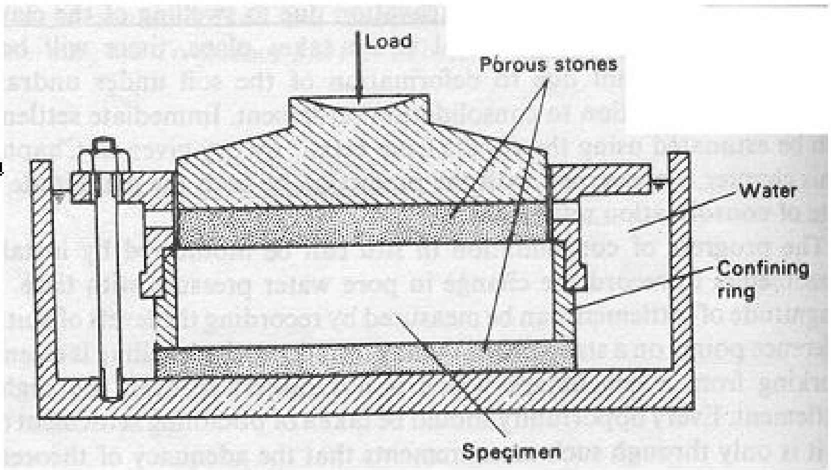
4. Oedometer test

1) Test set-up



Diameter75 mm
Thickness 15-20 mm

[Fig. 1] The oedometer. *(p.127, 그림 5.6)*

2) Test procedures

① A sequence of pressures applied *(p.127, KS F 2316)*

② Initial pressure = (the in-situ effective stress)
(except for soft & very soft clays)

③ Loaded for a period of ($24^h(48^h)$)

④ Changes in thickness measured by dial gages at suitable intervals
(text p.127; 표 5.1)

⑤ Pressures doubled up to (the stress range of interest)

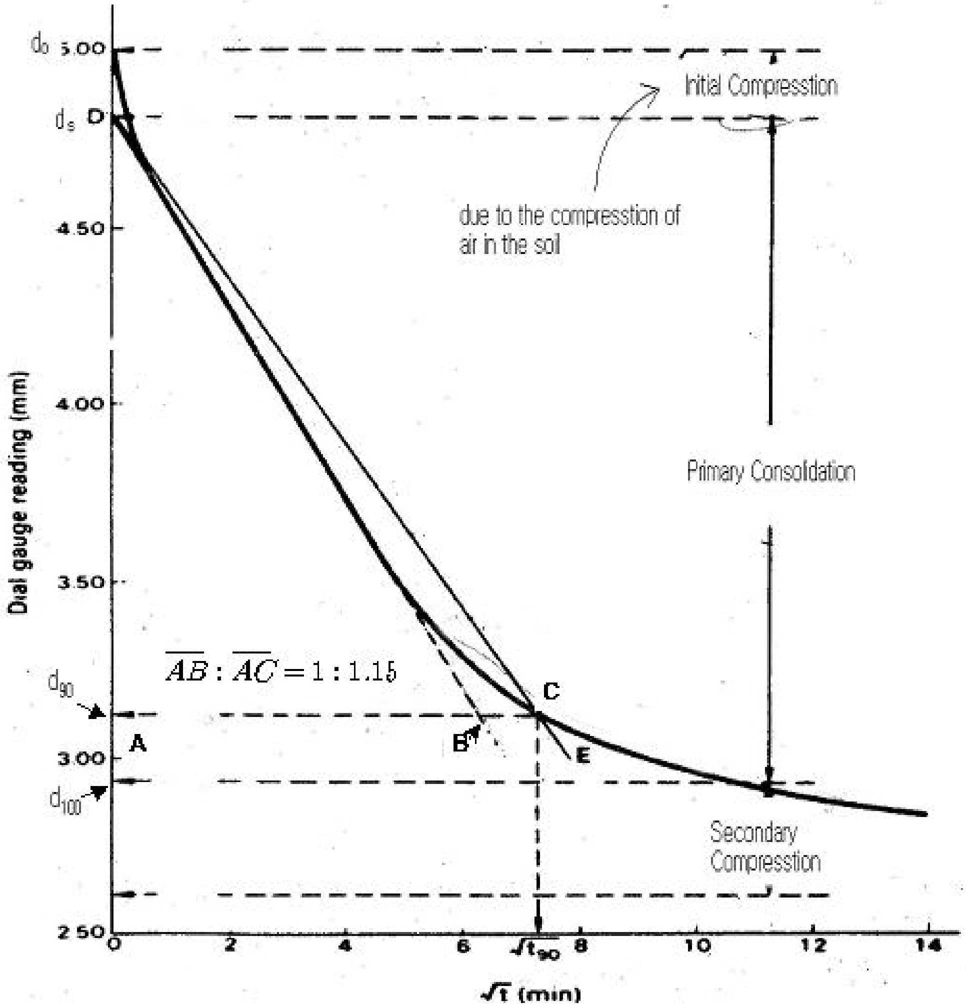
⑥ After final load application, the load is removed in several stages

