

C20/B500C

φορτίο σχεδιασμού:
10 kN/m²

(υαδολιμή φόρτιση -
όχι δυσμενής φόρτιση)

1. Επιλογή διαστάσεων

§ 18.1.1 $\Pi_1: \frac{\ell_{max}}{\ell_{min}} = \frac{4.90}{4.30} = 1.14 < 2.0 \rightarrow$ οπλισμένη κατά 2 διευθύνσεις

$\Pi_2: \frac{\ell_{max}}{\ell_{min}} = \frac{5.90}{4.30} = 1.37 < 2.0 \rightarrow$ " "

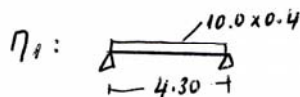
§ 16.2 $\Pi_1: mind = \frac{a \ell}{30} = \frac{0.8 \times 4.90}{30} = 13.07 \text{ cm}$
 $\Pi_2: mind = \frac{a \ell}{30} = \frac{1.0 \times 4.30}{30} = 14.33 \text{ cm}$ } επιλέγω $h = 18 \text{ cm}$

2. Διακινή επιλογή με την μέθοδο Markus

$\Pi_1: \varepsilon = \frac{\ell_y}{\ell_x} = \frac{4.30}{4.90} = 0.878 \rightarrow \begin{cases} k_x = 0.600 \\ v_x = 0.637 \end{cases} \quad \begin{cases} k_y = 0.400 \\ v_y = 0.749 \end{cases}$

$\Pi_2: \varepsilon = \frac{\ell_y}{\ell_x} = \frac{4.30}{5.90} = 0.729 \rightarrow \begin{cases} k_x = 0.415 \\ v_x = 0.638 \end{cases} \quad \begin{cases} k_y = 0.585 \\ v_y = 0.741 \end{cases}$

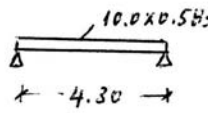
Τομή y-y



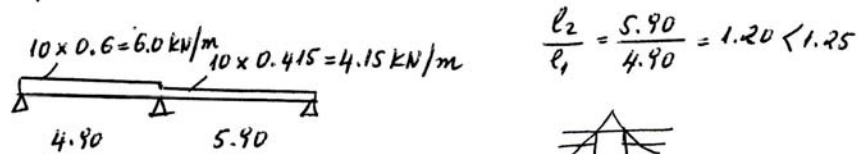
$\max M = \frac{q \ell^2}{8} = \frac{4.0 \times 4.30^2}{8} = 9.2 \text{ kNm}$

$\max M = 9.2 \cdot v_y = 0.749 \times 9.2 = 6.89 \text{ kNm}$

π. Γιαρρόπουλος

$\Pi_2:$ 
 $\max M = \frac{q \ell^2}{8} = 5.85 \cdot \frac{4.30^2}{8} = 13.5 \text{ kNm}$
 $\max M = v_y \cdot (13.5) = 0.741 \cdot 13.5 = 10.0 \text{ kNm}$

Τομή x-x



$$M_B = -0.0568 \times q_1 \cdot \ell_1^2 - 0.0682 \times q_2 \cdot \ell_2^2 = -18.03 \text{ kNm} \times 0.9 = 16.2 \text{ kNm}$$

$$M_{AB} = 0 + \left(q_1 \frac{\ell_1}{2} + \frac{M_B - 0}{\ell_1} \right)^2 \frac{1}{2q_1} = 10.1 \text{ kNm} \times 0.637 = 6.43 \text{ kNm}$$

$$M_{BF} = M_B + \left(\frac{q_2 \ell_2}{2} + \frac{0 - M_B}{\ell_2} \right)^2 \frac{1}{2q_2} = 10.2 \text{ kNm} \times 0.638 = 6.5 \text{ kNm}$$

