Επαναληπτικές Ασκήσεις

14 May 2024 17:03

1 α) $V_0 = 12000\,m^3$, $e_0 = 1.0$, $e_f = 0.8$

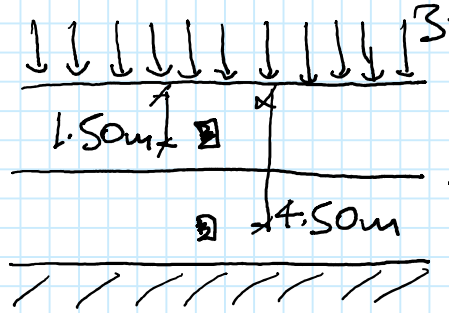
$$e = \frac{V_v}{V_s} = \frac{V - V_s}{V_s} = \frac{V}{V_s} - 1 \Rightarrow V_s = \frac{V}{1+e} = \frac{V_0}{1+e_0} = \frac{V_f}{1+e_f} \Rightarrow$$

$$\Rightarrow V_f = \frac{1+e_f}{1+e_0} V_0 = \frac{1+0.8}{1+1.0} * 12000 \Rightarrow \underline{V_f = 10800\,m^3}$$

Αλλά $V_f = 60 \cdot 60 \cdot h \Rightarrow \underline{\underline{h = 3m}}$

Για $S_r = 1.0 \Rightarrow \gamma = \gamma_w \cdot \frac{G_s + e}{1+e} = 10 \cdot \frac{2.7+0.8}{1+0.8} \Rightarrow \underline{\underline{\gamma = 19.4 \frac{kN}{m^3}}}$

β)



Ιλύς, $\gamma = 19\,kN/m^3$, $k_0 = 0.546$

άμμος, $\gamma = 20\,kN/m^3$, $k_0 = 0.625$

Ιλύς:

$\sigma_{v,0} = 1.5 * 19 = 28.5\,kPa$

$u = 1.5 * 10 = 15\,kPa$

$\sigma'_{v,0} = \quad = 13.5\,kPa$

$\sigma'_{h,0} = 0.546 * 13.5 = 7.37\,kPa$

$\sigma_v = 28.5 + 57 = 85.5\,kPa$

$u = \quad = 15\,kPa$

$\sigma'_{v,0} = \quad = 70.5\,kPa$

$\sigma'_h = 0.546 * 70.5 = 38.5\,kPa$

Άμμος:

$\sigma_{v,0} = 3*19 + 1.5*20 = 87\,kPa$

$u = 4.5 * 10 \quad = 45\,kPa$

$\sigma'_{v,0} = \quad = 42\,kPa$

$\sigma'_h = 0.625 * 42 = 26.25\,kPa$

$\sigma_v = 87 + 57 = 144\,kPa$

$u = \quad = 45\,kPa$

$\sigma'_v = \quad = 99\,kPa$

$\sigma'_h = 0.625 * 99 = 61.88\,kPa$

$\sigma_{v,0} =$ $= 42$ kPa $\Big\}$ $\sigma_v =$ $= 99$ kPa

$\sigma'_{h,0} = 0.625 * 42 = 26.25$ kPa $\Big\}$ $\sigma'_h = 0.625 * 99 = 61.88$ kPa

γ) $\rho = \rho_{\text{ιλύς}} + \rho_{\text{άργιλος}}$

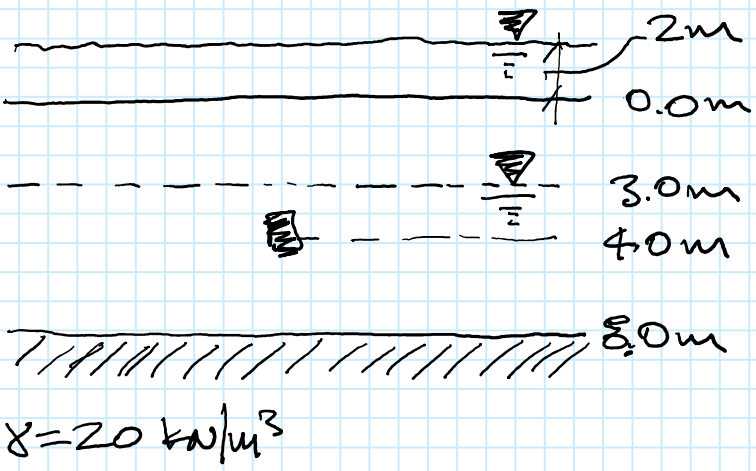
$\rho_{\text{ιλύς}} = 3.0 * \frac{0.10}{1+0.85} \log\left(\frac{70.5}{13.5}\right) = 0.116$ m

