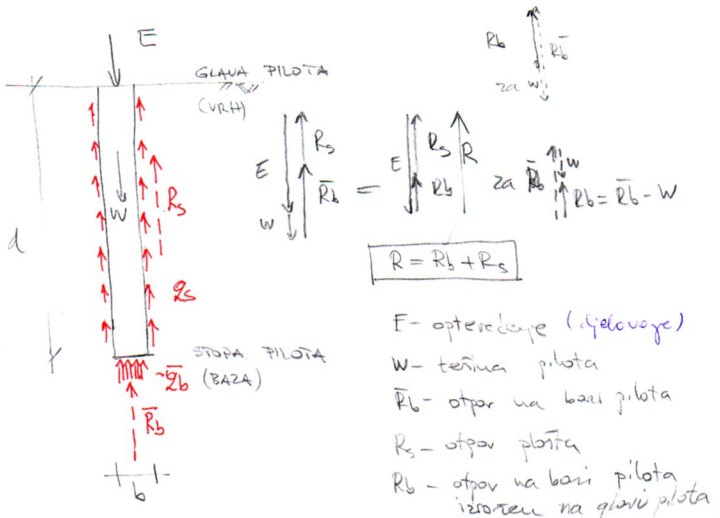
DUBOKO TEMELJENJE — PILOTI



F – opterećenje (djelovanje)

W – težina pilota

$\bar{R}_b$ – otpor na bazi pilota

R_s – otpor plašta

R_b – otpor na bazi pilota izražen na glavi pilota

KONTROLA NOSIVOSTI PILOTA PREMA EC7 (API metoda)

$$F + W \leq \bar{R}_b + R_s$$

$$F \leq \bar{R}_b - W + R_s$$

$$\boxed{F \leq R_b + R_s} \Rightarrow \text{proračunska vrijednost}$$

$$R_s = \int_0^d q_s \cdot c \cdot dy$$

q_s – specifičan otpor po plaštu

c – opseg pilota

$$R_b = A_b \cdot q_b$$

q_b – specifičan otpor baze

A_b – površina baze

SPECIFIČAN OTPOR

KOHERENTNA TLA (određuje se prema c_u)

$\xi_b = \ldots$

$\xi_s = \ldots$

NEKOHERENTNA TLA (određuje se prema N_{60})

$\xi_b = \ldots$

$\xi_s = \ldots$

KARAKTERISTIČNA NOSIVOST PILOTA

- Ovisi o broju istražnih radova ili broju ispitanih pilota n $\Rightarrow$ korelacijski faktor ξ

$$R_k = \min\left\{ \frac{R_{srednje}}{\xi_i} ; \frac{R_{minimalno}}{\xi_j} \right\}$$

PRORAČUNSKA NOSIVOST PILOTA PREMA EC7

za PP1/k1 $\Rightarrow$ A1 + M1 + R1

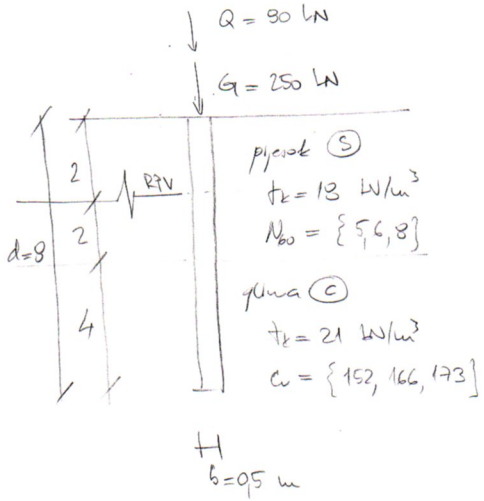
za PP1/k2 $\Rightarrow$ A2 + M1 + R4

$$E_d \leq R_d = \frac{R_k}{\gamma_R}$$

Zadatak

Na slici je prikazan bušeni pilot u horizontalno uklještenom tlu. Za zadane dimenzije pilota i geotehničkog profila tla potrebno je:

a) odrediti specifičnu minimalnu nosivost pilota
b) odrediti specifičnu računsku nosivost pilota
c) odrediti karakterističnu nosivost usporedivu za kontrolu nosivosti pilota
d) provjeriti nosivost pilota prema PP1/K1 } (karakteristični pristup za otpornosti odvojeno za plašt i stopu)
e) provjeriti nosivost pilota prema PP1/K2



(9.) geometrijske dimenzije pilota

$b = 0{,}5\ m$

$c = 0{,}5\pi = 1{,}57\ m$

$A_b = 0{,}5^2\pi/4 = 0{,}196\ m^2$

(X.) karakteristične vrijednosti 'čvrstoće' tla

(5) $N_{60\ min} = 5$

$N_{60\ sred} = \frac{5+6+8}{3} = 6{,}3$

(c) $c_{u\ min} = 152\ kN/m^2$

$c_{u\ sred} = \frac{152 + 166 + 173}{3} = 163{,}7\ kN/m^2$

a) specifična minimalna nosivost pilota

($c_u = 152\ kN/m^2$; $N_{60} = 5$)

$R_{min} = R_b + R_s = \underbrace{R_b^c}_{glina} + \underbrace{(R_s^c + R_s^s)}_{pijesak}$

nosivost 'baze'

