

$$f'_c = 3 \text{ ksi}$$

$$f_y = 60 \text{ ksi}$$

$$d' = 15.5$$

$$h = 18$$

$$b = 8$$

$$0.85 f'_c b d + A_s f_y = A_s f_y \quad \text{has to yield}$$

$$0.85 f'_c b d + A_s E_s 0.003 \frac{d-c}{c} = A_s E_s 0.003 \frac{d-c}{c} \quad \frac{0.003}{c} = \frac{E_s}{d-c}$$

$$E_s = 0.003 \frac{d-c}{c}$$

$$0.85 f'_c b d^2 + A_s E_s 0.003 c - A_s E_s 0.003 d' =$$

$$A_s E_s 0.003 c - A_s E_s 0.003 d'$$

$$\frac{0.003}{c} = \frac{E'_s}{d-d'}$$

$$E'_s = 0.003 \frac{d-d'}{c}$$

$$(0.85 f'_c b d^2) c^2 +$$

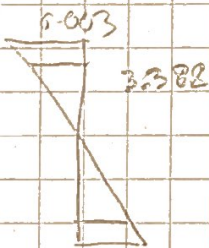
$$(0.85 f'_c b d^2) c^2 + A_s E_s 0.003 c - A_s E_s 0.003 d' - A_s f_y c = 0$$

$$(0.85 f'_c b d^2) c^2 + (A_s E_s 0.003 - A_s f_y) c - A_s E_s 0.003 d'$$

$$(0.85 \cdot 3000 \cdot 0.85 \cdot 2) c^2 + (1.58 \cdot 29000000 \cdot 0.003 - 1.58 \cdot 60000) c - 1.58 \cdot 29000000 \cdot 0.003 \cdot 2.5$$

$$17340 c^2 + 42660 c - 343650$$

$$c = 3.388$$



$$E_s = E_u \frac{d-c}{c}$$

close (round error)

$$C_c + C_{st} = T_{st} \quad 94760$$

$$a = 3.388 \cdot 0.85 = 2.879$$

$$C_c = 0.85 \cdot 3000 \cdot 8 \cdot 2.879 = 58731.6$$

$$E'_s = 0.00078 \text{ no yield}$$

$$C_{st} = 22802.8 \cdot 1.58 = 36028.4$$

$$E_s = 0.01 \text{ OK}$$

$$T_{st} = 60000 \cdot 1.58 = 94800$$

$$f_s = 0.00078 \cdot 29000000$$

$$= 22802.8 \text{ psi}$$

$$58731.6 \left(\frac{15.5 - 2.879}{2} \right) + 36028.4 (15.5 - 2.5)$$

$$= 1294164.86 \quad 107.8 \text{ kips}$$