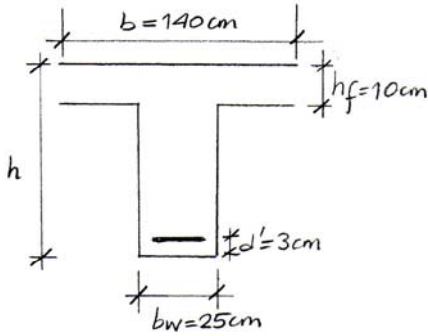


1

CEVAP:



MALZEME : C16/S220

$$a) E_c/E_s = 3/10 \xrightarrow{C16/S220} K = 67,8$$

A mesnedindeki eğilme momentine göre hesap yapılır.

$$M_d = -12,00 \text{ tm}$$

$$K = \frac{b_w \cdot d^2}{M_d} \xrightarrow{\text{mesnette basıncı bölgesi gövdede olduğundan}} \text{gövde genişliği alınmalı.}$$

$$67,8 = \frac{25 \cdot d^2}{1200} \rightarrow d = 57 \text{ cm}$$

$$h = d + d' = 57 + 3 = 60 \text{ cm}$$

$$K = 67,8 \rightarrow k_s = 0,577 \Rightarrow A_s = k_s \cdot \frac{M_d}{d} = 0,577 \cdot \frac{1200}{57} = 12,15 \text{ cm}^2$$

$$(5\phi 16 = 12,7 \text{ cm}^2)$$

$$b_w = 21,2 \text{ cm} < 25 \text{ cm} \checkmark$$

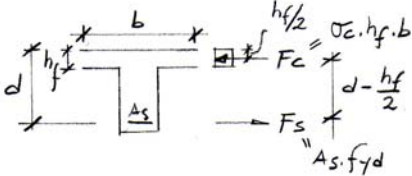
b) B mesnedinde $M_d = -8,00 \text{ tm}$

$$K = \frac{b_w \cdot d^2}{M_d} = \frac{25 \cdot 57^2}{800} = 101,5 \xrightarrow{C16/S220} k_s = 0,558$$

$$A_s = k_s \cdot \frac{M_d}{d} = 0,558 \cdot \frac{800}{57} = 7,83 \text{ cm}^2 \quad (4\phi 16 = 8 \text{ cm}^2)$$

$$b_w = 16,6 \text{ cm} < 25 \text{ cm} \checkmark$$

c) Asıklıkta eğilme momenti $M_d = 8,08 \text{ tm}$



$$M_d = F_s \cdot \left(d - \frac{h_f}{2}\right) = A_s \cdot f_y d \cdot \left(d - \frac{h_f}{2}\right)$$

$$A_s = \frac{M_d}{f_y d \cdot \left(d - \frac{h_f}{2}\right)} = \frac{808}{\frac{4,2}{1,15} \cdot \left(57 - \frac{10}{2}\right)} = 8,12 \text{ cm}^2$$

$$(5\phi 16 = 10 \text{ cm}^2)$$

$$\text{Beton gerilmesi kontrolü} \rightarrow M_d = F_c \cdot \left(d - \frac{h_f}{2}\right) = \sigma_c \cdot h_f \cdot b \cdot \left(d - \frac{h_f}{2}\right) \quad b_w = 20,2 \text{ cm} < 25 \text{ cm} \checkmark$$

$$\sigma_c = \frac{M_d}{b \cdot h_f \cdot \left(d - \frac{h_f}{2}\right)} = \frac{808}{140 \cdot 10 \cdot \left(57 - \frac{10}{2}\right)} = 0,011 \text{ t/cm}^2 \leq 0,85 \cdot f_{cd} = 0,85 \cdot \frac{9,16}{1,5} = 0,09 \checkmark$$

d-) $V_d = 9,79 \text{ ton}$

2

Kesit alanının kontrolü $\rightarrow V_d \leq 0,22 \cdot f_{cd} \cdot b_w \cdot d$ olmalı.

$$9,79 \leq 0,22 \cdot \frac{0,16}{1,5} \cdot 25 \cdot 57 = 33,4 \text{ ton} \checkmark$$

$$V_{cr} = 0,65 \cdot f_{ctd} \cdot b_w \cdot d = 0,65 \cdot \frac{0,014}{1,5} \cdot 25 \cdot 57 = 8,645 \text{ t.} < V_d = 9,79 \text{ t.}$$

↓

etriye hesabı gerekir.

betonun taşıyabileceği kesme kuvveti

$$V_c = 0,80 \cdot V_{cr} = 0,80 \cdot 8,645 = 6,916 \text{ t.}$$

$$V_w = \frac{2 \cdot A_o}{s} \cdot d \cdot f_{ywd} = \frac{2 \cdot 0,5}{20} \cdot 57 \cdot \frac{2,2}{1,15} = 5,45 \text{ t.}$$

↓
etriyenin taşıyabileceği kesme kuvveti

(Etriye $\phi 8/20$ seçildi
 $A_o = 0,5 \text{ cm}^2$ $s = 20 \text{ cm}$ $s \leq \begin{cases} d/2 = 57/2 = 28,5 \text{ cm} \\ 30 \text{ cm} \checkmark \\ b_w = 25 \text{ cm} \checkmark \end{cases}$)

$$V_r = V_c + V_w = 6,916 + 5,45 = 12,37 \text{ ton} > V_d = 9,79 \text{ ton} \checkmark$$

