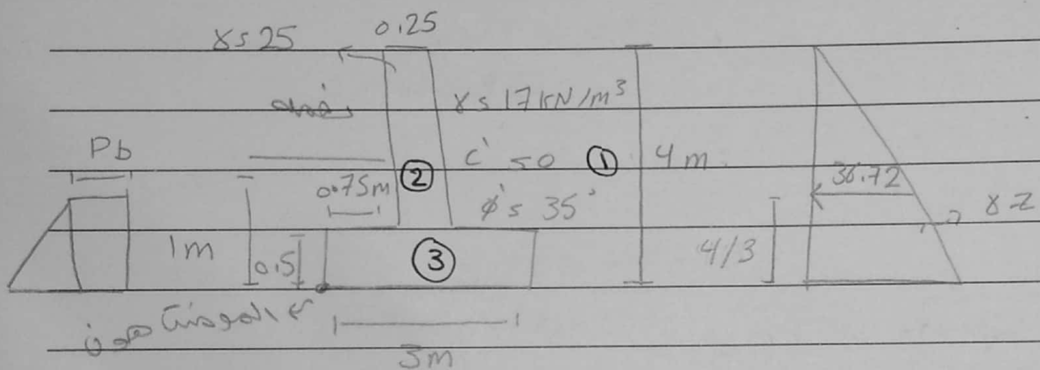
م محاضرة 24/11 بدنا فاينل ...

26 - 11 - 2019

EX: Determine the F.s agnaist sliding, over turning and Bc? (using Rankine.)



$\gamma = 16\ kN/m^3$

$c' = 25\ kpa.$

$\phi = 15°$

Sol: → single layer → c = 0 → G.w.T X

$$K_a = \frac{1-\sin\phi'}{1+\sin\phi'} = \frac{1-\sin 35}{1+\sin 35} = 0.27$$

$$K_p = \frac{1+\sin\phi}{1-\sin\phi} = \frac{1+\sin 15}{1-\sin 15} = 1.69$$ ← انتبه هو نفس السؤال.

$$p_a = \frac{1}{2}\gamma H^2 K_a$$

$$= \frac{1}{2} * (17) * (4)^2 * (0.27) = 36.72$$

$P_{ah} = 36.72$ $P_v = 0$ → ما في ميلان بالسؤال

- over turning

$$F.S = \frac{\Sigma M_R}{\Sigma M_o}$$

$$M_o = (P_{ah})\bar{x} = 36.72 * 4/3 = 48.96\ kN.m/m$$

$P_p =$ △ + □ ← خدت سويل يلي تحت القاعدة pass.

$= \frac{1}{2} \gamma D^2 k_p + 2 C D \sqrt{k_p}$

$= \frac{1}{2} * 16 * 1^2 * 1.69 + 2 * 25 * 1 * \sqrt{1.69}$

$= 13.52 + 65 = 78.52$ kN/m

$M_{Pp} = 13.52 * \frac{1}{3} + 65 * \frac{1}{2}$

$= 36.988 = 37$ kN.m/m

← أهملنا وزن السويل يلي فيه pass.

seg #	Ai	xi	m
1	(3.5)(3 - 0.25 - 0.75)(17) = 119	2	350
2	(0.25) * 3.5 * 25 = 21.4	0.875	19.075
3	(0.5) * 3 * 25 = 37.5	1.5	56.25
Σ	177.9		313.325

1) F.S ot $= \frac{\Sigma M_R}{\Sigma M_o} = \frac{313.325 + 37}{48.96} = 7.15 > 3$ ok

2) F.S sliding $= \frac{\Sigma V \tan(k_1 \phi_2) + B k_2 c_2 + P_p}{P_{ah}}$

$= [177.9 \tan(\frac{2}{3} * 15) + 3(\frac{2}{3} * 25) + 78.523] / 36.75$

$= 4.36 > 1.5$ ok

$$e = \frac{B}{2} - \frac{\Sigma M_R - \Sigma M_o}{\Sigma V}$$

السالب يعني

على يسار القاعدة.

