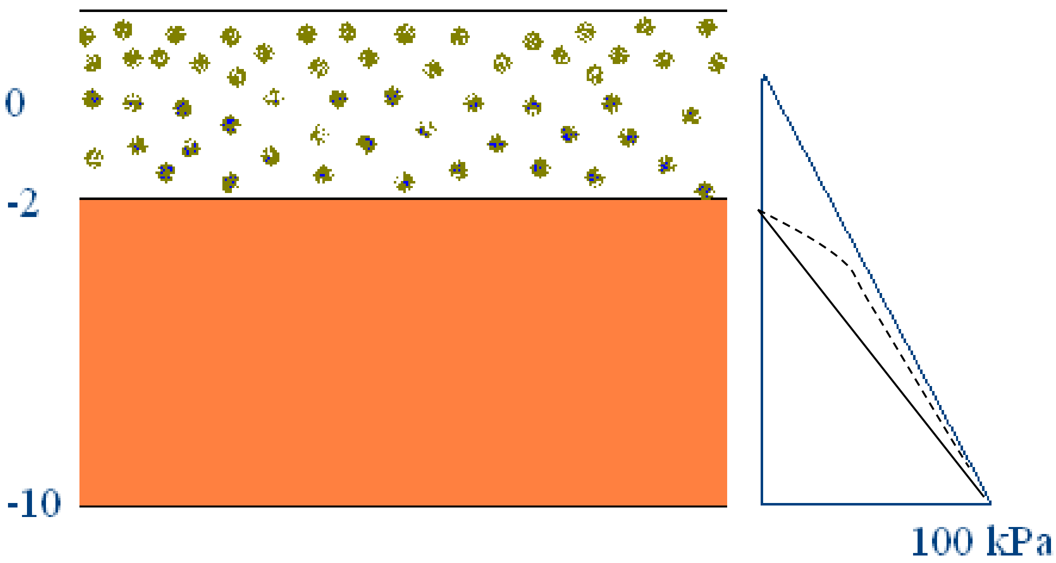
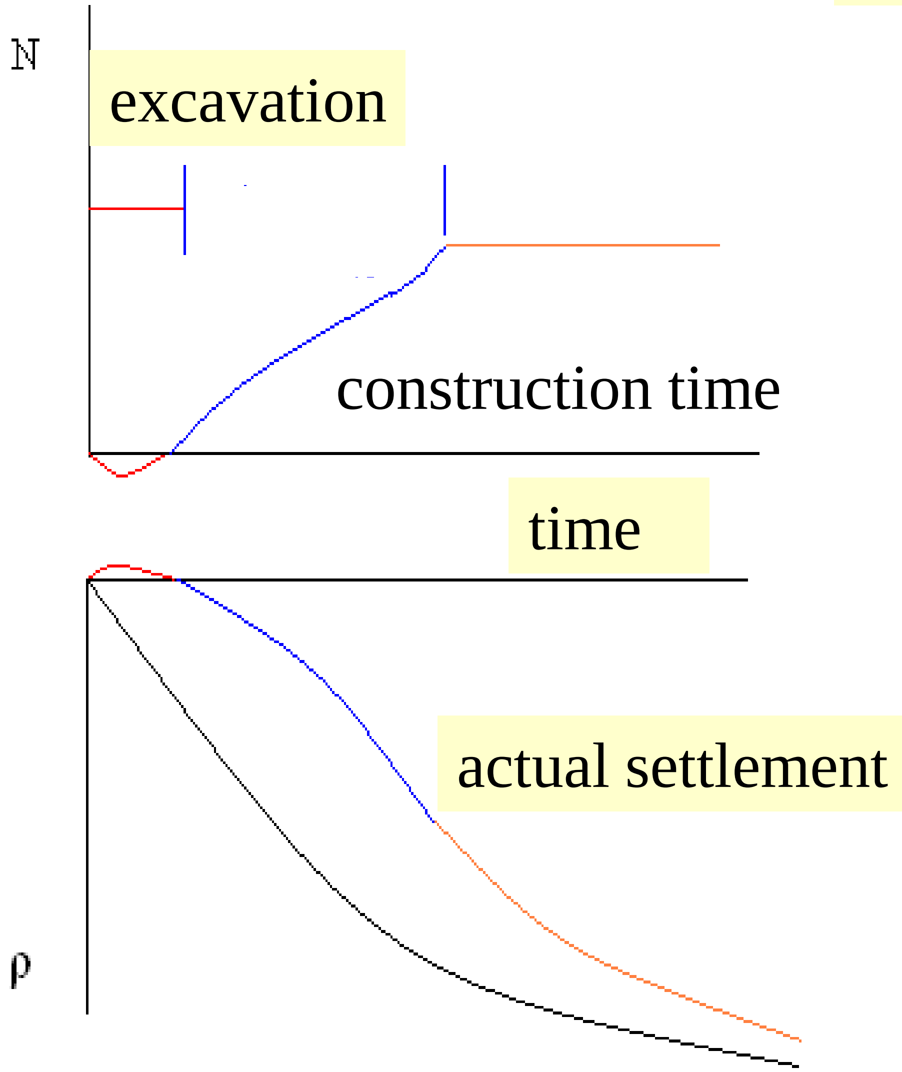
Triangular distribution of initial excess pore pressure



