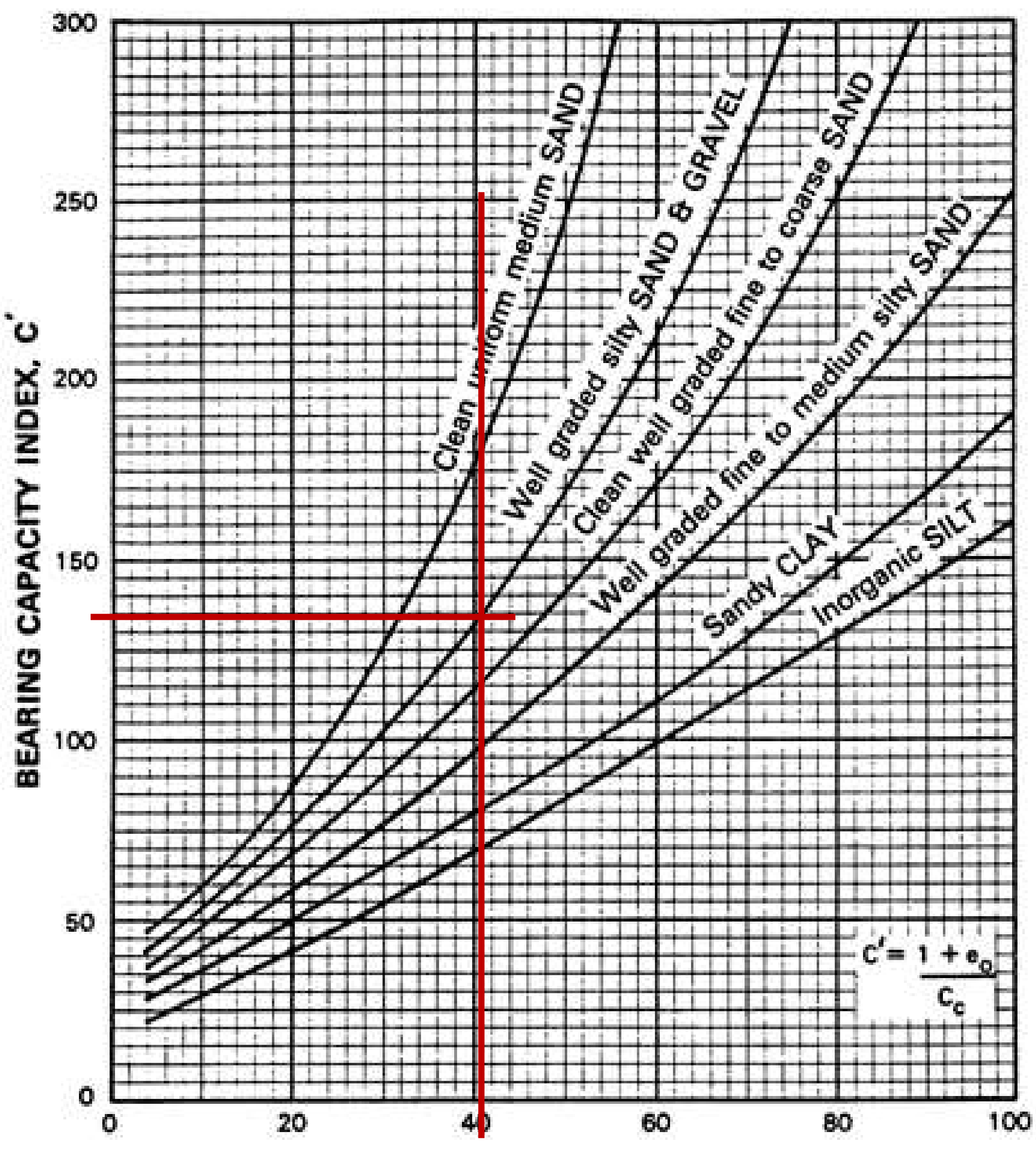
Immediate Settlement – Use of SPT Index

$$\varepsilon = \frac{1}{C'} \log_{10}\left(\frac{\sigma_o + \Delta\sigma'_v}{\sigma_o}\right)$$

or

$$s = \int_0^H \varepsilon dz = \sum_{i=1}^{n} \frac{H_i \Delta\sigma_{zi}}{E_{si}} \longleftarrow M_i$$