$$= \frac{3}{2} - \frac{313.325 + 37 - 48.96}{177.9} = -0.194\ m$$

$$\therefore e = 0.194\ m < \frac{B}{6} = \frac{3}{6} = 0.5 \quad \text{ok}$$

$$q_{max} = \frac{\Sigma V}{B}\left(1 + \frac{6e}{B}\right)$$

$$= \frac{177.9}{3}\left(1 + \frac{6 * 0.194}{3}\right) = 82.3\ kpa$$

$$q_{min} = 36.29\ kpa.$$

$$\beta = \tan^{-1}\left(\frac{\Sigma H}{\Sigma V}\right) = \tan^{-1}\left(\frac{36.72}{177.9}\right) = 11.6^\circ < 15^\circ \quad \text{ok}$$

$$q_{ult} = c N_c F_{cs} F_{cd} F_{ci} + q N_q F_{qs} F_{qc} F_{qi} + \frac{1}{2} \gamma B N_\gamma F_{\gamma s} F_{\gamma c} F_{\gamma i}$$

← دائماً الـ Df عند منطقة الـ passive . $D_f < B$ $1 < 3$ ok $\phi > 0$ ←

$F_{cd} = 1 - \frac{1 - F_{qd}}{N_c \tan\phi} = 1.131$, $F_{\gamma d} = 1$

نحدا ايها بنجدول .

$N_c = 10.98$ $N_q = 3.94$ $N_\gamma = 2.65$ $\phi = 15^\circ \rightarrow$ القاعدة

للأسفل .

$F_{qd} = 1 + 2\tan\phi\,(1-\sin\phi)^2 \frac{D_f}{B} = 1 + 2\tan 15\,(1-\sin 15)^2 * \frac{1}{3}$

$F_{qd} = 1.098$ $F_{ci} = (1 - \frac{\beta}{90})^2 = (1 - \frac{11.6}{90})^2 = 0.754$

$F_{\gamma i} = (1 - \frac{\beta}{\phi})^2 = (1 - \frac{11.6}{15})^2 = 0.051$

$\rightarrow \frac{q_{ult}}{q_{max}} > 3$, $q_{min} > 0$

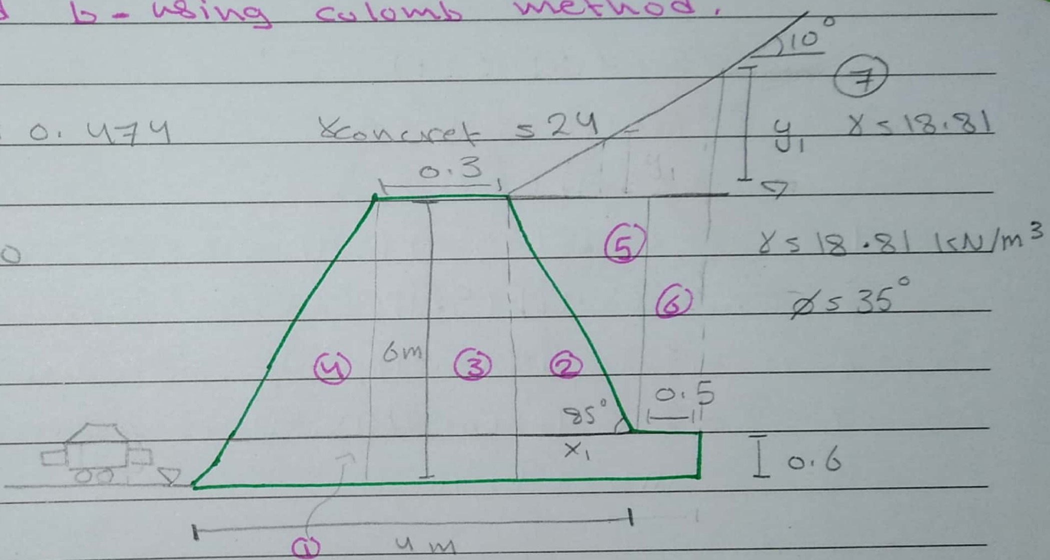
Five Apple

Ex: Determine the F.S against sliding a- using Rankine method b- using colomb method.

$$x_1 = \frac{6-0.6}{\tan 85} = 0.474$$

$$\frac{y_1}{0.97} = \tan 10$$

$$y_1 = 0.17$$



$\gamma = 18.81$ $c' = 0$ $\phi = 35°$

$$K_a = \cos 10 \frac{\cos 10 - \sqrt{\cos^2 10 - \cos^2 35}}{\cos 10 + \sqrt{\cos^2 10 - \cos^2 35}} = 0.28$$

$H' = 6 + 0.17 = 6.17$ m

$P_a = \frac{1}{2} \gamma' H'^2 K_a$! → consider the soil above the water table is saturated too. !