- **Excess pore pressure dissipation**
- →
- **Increase in effective stress**

- **Lowering the water table**
- **Pumping of water at the bottom of the clay layer**

Taylor (1948)



- $t<t_{construction}$

$\rho_t=\rho_{t'} * N/N_{total}$

where $t'=0.5t$

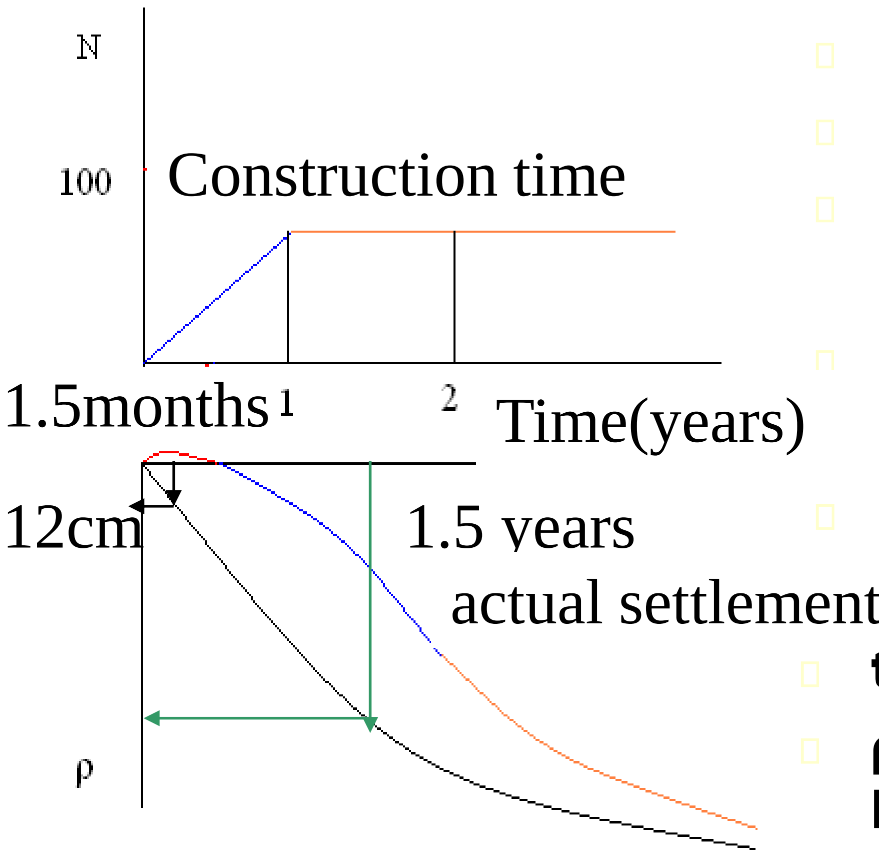
- $t>t_{construction}$

$\rho_t=\rho_{t'}$

Where

$t=t-0.5t_{constr.}$

Linear increment of construction load



- $t<t_{construction}$
- $\rho t=\rho t' * N/N_{total}$
- where $t'=0.5t$

- $t>t_{construction}$
- $\rho t=\rho t'$ where
- $t=t-0.5t\kappa\alpha\tau$

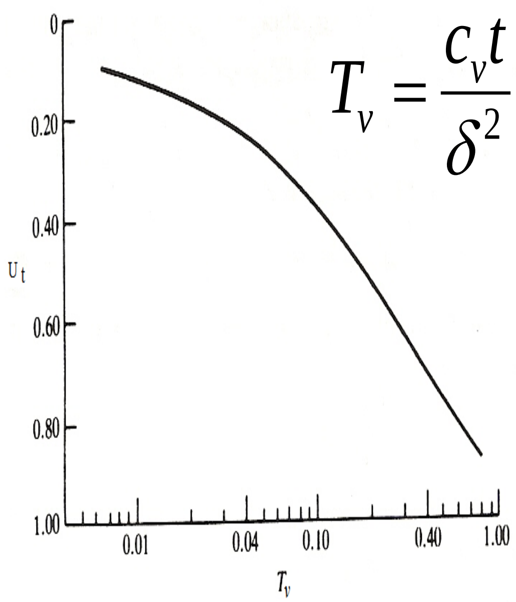
- **t=3 months**
- **$\rho t=\rho t' *0.25$ N/Noλ΄=3/12=0.25**