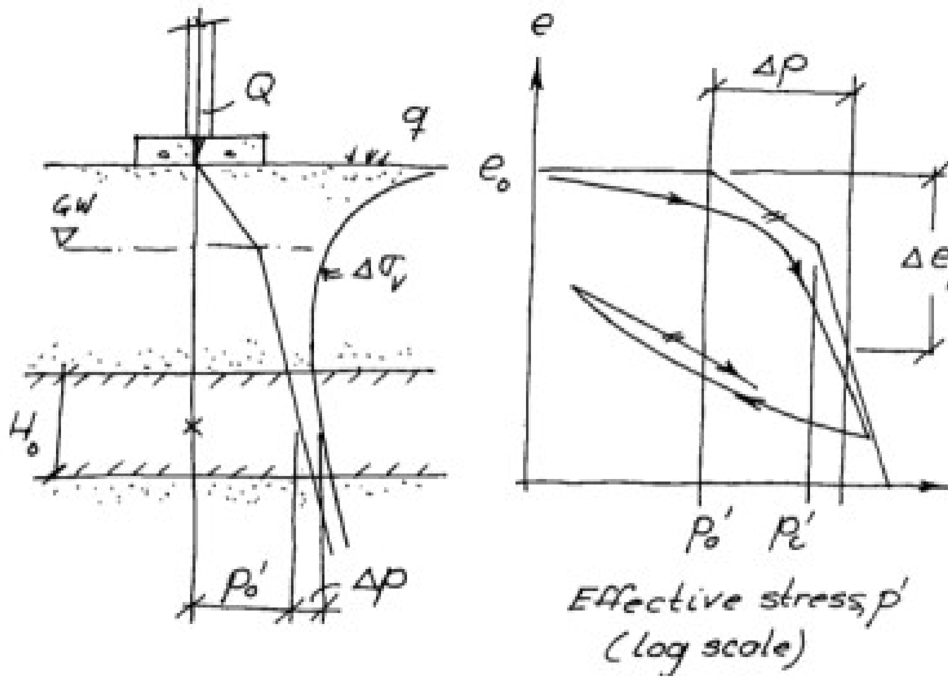
*N'—SPT (N) Value Corrected for Overburden Pressure.

Hough, "Compressibility as a Basis for Soil Bearing Value" ASCE 1959

Consolidation Settlement

Δu must be determined using Skempton's pore pressure parameters should be used for 2-D or 3-D load applications

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



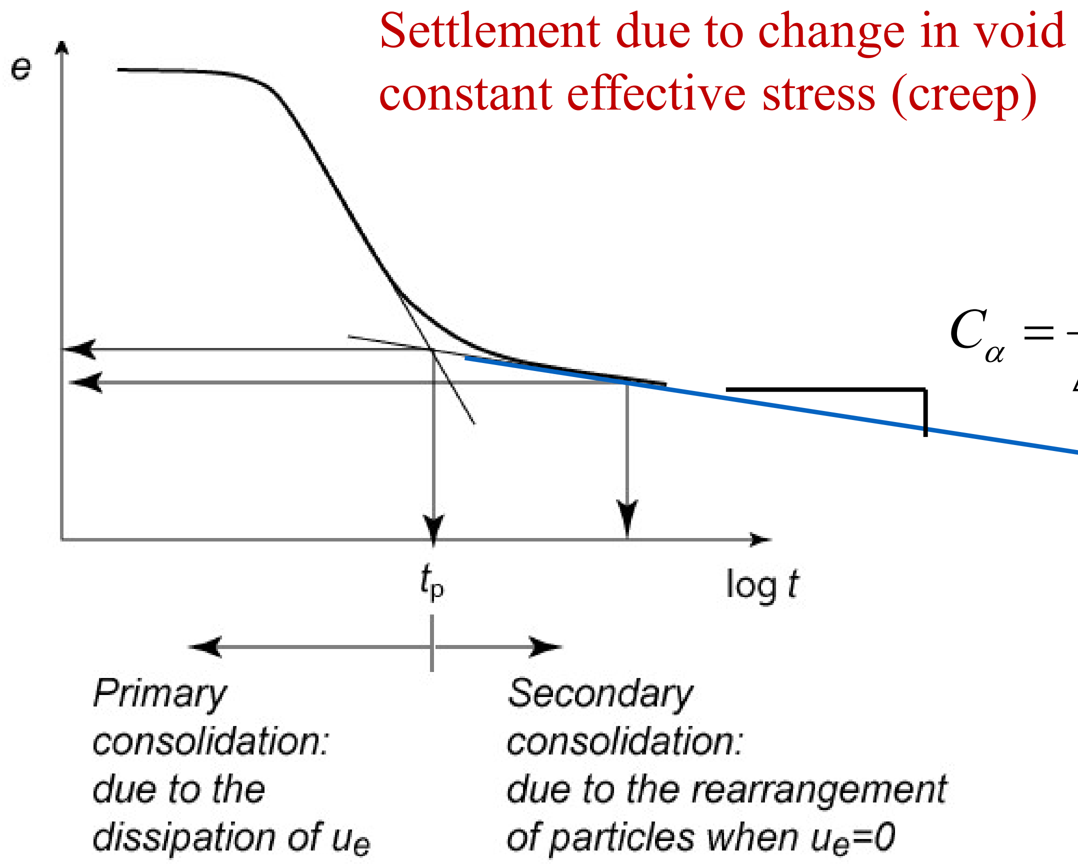
$$s_c = s_{c1} + s_{c2}$$

$$s_c = C_c \frac{\log(\sigma_1' / \sigma_c')}{1+e_0} H + C_e \frac{\log(\sigma_c' / \sigma_0')}{1+e_0} H$$