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$P_a = \frac{1}{2} (18.81 - 9.81) (6.17)^2 (0.28) = 47.9 \text{ kN/m}$

$P_{ahs} = 47.9 \cos 10 = 47.17 \text{ kN/m}^2$

$P_V = 47.9 \sin 10 = 8.31 \text{ kN/m}^2$

$P_{ah} = P_w + P_s = 176.58 + 47.17 = 223.75 \text{ kN/m}$

$P_w = 0.5 * 9.81 * (6)^2 * 1 = 176.58$

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Seg #

1	0.6 (4.5) (24)
2	0.5 (0.47) (5.4) (24)
3	0.3 (5.4) (24)
4	0.5 (3.23) (5.4) (24)
5	0.5 (0.47) (5.4) (18.81)
6	0.5 (5.4) (18.81)
7	0.5 (0.17) (0.97) (18.81)
Σ	= 418.8 kN/m

γ مضروبة بالسويل sat لكن ملاحظة
هنا شي γ' لأنه لو فصلت
السويل عن الماء وحسبت وزن
الماء لحاله رح يطلع نفس الشي .

← كان يفترض نضيف
. ΣV ↓ P_V

$$F.S_{\text{sliding}} = \frac{\Sigma V \tan(k_1 \phi_2) + B k_2 c_2 + P_p}{\Sigma P_h}$$

$$= \frac{418.81 \tan\left(\frac{2}{3}(35)\right) + 0 + 0}{223.75} = 0.81 < 1.5$$

$$F.S_{\text{sliding}} = 1.5 = \frac{\Sigma V \tan(V_1 \phi_2) + 0 + P_p}{\Sigma P_h}$$

$P_p = 1.5 \times 223.75 - 418.8 \tan\left(\frac{2}{3}(35)\right) = 154 \text{ kN/m}$

$K_p = \dfrac{1 + \sin 35}{1 - \sin 35} = 3.69$

$P_p = \frac{1}{2} \gamma' D^2 K_p + 2c \cancel{D} \sqrt{K_p}$

$154.47 = \frac{1}{2}(18.81 - 9.81) D^2 (3.69) \rightarrow c = 0$

تأثير الماء رح يكون من اليمين واليسار

لهيك ما أخذته بعين الاعتبار.

$\Rightarrow D = 3.05 \text{ m.}$

← يلي سبب المشكلة وجود الماء ← ما لازم أسمح يتجمع الماء عند R.

بأي حال.

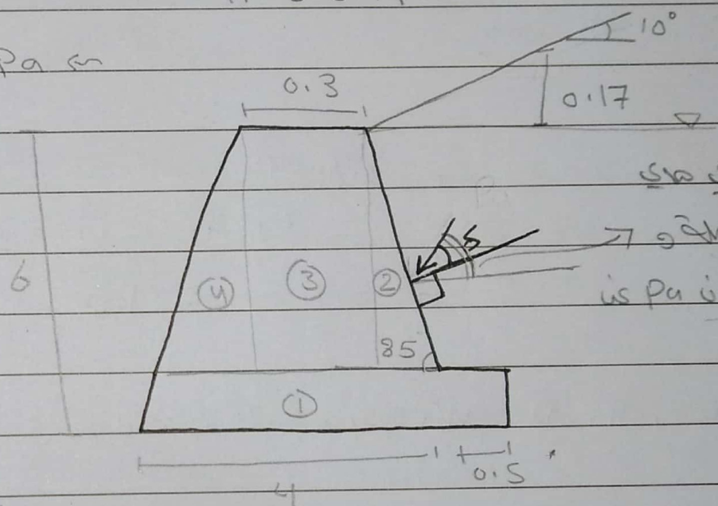
~ كيف أوجد المومنت لـ Pv ~ كيف المسافة ؟