Find settelement after 3 months from beginning of construction

- **t=2 years**
- **$\rho t=\rho t'$ where**
- **$t=t-0.5t_{constr}=$**
- **1.5 years**

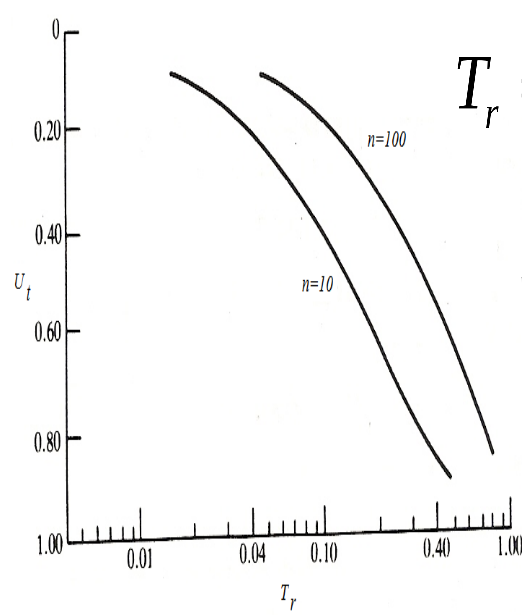
One-dimensional & Radial consolidation

1 x D consolidation
(Taylor, 1948)



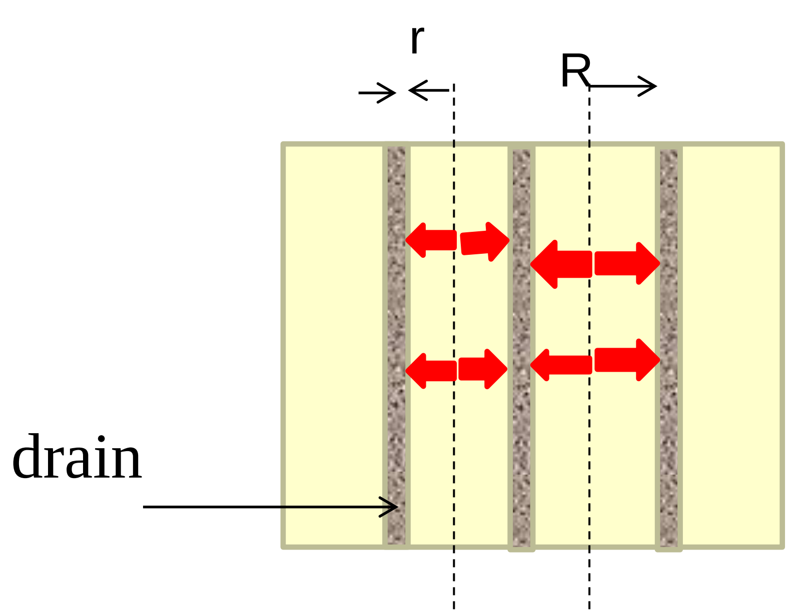
$$T_v = \frac{c_v t}{\delta^2}$$

Radial consolidation
(Barron, 1948)



$$T_r = \frac{c_r t}{R^2}$$

n=R/r



DRAINS

Anisotropic soil properties

k_r/k_v=2-10 for normally consolidated clays

(where r,v radial and vertical direction)

Drains

Triangular or	De=1.13 * S
rectangular layout	De=1.05 * S
where	De: equivalent dia or diameter of influence
και	S: distance between drains

Define

The distance S between drains and the radius Rd of the drain for average degree of consolidation U>90% at a time t

Calculation

The optimum design of the drains is defined by trial and error for various combinations of S & Rd

AVERAGE DEGREE OF CONSOLIDATION FOR VERTIVAL & RADIAL DRAINAGE

1-U = (1-Uz) * (1-Ur)

where Uz , Ur are the average degrees of consolidation for independent vertical and radial drainage conditions

$$T_v = \frac{c_v * t}{H^2}$$

$$T_r = \frac{c_r * t}{D_e^2}$$

where D_e the drain ‘diameter of influence’

$$U_r = 1 - \exp(-8 * T_r / A) \quad (1)$$

&

$$A = \ln\left[\frac{\mathrm{Re}}{Rd}\right] - \frac{3}{4} + \left[\frac{k_r}{k_{r,s}} - 1\right]\ln\left[\frac{Rs}{Rd}\right]$$

SMEAR ZONE
(ΖΩΝΗ ΑΝΑΜΟΧΛΕΥΣΗΣ)

Calculation of Ur from the exact analysis (equation 1) takes into account the existance of a smear zone having coefficient of permeability $k_{r,s}$ and diameter D_s.

assumptions:

• smear zone diameter $D_s = 2 \sim 3 * D_d$

where Dr is drain diameter

• the coefficient of permeability for the smear zone is similar to the coefficient of the soil permeability in the vertical direction

$$k_{r,s} / k_v = 1 \sim 1.5$$