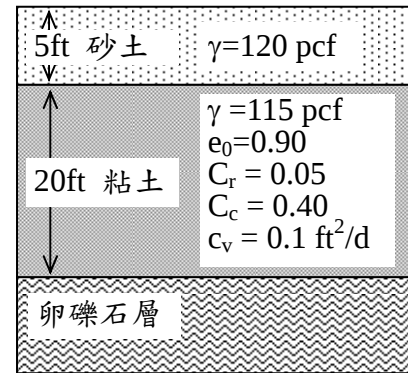


- 一、考慮如右圖之土層，其土壤之參數如圖所示，地下水水位始終在地表面處(高程為0ft)，而粘土層之預壓密應力比其初始垂直有效覆土壓力高出1000psf，若有一厚25ft、單位重 $\gamma=120\text{pcf}$ 之回填土，在很短的時間內被堆置在此一土層上，計算其極限沉陷量 S_u ?



粘土層中點之初始垂直覆土有效應力：

$$\bar{\sigma}_0 = 5 \times 120 + 10 \times 115 - 15 \times 62.4 = 814$$

$$\bar{\sigma}_i = 814 + 1000 = 1814$$

$$\bar{\sigma}_f = 814 + 25 \times 120 = 3814$$

$$\begin{aligned} S_u &= \frac{C_r}{1+e_0} \cdot L \cdot \log \frac{\bar{\sigma}_i}{\bar{\sigma}_0} + \frac{C_c}{1+e_0} \cdot L \cdot \log \frac{\bar{\sigma}_f}{\bar{\sigma}_i} \\ &= \frac{0.05}{1+0.90} \times 20 \times \log \frac{1814}{814} + \frac{0.40}{1+0.90} \times 20 \times \log \frac{3814}{1814} \\ &= 1.542 \text{ ft} = 18.5 \text{ inch} \end{aligned}$$

- 二、如上之土層，假設黏土層之上、下方均為完全透水邊界。

(1) 計算第300天時，其壓密沉陷量 S ?

(2) 需要多少天才會沉陷10 inches?

$$(1) \quad t=300 \text{ 天} \quad T = \frac{C_v \cdot t}{H^2} = \frac{0.1 \times 300}{10^2} = 0.3$$

查表或利用第四題之Excel試算表可得知：當 $T=0.3$ 時 $U=0.613$

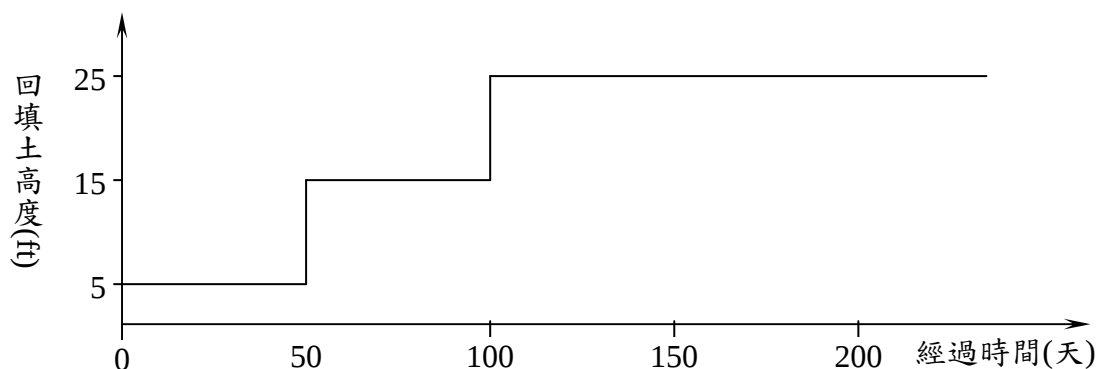
$$\text{所以 } S = S_u \times U = 18.5 \times 0.613 = 11.34 \text{ inch}$$

$$(2) \quad S = 10 \text{ inch} \Rightarrow U = S/S_u = 10/18.5 = 0.541$$

查表或利用第四題之Excel試算表可得知：當 $U=0.541$ 時 $T=0.231$

$$\text{所以 } t = \frac{T \cdot H^2}{C_v} = \frac{0.231 \times 10^2}{0.1} = 231 \text{ 天}$$

- 五、若第一題之土層受到如下圖所示之載重，試計算此一粘土層在第30, 80, 150, 300天時之壓密沉陷量。



提示： $U = U_1W_1 + U_2W_2 + U_3W_3$

$$W_1 = 5/25 = 0.2 \quad W_2 = W_3 = 10/25 = 0.4$$

(1) $t=30$ 天 $t_1=30$ 天 $T_1 = \frac{0.1 \times 30}{10^2} = 0.03 \Rightarrow U_1 = 0.1954$

$$U = 0.1954 \times 0.2 = 0.039 \Rightarrow S = 18.5 \times 0.039 = 0.72 \text{ inch}$$

(2) $t=80$ 天 $t_1=80$ 天 $T_1 = \frac{0.1 \times 80}{10^2} = 0.08 \Rightarrow U_1 = 0.3192$

$$t_2 = 80 - 50 = 30 \text{天} \quad T_2 = \frac{0.1 \times 30}{10^2} = 0.03 \Rightarrow U_2 = 0.1954$$

$$U = 0.3192 \times 0.2 + 0.1954 \times 0.4 = 0.142 \Rightarrow S = 18.5 \times 0.142 = 2.63 \text{ inch}$$

(3) $t=150$ 天 $t_1=150$ 天 $T_1 = \frac{0.1 \times 150}{10^2} = 0.15 \Rightarrow U_1 = 0.4369$

$$t_2 = 150 - 50 = 100 \text{天} \quad T_2 = \frac{0.1 \times 100}{10^2} = 0.10 \Rightarrow U_2 = 0.3568$$

$$t_3 = 150 - 100 = 50 \text{天} \quad T_3 = \frac{0.1 \times 50}{10^2} = 0.05 \Rightarrow U_3 = 0.2523$$

$$U = 0.4369 \times 0.2 + 0.3568 \times 0.4 + 0.2523 \times 0.4 = 0.331$$

$$\Rightarrow S = 18.5 \times 0.331 = 6.12 \text{ inch}$$

(4) $t=300$ 天 $t_1=300$ 天 $T_1 = \frac{0.1 \times 300}{10^2} = 0.30 \Rightarrow U_1 = 0.6132$

$$t_2 = 300 - 50 = 250 \text{天} \quad T_2 = \frac{0.1 \times 250}{10^2} = 0.25 \Rightarrow U_2 = 0.5622$$

$$t_3 = 300 - 100 = 200 \text{天} \quad T_3 = \frac{0.1 \times 200}{10^2} = 0.20 \Rightarrow U_3 = 0.5041$$

$$U = 0.6132 \times 0.2 + 0.5622 \times 0.4 + 0.5041 \times 0.4 = 0.549$$

$$\Rightarrow S = 18.5 \times 0.549 = 10.16 \text{ inch}$$