$R_b^c = A_b \cdot \xi_b$

$\xi_b \Rightarrow N_c \cdot c_u \approx 8{,}9 \cdot 152 = 1337{,}6\ kN/m^2$

$\rightarrow R_b^c \approx 0{,}196 \cdot 1337{,}6$

$\boxed{R_b^c \approx 262\ kN}$

Nosivost plašta

Glina:

$$R_s^c = \int_4^8 \varrho_s \cdot c \cdot d_y = \varrho_s \cdot c \cdot 4{,}0$$

$\varrho_s = \alpha \cdot c_u$

$\frac{c_u}{p_{at}} = \frac{152}{100} = 1{,}52$; $1{,}5 < \frac{c_u}{p_{at}} < 2{,}5 \Rightarrow \alpha = 0{,}55 - 0{,}1\left(\frac{c}{p_{atm}} - 1{,}5\right)$

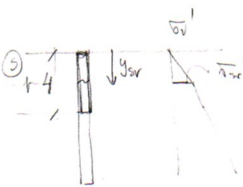
$= 0{,}55 - 0{,}1\left(\frac{152}{100} - 1{,}5\right)$

$\alpha = 0{,}548$

$\varrho_s = 0{,}548 \cdot 152 = 83{,}3$ kN/m²

$\rightarrow R_s^c = 83{,}3 \cdot 1{,}57 \cdot 4{,}0$

$R_s^c \approx 523$ kN



Pijesak:

$$R_s^c = \int_0^4 \varrho_s \, c \, d_y = \varrho_s \cdot c \cdot 4{,}0 =$$

$\varrho_s = \beta \cdot \overline{\sigma_v}'_{sr}$

za pijesak : $\beta = \max\left\{0{,}25 \; ; \; \overline{N}\,(1{,}5 - 0{,}25\,\overline{y_{sr}})\right\}$

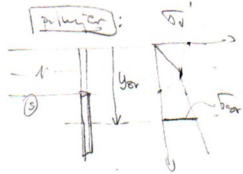
za $N_{60} < 15$ $\quad \overline{N} = N_{60}/11 = 5/11 = 0{,}45$

$\beta = \max\left\{0{,}25 \; ; \; 0{,}45\,(1{,}5 - 0{,}25\,\underbrace{\sqrt{2}}_{0{,}51})\right\}$

$\rightarrow \varrho_s = 0{,}51 \cdot (18 \cdot 2{,}0) = 18{,}3$ kN/m²

$\rightarrow R_s^c = 18{,}3 \cdot 1{,}57 \cdot 4{,}0$

$R_s^c \approx 115$ kN



$R_{uu} = R_b^c + R_s^c + R_s^s = 262 + (523 + 115) = 262 + 638$

$R_{uu} = 900$ kN

b) specifična srednja nosivost pilota

za $c_u = 163{,}7$; $N_{60} = 63$

⋮ postupak prikazan pod a)

$R_b^c = 282$ kN

$R_s^c = 551$ kN

$R_s^s = 147$ kN

$\left.\begin{matrix} R_s^c = 551 \text{ kN} \\ R_s^s = 147 \text{ kN} \end{matrix}\right\} R_s = 698$

$R_{sred} = 980$ kN

c) karakteristična nosivost pilota

$R_k = \min\left\{ \frac{R_{srednje}}{\xi_i} ; \frac{R_{min}}{\xi_j} \right\}$, za 3 ispitivanja $\xi_i = 1{,}33$, $\xi_j = 1{,}23$

$= \min\left\{ \frac{980}{1{,}33} ; \frac{900}{1{,}23} \right\}$

$= \min\left\{ 737 ; 732 \right\}$

$\boxed{R_k = 732 \text{ kN}} \Rightarrow R_{b_k} = \frac{282}{1{,}33} = 212 \text{ kN}$

$R_{s_k} = \frac{638}{1{,}33} = 480$ kN

d) Kontrola nosivosti prema PP1/K1 (A1+M1+K1)

$$Ed = G \cdot 1{,}35 + Q \cdot 1{,}5$$
$$= 250 \cdot 1{,}35 + 80 \cdot 1{,}5$$
$$\boxed{Ed = 457{,}5 \text{ kN}}$$

$$Rd = \frac{R_k}{\gamma_R} = \frac{R_{bk}}{\gamma_b} + \frac{R_{sk}}{\gamma_s} = \frac{212}{1{,}25} + \frac{480}{1{,}0} = 170 + 480$$

$$\boxed{Rd = 650 \text{ kN}} > 457{,}5 \text{ kN} \quad \text{// zadovoljava nosivost}$$

e) Kontrola nosivosti prema PP1/K2 (A2+M1+R4)

$$Ed = G \cdot 1{,}0 + Q \cdot 1{,}3$$
$$= 250 \cdot 1{,}0 + 80 \cdot 1{,}3$$
$$\boxed{Ed = 354{,}0 \text{ kN}}$$

$$Rd = \frac{R_{bk}}{1{,}6} + \frac{R_{sk}}{1{,}3} = \frac{212}{1{,}6} + \frac{480}{1{,}3} = 132 + 370$$

$$\boxed{Rd = 502 \text{ kN}} > 354{,}0 \text{ kN} \quad \text{// zadovoljava nosivost}$$