virgin rebound

For 2 or 3-D, the focus is on Δu, not on $\Delta\sigma$ for consolidation; $\Delta\sigma' = -\Delta u$

Secondary Consolidation Settlement



$$C_\alpha = \frac{\Delta e_s}{\Delta \log t}$$

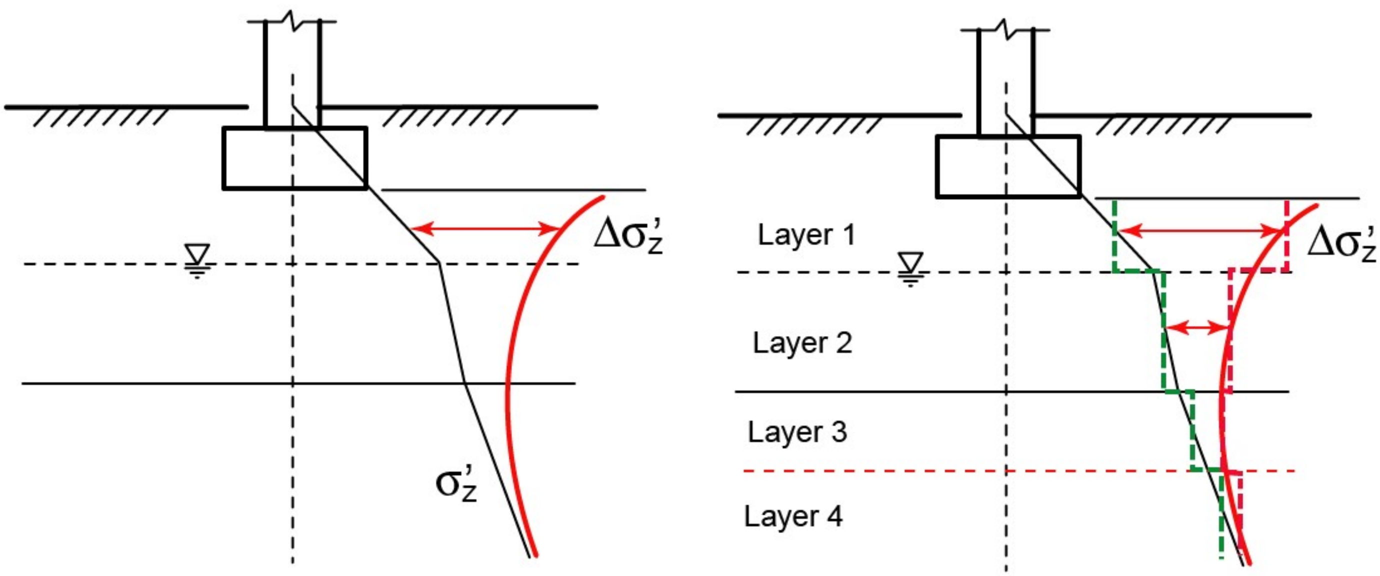
Secondary compression index, C_α		
$C_\alpha = 0.00168 + 0.00033 I_P$		Nakase et al. (1988)
$= 0.0001 w_N$		NAFAC DM7.1 p. 7.1–237
$C_\alpha = 0.032 C_c$	$0.025 < C_\alpha < 0.1$	Mesri and Godlewski (1977)
$= 0.06$ to $0.07 C_c$	Peats and organic soil	Mesri (1986)
$= 0.015$ to $0.03 C_c$	Sandy clays	Mesri et al. (1990)

$$s_s = \frac{C_\alpha}{1+e_0} H \Delta \log t = \frac{C_\alpha}{1+e_0} H \log\left(t/t_p\right)$$

C_α = secondary compression index (dimensionless), which is defined as the slope of the secondary compression curve.

e_0 = void ratio at the end of primary consolidation.

Settlement Determination



- Divide soil layer into several sublayers
- Calculate change of stress at the center of each sublayer
- Assume uniform stress distribution in each sublayer
- Calculate the settlement of each sublayer s_i
- $s = \Sigma s_i$