3. Οντίκρυοι

Κατά y-y: $d = 180 - c - \phi/2 =$
 $= 180 - (20 - 5 + 5) - 5 = 155 \text{ mm}$
 $\max e = 1.5h = 1.5 \times 180 = 270 \text{ mm} \rightarrow \max e = 200 \text{ mm}$

$$\Pi_1: \frac{M_{sd}}{bd^2} = \frac{6.89 \times 10^{-3}}{1.00 \times (0.155)^2} = 0.287 \rightarrow \rho = 0.068\% \rightarrow$$

$$A_{sy} = \frac{0.15}{100} \times 100 \times 15.5 = 2.32 \text{ cm}^2/\text{m} \rightarrow \phi 8/20 (=2.51 \text{ cm}^2/\text{m})$$

$$\Pi_2: \frac{M_{sd}}{bd^2} = \frac{10.0 \times 10^{-3}}{1.00 \times (0.155)^2} = 0.416 \rightarrow \rho = 0.099\% \rightarrow$$

$$A_{sy} = \frac{0.15}{100} \times 100 \times 15.5 = 2.32 \text{ cm}^2/\text{m} \rightarrow \phi 8/20 (=2.51 \text{ cm}^2/\text{m})$$

Π. Γιαννόπουλος

Κατά x-x : $d = 155 - 10 = 145 \text{ mm}$

Π_1 : Άνοιγμα: $\frac{M_{sd}}{bd^2} = \frac{6.4 \cdot 10^{-3}}{1.0 (0.145)^2} = 0.304$ αφού $\phi 8/20 (=2.51 \text{ cm}^2/\text{m})$

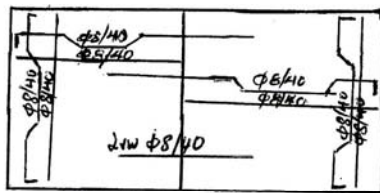
Π_2 : Άνοιγμα: $\frac{M_{sd}}{bd^2} = \frac{6.5 \cdot 10^{-3}}{1.0 (0.145)^2} = 0.309$ αφού $\phi 8/20 (=2.51 \text{ cm}^2/\text{m})$

Στήριξη $\Pi_1 - \Pi_2$: $\frac{M_{sd}}{bd^2} = \frac{16.2 \times 10^{-3}}{1.0 \times 0.145^2} = 0.771 \rightarrow \rho = 0.186\%$

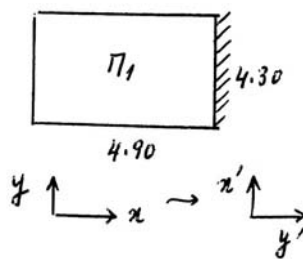
$A_{sx} = \frac{0.186}{100} \times 100 \times 14.5 = 2.69 \text{ cm}^2/\text{m}$

Υπάρχουν $\phi 8/40 + \phi 8/40 (=2.51 \text{ cm}^2/\text{m})$

Πρόβλεψη: $\phi 8/40 (=1.26 \text{ cm}^2/\text{m})$



4. Δρατυνή επίλυση με τους πίνακες Czerney



Πιν. 16.6 (Περ. 2)

$\varepsilon = \frac{4.90}{4.30} = 1.14$

$m'_x = 29.02$

$m'_y = 28.8$

$m'_{y'erm} = 10.5$

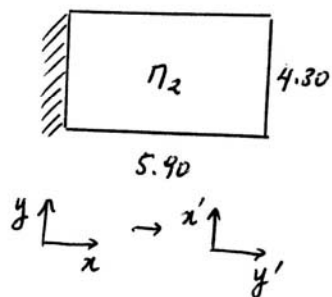
$M = \frac{q l x'^2}{m} (=l \text{ min})$

$M'_x = \frac{10.0 \times 4.30^2}{29.02} = 6.37 \text{ kNm} = M_y$

$M'_y = \frac{10.0 \times 4.30^2}{28.8} = 6.4 \text{ kNm} = M_x$

$M'_{y'erm} = \frac{-10.0 \times 4.30^2}{10.5} = -17.6 \text{ kNm} = M_{x'erm}$

π. Γαωόπουλος



$$\varepsilon = 1.37 = \frac{5.40}{4.30}$$

$$\begin{cases} m_{x'} = 19.5 \rightarrow M_{x'} = 9.5 \text{ kNm} = M_y \\ m_{y'} = 30.30 \rightarrow M_{y'} = 6.1 \text{ kNm} = M_x \\ m_{y'erm} = -9.3 \rightarrow M_{y'erm} = -19.9 \text{ kNm} = M_{xerm} \end{cases}$$

$$M_{6erm} = \frac{17.6 + 19.9}{2} = -18.75 \text{ kNm} \text{ (για άθροισμα 2 τιμών)}$$