1 - 12 - 2019

~ Last example ~ consider $\delta = 2/3\ \phi'$

$H' = 6.17$

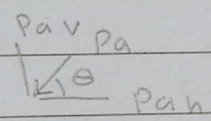
~ Pa تميل بزاوية δ عن العمودي على الجدار



أنا بدي هاي الزاوية كاملة ← تمثل ميلان Pa عن الأفقي .

$\theta = 90 - 85 + \frac{2}{3} * 35$

$\theta = 28.33$



$$K_a = \frac{\sin^2(\beta + \phi)}{\sin^2\beta\ \sin(\beta - \delta)\left[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi - \alpha)}{\sin(\beta - \delta)\sin(\alpha + \beta)}}\right]^2}$$

$$K_a = \frac{\sin^2(85 + 35)}{\sin^2(85)\ \sin(85 - \frac{2}{3} * 35)\left[1 + \sqrt{\frac{\sin(35 + 23.33)\sin(35 - 10)}{\sin(85 - 23.33)\sin(85 + 10)}}\right]^2}$$

$= 0.412$

$P_a = 1/2\ \gamma'\ H'^2\ K_a$

$= 0.5 * (18.81 - 9.81) * (6.17)^2 * (0.412) = 70.579\ kN/m.$

$P_{ah} = 70.579 \cos(28.33) = 62.12\ kn/m$

$P_{av} = 70.579 \sin(28.33) = 33.493\ kn/m$

$\Sigma W = W_1 + W_2 + W_3 + W_4$

$\Sigma V = \Sigma W + P_v$

$= 347.25 + 33.493 = 380.743$

$= 381.04$

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$$F.S_{sliding} = \frac{\Sigma V \tan k_1 \phi_2 + B k_2 c_2 + P_p}{\Sigma P_{ah}}$$

$$= \frac{381.04 \tan\left(\frac{2}{3} * 35\right) + 0 + 0}{62.12 + \underbrace{176.58}_{P_w}}$$

$$= 0.688 < 1.5$$

← بدي أكمل key حتى أحل المشكلة ← بدي أطلع D اللازمة .

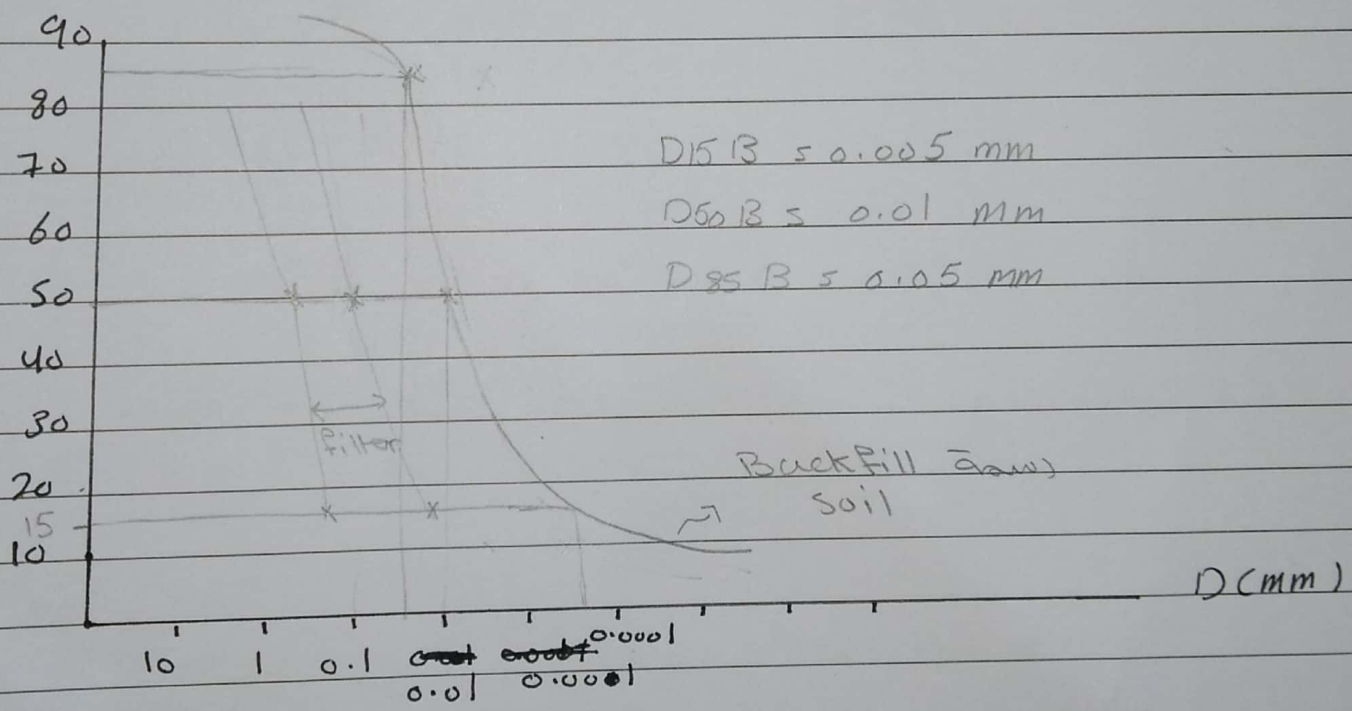
← مثل السؤال يلي قبل .