$\rho_{\text{άργιλος}} = 3.0 * \frac{0.20}{1+1.20} \log\left(\frac{99.0}{42.0}\right) = 0.102$ m

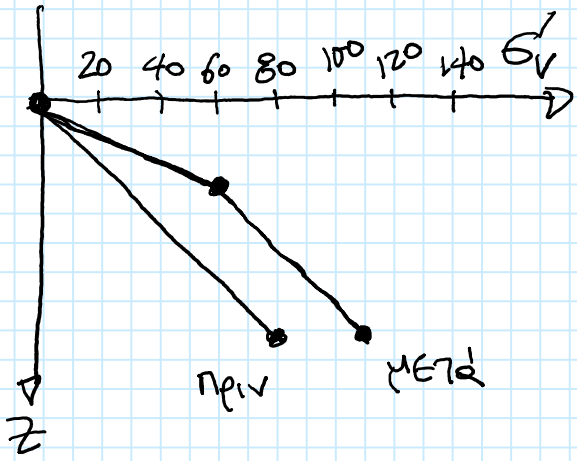
$\Big\}$ $\rho = 0.218$ m

δ) $OCR = \frac{\sigma'_{v,max}}{\sigma'_v} = \frac{99}{42} = 2.4$

(2)



α) $\gamma = 20$ kN/m^3



πριν: $z = 0$m $\sigma_v = 2*10 = 20$, $u = 2*10 = 20$, $\sigma'_v = 0$ kPa

$z = 8$m $\sigma_v = 2*10 + 8*20 = 180$, $u = 10*10 = 100$

$\sigma'_v = 80$ kPa

μετά: $z = 0$m - . - . $\sigma'_v = 0$ kPa

$z=3m$: $\sigma_v = 3*20 = 60$, $u = 0$ $\quad \sigma'_v = 60$ kPa

$z=8m$: $\sigma_v = 8*20 = 160$, $u = 5*10 = 50$, $\sigma'_v = 110$ kPa

β) Μέσο της στρώσης:

πριν: $\sigma_v = 2*10 + 4*20 = 100$ kPa

$u = (2+4)*10 = 60$ kPa

$\sigma'_v = = 40$ kPa

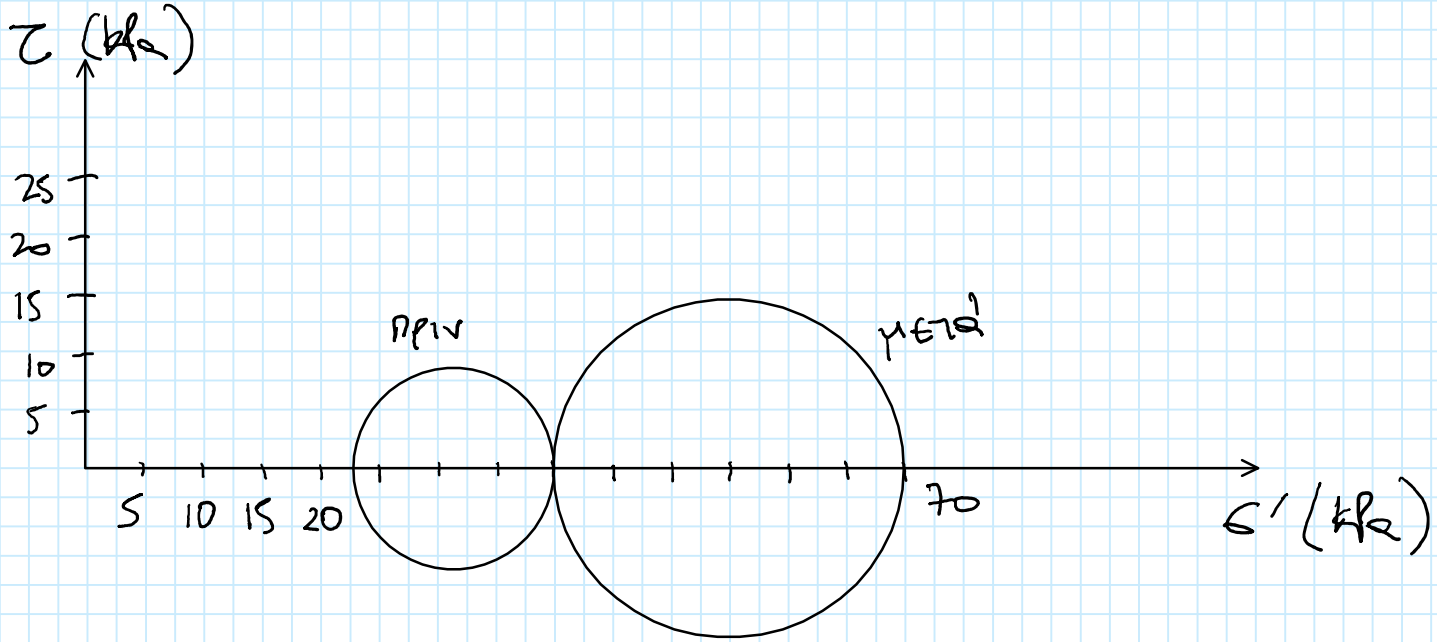
$\sigma'_h = 0.562*40 = 22.5$ kPa

μετά: $\sigma_v = 4*20 = 80$ kPa

$u = 1*10 = 10$ kPa

$\sigma'_v = = 70$ kPa

$\sigma'_h = 0.562*70 = 39.3$ kPa



γ) $\rho = 8 * \frac{0.12}{1+0.90} \log\left(\frac{70}{40}\right) = 0.123m$

(3) a) $\phi_1 = \operatorname{atan}\frac{60.10}{100} = 31.0°$

$\phi_2 = \operatorname{atan}\frac{121.12}{200} = 31.2°$

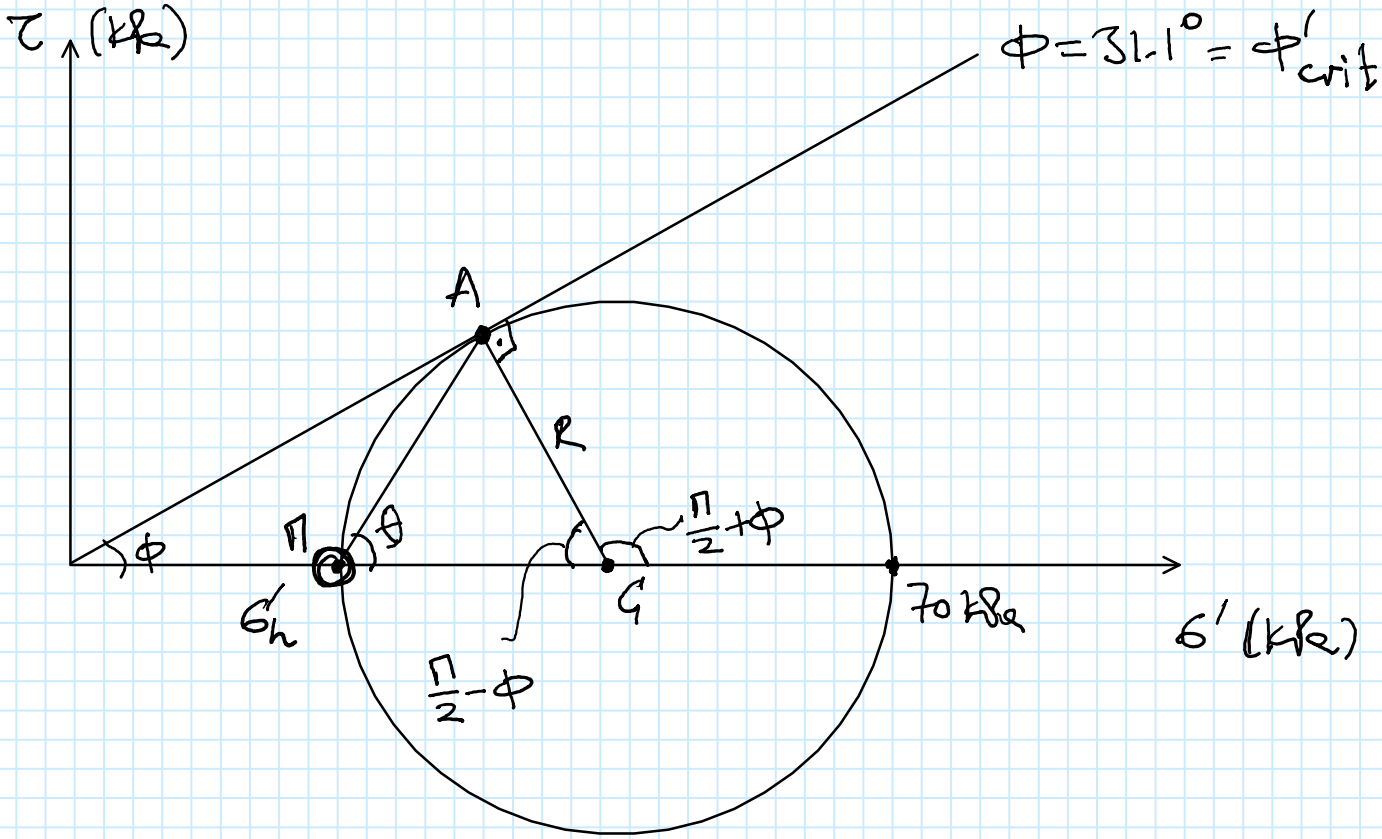
$\phi_3 = \operatorname{atan}\frac{180.97}{300} = 31.1°$

$\Rightarrow \phi'_{crit} = 31.1°$

b) $\sigma_v = 10 * 17 = 170$ kPa

$u = 10 * 10 = 100$ kPa

$\sigma'_v = \quad = 70$ kPa



$\sin\phi = \frac{\frac{1}{2}(\sigma'_v - \sigma'_h)}{\frac{1}{2}(\sigma'_v + \sigma'_h)} \rightarrow \sigma'_h = \frac{1-\sin\phi}{1+\sin\phi}\sigma'_v = \frac{1-\sin 31.1°}{1+\sin 31.1°} * 70 \rightarrow$

