LECTURE 29

Settlement Calculations

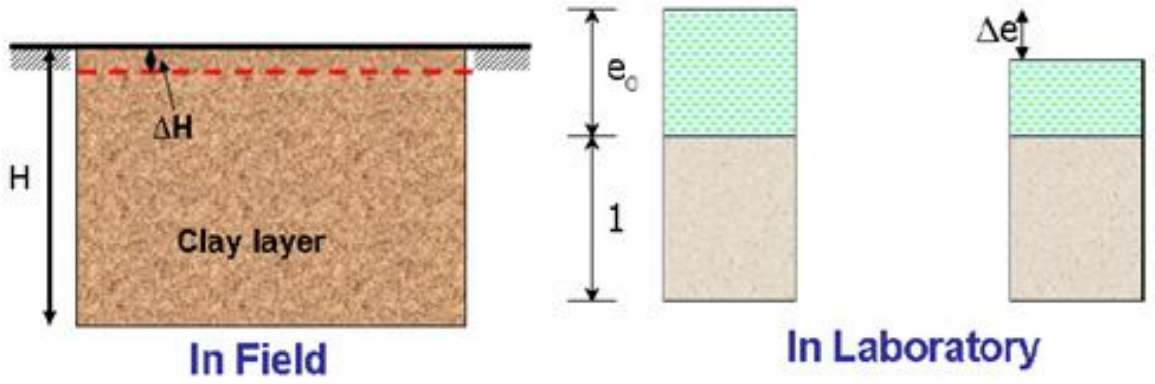


Figure: Compression of field deposit

If the clay layer of thickness H when subjected to an increase in average effective overburden pressure from σ'_0 to σ'_1 ($\sigma'_0+\Delta\sigma'$) there will be consolidation settlement of ΔH.

The strain $\varepsilon = \dfrac{\Delta H}{H}$ *in field*

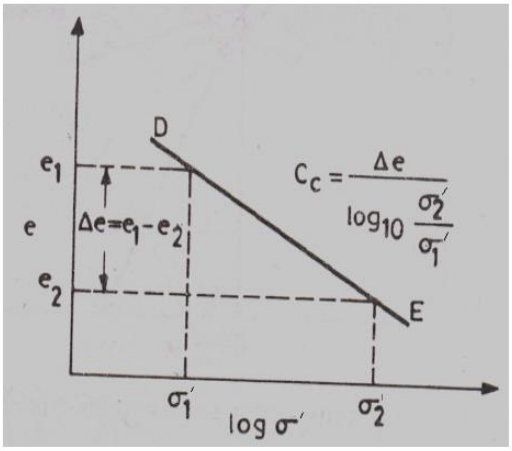
$\varepsilon = \dfrac{\Delta e}{1+e_0}$ *in lab*

Equating

$$\frac{\Delta H}{H} = \frac{\Delta e}{1 + e_0}$$

$$\Delta H = \frac{\Delta e \; H}{1 + e_0}$$

Case-1 For normally consolidated soils



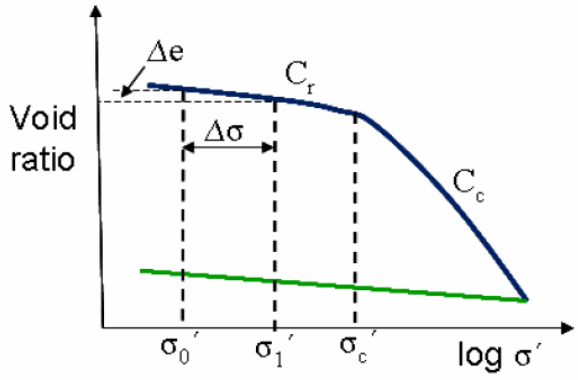
$$C_c = \frac{\Delta e}{\log_{10}\frac{\sigma_1'}{\sigma_0'}} = \frac{\Delta e}{\log_{10}\left(\frac{\sigma_0' + \Delta\sigma}{\sigma_0'}\right)}$$

$$\Delta e = C_c \log_{10}\left(\frac{\sigma_0' + \Delta\sigma}{\sigma_0'}\right)$$

$$\Delta H = \frac{C_c}{1+e_0} H \log_{10}\left(\frac{\sigma_0' + \Delta\sigma}{\sigma_0'}\right)$$

Case-2 Over consolidated soils

Case 1: $\sigma_1' < \sigma_c'$

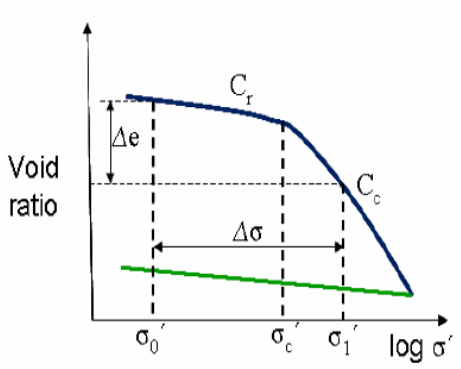


$$\Delta e = C_r \log_{10}\left(\frac{\sigma_1'}{\sigma_0'}\right)$$

$$\Delta H = \frac{C_r}{1+e_0} H \log_{10}\left(\frac{\sigma_0' + \Delta\sigma}{\sigma_0'}\right)$$

$$\sigma_0' < \sigma_c' < \sigma_1'$$

Case 2:



$$\Delta e = \Delta e_1 + \Delta e_2$$

$$\Delta e = C_r \log_{10}\left(\frac{\sigma_c'}{\sigma_0'}\right) + C_c \log_{10}\left(\frac{\sigma_1'}{\sigma_c'}\right)$$

$$\Delta H = C_r \log_{10}\left(\frac{\sigma_c'}{\sigma_0'}\right) + C_c \log_{10}\left(\frac{\sigma_0' + \Delta\sigma}{\sigma_c'}\right)$$