

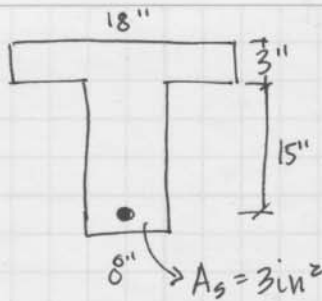
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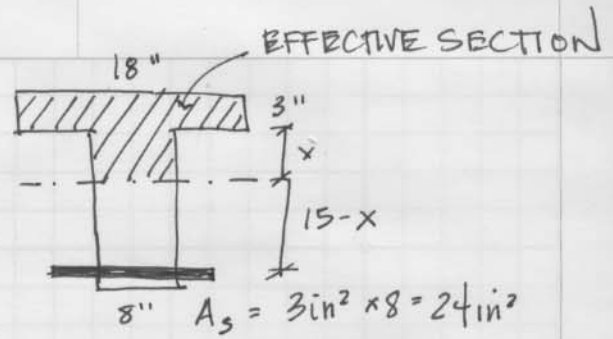
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13-1 (B)



$$E_c = 3625 \text{ ksi}$$

$$n = 8 \text{ (Data Sheet D-23)}$$



(1) Determine Neutral Axis of the Effective section:

$$A_c \bar{x}_c = A_t \bar{x}_t$$

$$(18" \times 3")(x + 1.5") + (8" \times x)(x/2) = 24 \text{ in}^2 (15 - x)$$

$$54x + 81 + 4x^2 = 360 - 24x$$

$$4x^2 + 78x - 279 = 0$$

Solve using quadratic formula:

$$x = \frac{-78 \pm \sqrt{78^2 - (4)(4)(-279)}}{(2)(4)}$$

(Disregard negative answer)

$$x = 3.088"$$

(2) Transformed Moment of Inertia:

$$\text{Flange: } bd^3/12 = \frac{18(3)^3}{12} = 40.5 \text{ in}^4 + Ay^2 = (18)(3)(3.088 + 1.5")^2 = 1136.7 \text{ in}^4$$

$$\text{Web: } bd^3/3 = \frac{8(3.088)^3}{3} = 78.52 \text{ in}^4$$

$$\text{Reinforcement: } Ay^2 = (24 \text{ in}^2)(11.912 \text{ in})^2 = 3405 \text{ in}^4$$

$$I_{TR} = 4661.2 \text{ in}^4$$

(3) Resisting Capacity of Concrete & Steel:

$$\text{Concrete } f'_c = 1.8 \text{ ksi} \quad M = \frac{F'_c I_{TR}}{c} = \frac{(1.8 \text{ ksi})(4661 \text{ in}^4)}{6.088"} = 1378 \text{ "k}$$

$$\text{Steel } F_y = 20 \text{ ksi} \quad M = \frac{F_y I_{TR}}{c_n} = \frac{(20 \text{ ksi})(4661 \text{ in}^4)}{(11.912")(8)} = 978 \text{ "k}$$

Steel Governs.

(4) Actual stress in concrete:

$$f = \frac{M_c}{I_{TR}} = \frac{(978 \text{ "k})(6.088")}{4661 \text{ in}^4} = 1.28 \text{ ksi}$$