$\rightarrow \sigma'_h = 22.3$ kPa

γ) Κλίση επιπέδου αστοχίας : θ

Από το σχήμα, $\theta = \frac{1}{2}\left(\frac{\pi}{2}+\phi\right) = \frac{\pi}{4}+\frac{\phi}{2}$ ⇝

⇝ $\theta = 45 + \frac{31.1}{2}$ ⇝ $\underline{\theta = 60.6^\circ}$

Οι (ενεργές) τάσεις στο επίπεδο αστοχίας είναι οι συντεταγμένες του σημείου Α:

$$\tau = R\sin\left(\frac{\pi}{2}-\phi\right) = R\cos\phi$$

$$\sigma' = C' - R\cos\left(\frac{\pi}{2}-\phi\right) = C' - R\sin\phi$$

Αλλά $C' = \frac{1}{2}(\sigma_v' + \sigma_h') = \frac{1}{2}(70+22.3) = 46.15$ kPa

$R = \frac{1}{2}(\sigma_v' - \sigma_h') = \frac{1}{2}(70-22.3) = 23.85$ kPa

Οπότε: $\tau = 23.85 \cdot \cos 31.1^\circ$ ⇝ $\underline{\tau = 20.4 \text{ kPa}}$

$\sigma' = 46.15 - 23.85 \sin 31.1^\circ$ ⇝ $\underline{\sigma' = 33.8 \text{ kPa}}$