

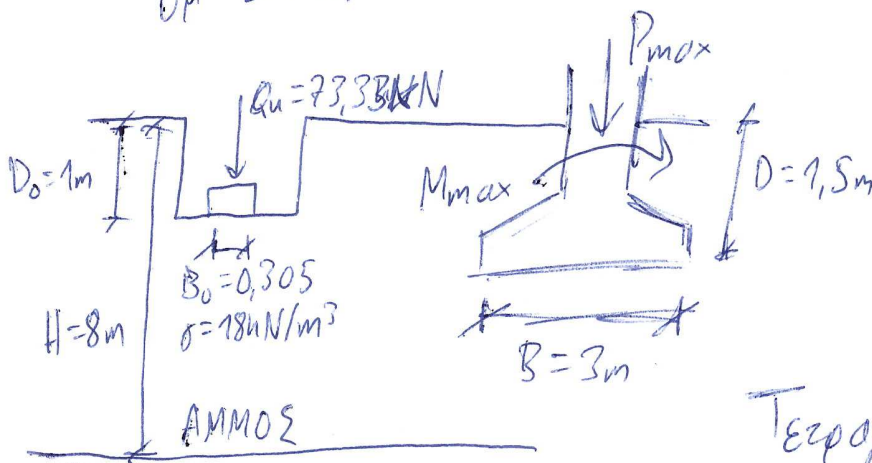
Συνέχεια πγς 2.2)

$$P_u = 12 \cdot 16,87 \cdot 1,30 + [(19,5 - 10) \cdot 15] \cdot 6,88 \cdot 1 + 0,5 \cdot (19,5 - 10) \cdot 2,50 \cdot 4,57 \cdot 0,8 = 404,63 \text{ kPa}$$

$$FS = \frac{P_u \cdot B^2}{\Sigma V} = \frac{404,63 \cdot 2,50^2}{820,63} = 3,08 > 3 \quad \checkmark$$

2.3) $B_0 = 0,305 \text{ m}$, $D_0 = 1 \text{ m}$: $Q_u = 73,33 \text{ kN}$

$\gamma_{\mu} = 21 \text{ kN/m}^3$ $D = 1,5$: $\theta_{\text{ερ.}} B \times L = 3 \text{ m} \times 4 \text{ m}$



a) $\Sigma A. = 2$

P_{max}

b) $P = 5 \text{ MN}$

M_{max} with $\Sigma A. = 2$

Τετραγωνικό

$$P_u = c N_c S_c + q N_q S_q + \frac{1}{2} B \gamma N_{\gamma} S_{\gamma}$$

Αμμος: $c = 0$, $\phi = 32^\circ$ άρα

$N_q = 28,52$, $N_{\gamma} = 27,49$

$S_c = 1,2$

$S_q = 1$

$S_{\gamma} = 0,8$

$$P_u = 18 \cdot 28,52 \cdot 1 + \frac{1}{2} \cdot 0,305 \cdot 18 \cdot 27,49 \cdot 0,8 = 573,73 \text{ kPa}$$

$Q'_u = P_u \cdot (0,305)^2 = 68,7 \text{ kN}$ άρα $\phi = 34^\circ$ άρα $Q'_u \approx Q_u = 73,33 \text{ kN}$

$$a) \Sigma A = \frac{P_u \cdot B \cdot L}{\Sigma V} = \frac{P_u \cdot B \cdot L}{P + G_{eq}} \quad \text{όπου}$$

$$G_{eq} = 21 \cdot 3 \cdot 4 \cdot 1,5 = 378 \text{ kN}$$

$$P_u = c N_c s_c + q N_q s_q + \frac{1}{2} \cdot B \cdot \gamma N_\gamma s_\gamma$$

$$\Gamma_{ca} \quad c=0, \varphi=34^\circ \Rightarrow N_q = 36,51, \quad N_\gamma = 36,96$$

$$\text{και συντελεστές} \quad s_c = 1 + 0,2 \frac{3}{4} = 1,15, \quad s_q = 1$$

$$\text{μορφής} \quad s_\gamma = 1 - 0,2 \frac{3}{4} = 0,85$$

$$\text{Άρα} \quad P_u = 18 \cdot 1,5 \cdot 36,51 \cdot 1 + \frac{1}{2} \cdot 3 \cdot 18 \cdot 36,96 \cdot 0,85 = 1,836,002 \text{ kN}$$

$$Q_u = 1,836,002 \cdot 3 \cdot 4 = 22.008,02 \text{ kN}$$

$$\Sigma A = \frac{22.008,02}{P + 378} = 2 \Rightarrow P = 10.626 \text{ kN}$$

$$b) \Gamma_{ca} \quad P = 5 \text{ MN}$$

$$\text{DIN 4017: } P_u = c N_c b_c \cdot s_c i_c + q + \gamma D N_q \cdot b_q \cdot s_q \cdot i_q + \frac{1}{2} \gamma B' N_\gamma \cdot b_\gamma \cdot s_\gamma \cdot i_\gamma$$

$$c=0, \quad b_q = b_\gamma = b_c = 1, \quad \theta=0^\circ \Rightarrow i_q = i_c = i_\gamma = 1$$

$$B' = B - 2e = 3 - \frac{2 \cdot M_{max}}{5378}, \quad e = \frac{\Sigma M}{\Sigma V} = \frac{M_{max}}{5.378}, \quad N_q = 29,44, \quad N_\gamma = 38,366$$

$$\text{Συντελεστές μορφής ηδ' ίσως: } s_q = 1 + \frac{B'}{L} \cdot \sin \varphi = 1 + \frac{\left(3 - \frac{M_{max}}{2.689}\right)}{4} \cdot \sin 34^\circ =$$

$$= 1,42 - 5,2 \cdot 10^{-5} M_{max}$$

$$s_c = \frac{(1,42 - 5,2 \cdot 10^{-5} M_{max}) 29,44 - 1}{29,44 - 1} = \frac{41,8 - 1,53 \cdot 10^{-3} M_{max} - 1}{28,44} = 1,43 - 5,38 \cdot 10^{-5} M_{max}$$

$$s_\gamma = 1 - 0,3 \left(\frac{3 - \frac{M_{max}}{2689}}{4} \right) = 1 - [0,225 - 2,79 \cdot 10^{-5} M_{max}] = 0,775 + 2,79 \cdot 10^{-5} M_{max}$$

$$P_u = 1,5 \cdot 18 \cdot 29,44 \cdot (1,42 - 5,2 \cdot 10^{-5} M_{max}) + \frac{1}{2} \cdot 18 \cdot \left(3 - \frac{M_{max}}{2689}\right) \cdot 38,366 (0,775 + 2,79 \cdot 10^{-5} M_{max}) =$$

$$= 1.128,73 - 0,041 M_{max} + (27 - 3,35 \cdot 10^{-3} M_{max}) (29,73 + 1,07 \cdot 10^{-5} M_{max}) =$$

$$= -3,58 \cdot 10^{-8} M_{max}^2 - 0,14 M_{max} + 1.128,73$$

$$\Sigma A = 2: \frac{P_u B L}{\Sigma V} = 2 \Rightarrow \frac{12(-3,58 \cdot 10^{-8} M_{max}^2 - 0,14 M_{max} + 1.128,73)}{5.378} =$$

$$\Rightarrow 10.756 = -4,296 \cdot 10^{-7} M_{max}^2 - 1,68 M_{max} + 13.544,76 \quad \text{Άρα}$$

$$M_{max} = 839,5 \text{ kNm}$$