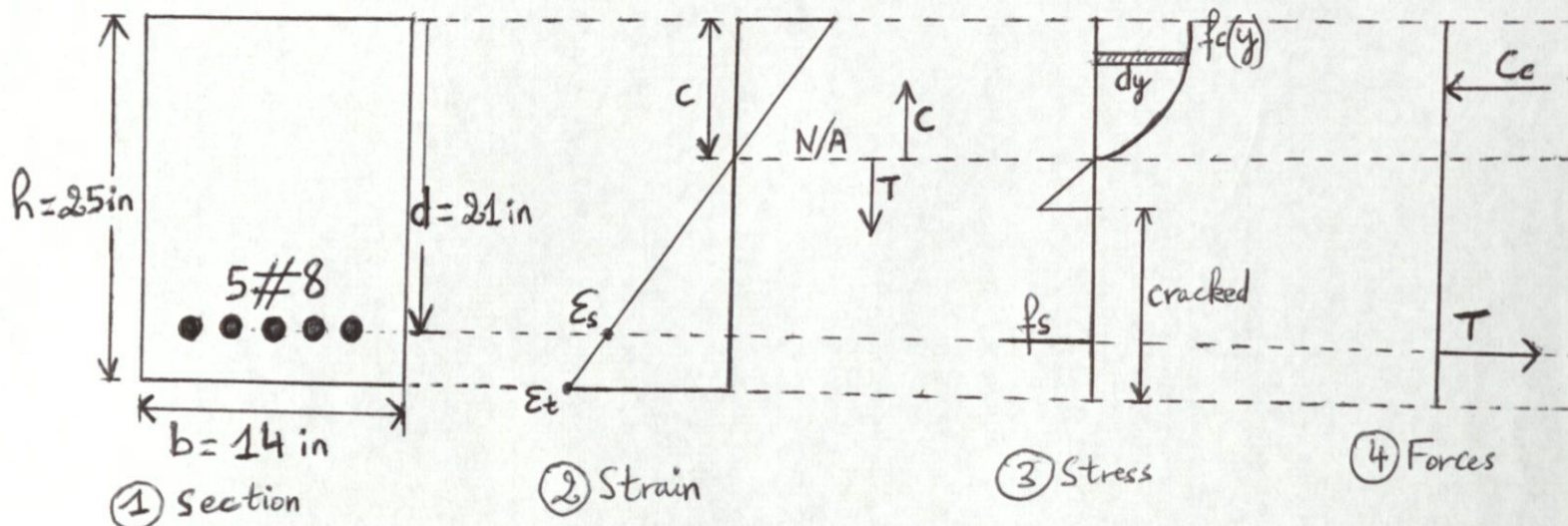


Singly Reinforced Analysis Example 1

Date: 29th September 2018



8 bars $\rightarrow A = 0.79 \text{ in}^2$
 $A_s = (5)(0.79 \text{ in}^2) = 3.95 \text{ in}^2$

$f'_c = 3,000 \text{ psi} \leq 4,000 \text{ psi} \Rightarrow \beta_1 = 0.85$; $f_y = 60,000 \text{ psi} = 60 \text{ ksi}$

$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{(3.95 \text{ in}^2)(60 \text{ ksi})}{0.85(3 \text{ ksi})(14 \text{ in})} = 6.639 \text{ in}$

$M_n = A_s f_y \left[d - \frac{a}{2} \right] = (3.95 \text{ in}^2)(60 \text{ ksi}) \left[21 \text{ in} - \frac{6.639}{2} \right] = 4,190.319 \text{ kips-in}$

Strain Compatibility

$c = \frac{a}{\beta_1} = \frac{6.639 \text{ in}}{0.85} = 7.810182896 \text{ in}$

$\epsilon_t = \epsilon_s = \left(\frac{d-c}{c} \right) \epsilon_{cu} = \left(\frac{21 \text{ in} - 7.810182896 \text{ in}}{7.810182896 \text{ in}} \right) (0.0035) = 5.91079114 \times 10^{-3}$
 $= 0.006 > 0.005$
 $\phi = 0.9 \leftarrow \text{Tension controlled}$

$\phi M_n = (0.9)(4,190.319 \text{ kips-in}) = 3,771.287 \text{ kips-in}$