3) Test results & interpretations

i) Dial gage reading vs. time

- determines (C_v, C_h)

$\sqrt{t}$ method



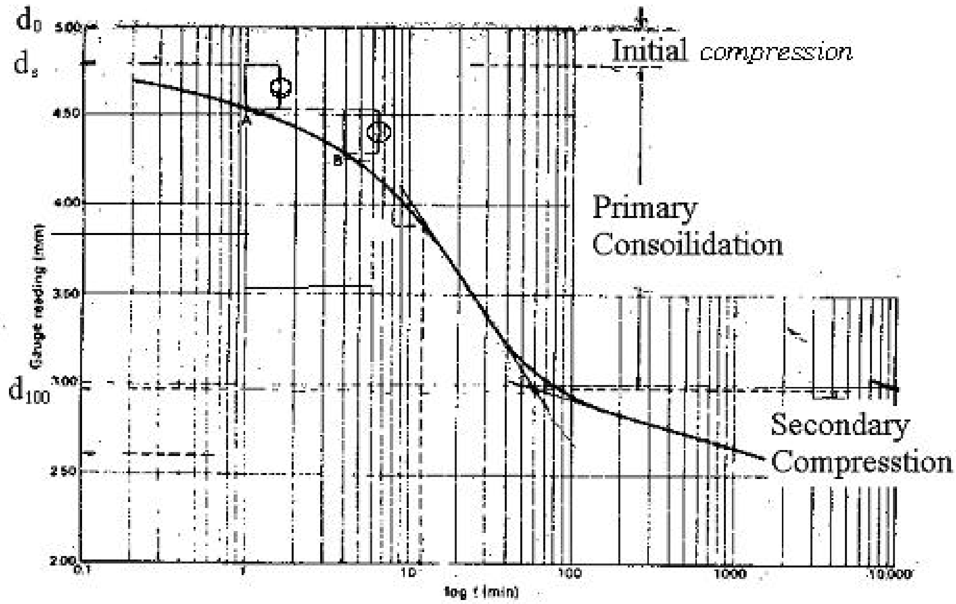
[Fig. 10] The root time method.

- $C_v = \dfrac{TH^2}{t} = \dfrac{0.848H^2}{t_{90}}$, *H: one half of the specimen thickness*

$\uparrow$

$\dfrac{C_v \tau}{H^2} = 1 \rightarrow C_v = \dfrac{H^2}{\tau} = \dfrac{H^2}{\frac{t}{T}} = \dfrac{H^2 T}{t}$

log t method



[Fig. 17] The log time method.

at t_1 at t_2

a) Two points (A, B) on the curve are selected for which t are in the ratio of 1:4. $t_2 = 4t_1$

b) An equal distance (with the vertical distance between A & B) set off above the first point (A) gives the point d_s

c) d_{100} is taken as the intersection of the two linear parts of the curve.