← رسمة الفلتر ممكن خطأ.

→ Grain size distribution for Backfill Soil.

→ Draw the range of ecceptable filter to placed between the wall and backfill.

← الفلتر هو نوع سويل بدي يحقق شروط معينة حتى أقدر استخدمه.
← بستخدمه حتى أضمن أنه المسام يلي بتصرف المياه لا تسكر.



← شروط لازم تتحقق

1) $\frac{D_{15} F}{D_{85} B} < 5$

2) $\frac{D_{15} F}{D_{15} B} > 4$

← شروط الثانوية

3) $D_{50} F \le 25 \; D_{50} B$

4) $D_{50} F \le 20 \; D_{15} B$

→ Filter:

$D_{15} F < 0.25 \quad D_{15} F > 0.02$

$D_{50} F \le 0.25 \quad D_{50} F \le 0.1$

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12-12-2019

Example : (in slides.)

Sol:

1) using merhof

$Q_{ult,net} = Q_p + Q_s - W$

$W = \gamma V = 25 * \left(\frac{25*25}{10000}\right) * 30 = 46.87$ kN.

$Q_p = q_p A_p$

$q_p = q N_q^* \leq 0.5 p_a N_q^* \tan \phi$

$q = \Sigma \gamma' z = 17*5 + (18 - 9.81)*5 + 20 * (20.81 - 9.81)$

$= 345.95$ kpa.

$N_q^* = 380$?

$q_p = (345.95 * 380) \leq 0.5 * 100 * 380 * \tan 40$

$131461 \leq 15942.89 \rightarrow$ استخدم الأقل

$25 \times 25 = 996.43$ kN.

$\rightarrow Q_t = q_t A_p = 15942.89 * \frac{25 \times 25}{10000} = 996.43 \text{ kN}.$

$\rightarrow L_{cr} = 15D = 15(0.75) = 3.75 \quad \bar{\sigma}_1 = 17 * 3.75 = 63.75 \text{ kpa}.$

→ median displacement. 1.6e. avg لهذا ناخذ side safe أخذنا الأكبر حتى نكون

$f = K \bar{\sigma} \tan \delta \rightarrow = \underline{1.4} K_o \bar{\sigma}_o \tan \delta$

$Q_s = \underline{4 * 0.25} [1.4(1 - \sin 33) * \frac{63.75}{2} * 3.75 + 1.4(1 - \sin 33) * 63.75 * (10 - 3.75) + 1.4(1 - \sin 40) * 63.74 * 20]$

$= 78342.28 \text{ kN}.$

$Q_s = \sum \underbrace{P \Delta L}\, f$

$Q_{ult\,net} = Q_t + Q_s - W$
$= 996.43 + 78342.28 - 46.82 = 79.29$ MN.