- $C_v = \frac{TH^2}{t} = \frac{0.196H^2}{t_{50}}$ $\qquad$ $d_{50} = \frac{d_s + d_{100}}{2}$

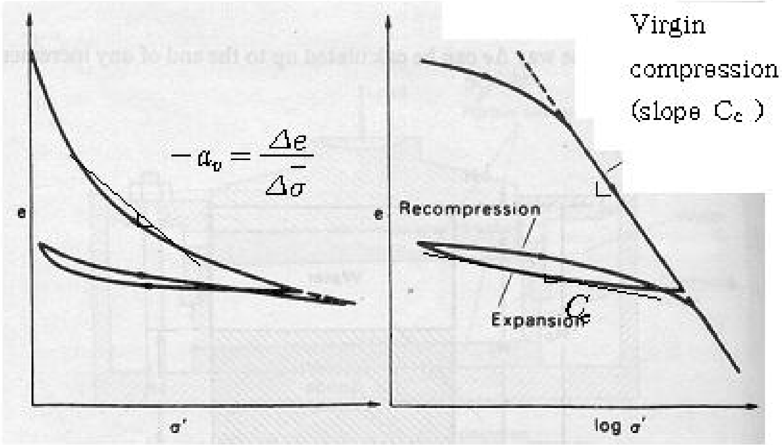
$\sqrt{t}$ vs. log t method *(보충자료 #1)*

- $\sqrt{t}$ requires a much shorter period of time

- a straight line portion is not always obtained on the $\sqrt{t}$ plot

ii) Void ratios vs. effective overburden pressures (e vs. $\bar{\sigma}$, e vs. $\log \bar{\sigma}$)

- determines (a_v, C_c / C_e, m_v)



[Fig. 4] Void ratio-effective stress relationship.

a_v : the coefficient of compressibility

C_c : the compression index

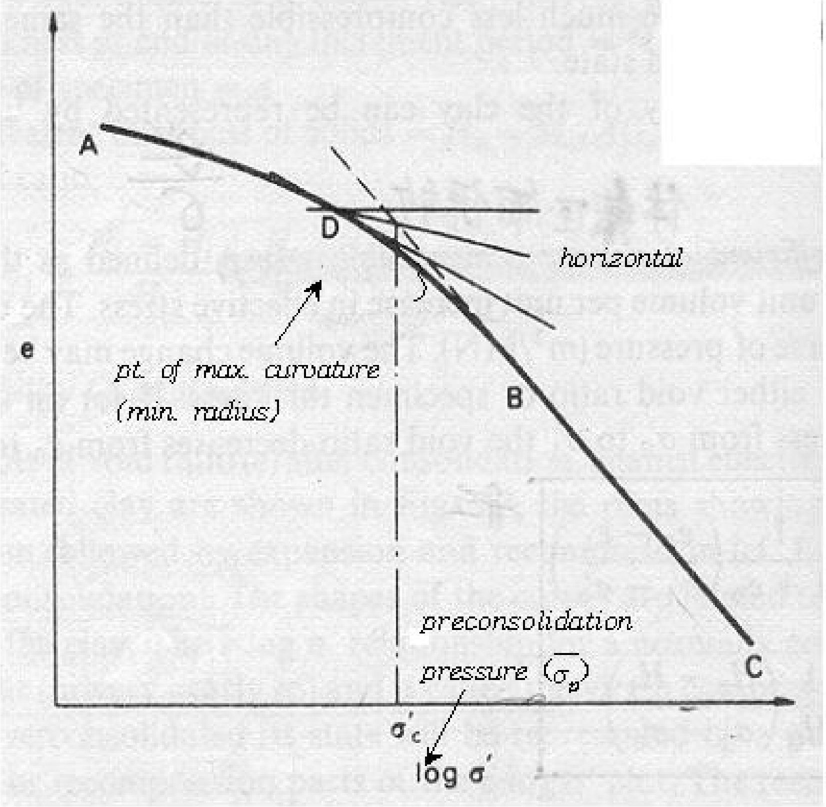
C_e : the expansion index (or C_r , C_s : recompression, swelling)

m_v : the coefficient of volume compressibility

$$= \frac{\varepsilon_v}{\Delta \bar{\sigma}} = \frac{\varepsilon_z}{\Delta \bar{\sigma}} \qquad (\because \text{ laterally confined})$$

$$= \frac{a_v}{1+e_0} \qquad (\because \ \epsilon_c = \frac{\Delta e}{1+e_0})$$

iii) Determination of Pre-consolidation pressure



[Fig. 5] Determination of preconsolidation pressure (Casagrande)

If $\overline{\sigma_c} = \overline{\sigma_o}$: NC

If $\overline{\sigma_c} > \overline{\sigma_o}$: OC $\overline{\sigma_0}$: the effective overburden pressure