$f'_c \to ?$ $P_{permisble} = (f'_c)(A)$ Note:

2-) use Coyle and castello
$q = 345.95$ kpa. $\frac{L}{D} = \frac{30}{0.25} = 120$

$\phi' = 40^\circ$ $\underline{Nq^* = 3}$

$Q_t = q_t A_p = 345.95 * 3 = 1037.85$ kN. يفترض تضرب في قيمة
قيمة من Meyerhof.
$\sigma_v \downarrow$

$Q_s = k\bar{\sigma} \tan\delta\, pL$
① $17 * 5 = 85$
② $17*5 + 5*(18-9.81) = 40.95$
① + ② = 125.95
$125.95 + 20(20.81 - 9.81) =$
345.95 kN.

$\bar{\sigma} = (\frac{1}{2} * 85 * 5 + 85 * 5 + \frac{1}{2} * 40.95 * 5) / 10$

$\bar{\sigma} = 773.98$ kpa.

$\bar{\sigma}_2 = [125.95 * 20 + \frac{1}{2} * 220 * 5] / 20 = 235.95$

$\frac{L}{D} = \frac{10}{0.25} = 40$ $\bar{\sigma} = 73.98$ $k = 0.5$ الأولى

$\frac{L}{D} = \frac{20}{0.25} = 80$ $k = 0.15$ الثانية

$Q_s = 0.5 * 73.98 * \tan(\frac{2}{3} * 33) * 4 * 0.25 * 10 +$

$0.15 * 235.95 * \tan(\frac{2}{3} * 40) * 4 * 0.25 * 20 =$

741.94

$1037.85 + 741.94 - 46.87 = 1732.92$ kn $< f'_c A$.

15-12-2019

Sol:

$Q_{ult} = Q_s + Q_t$

$Q_t = (9\ S_u)\ A_p = 9 * 100 * \_\_ * (0.406)^2 = 116.5\ kN$ ←

λ:

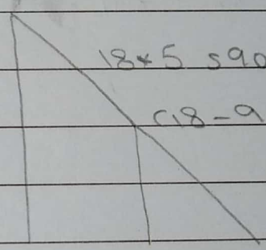
$Q_s = \Sigma p L f$

$f = \lambda(\bar{\sigma} + 2\ c_u)$

$\bar{\sigma}_1 = (0.5 * 90 * 5 + 90 * 5 +$

$0.5 * 5 * 40.95) / 10$

$= 77.73$



$\bar{\sigma}_2 = (0.5(130.95 + 326.75) * 20) / 10$

$= 228.85$

$L = 10\ m \quad \lambda_1 = 0.245$

$L = 20\ m \quad \lambda_2 = 0.173$ as segment not from zero.

$Q_s = \pi(0.406)(10 * (77.75 + 2*30) * 0.245) +$

$20 * (228.95 + 2*100) * 0.173)$

$= 1684.9$ تأكدوا

$Q_{ult} = 116.5 + 1684.9 =$ kn ←

α - method.

$Q_s = \alpha \, c_u \, P_{erL}$

$\frac{c_u}{\bar{\sigma}_1} = \frac{30}{77.73} = 0.38$

$\alpha_1 = 0.72$

$\frac{c_u}{\bar{\sigma}_2} = \frac{100}{228.8} = 0.43$

$\alpha_2 = 0.65$

$Q_s = 0.38 * 30 * \pi *$
$0.406 * 10 + 0.65 * 100 *$
$\pi * 0.406 * 20$
$= 1803.03$ kn ←

For Layer #1 $\phi_{res} = 20°$, $OCR = 1$

#2 $\phi_{res} = 10°$, $OCR = 3$

$Q_s = (1 - \sin\phi_{res}) \tan\phi_{res} \sqrt{OCR}\ \bar{\sigma}\ P \Delta L$

$= (1 - \sin 20) \tan(20) \sqrt{1}\ (77.73) * \pi * 0.406 * 10$

$+ (1 - \sin 10) \tan 10 \sqrt{3} * (226.85) * \pi * 0.406 * 20$

$= 1697.89$ kN