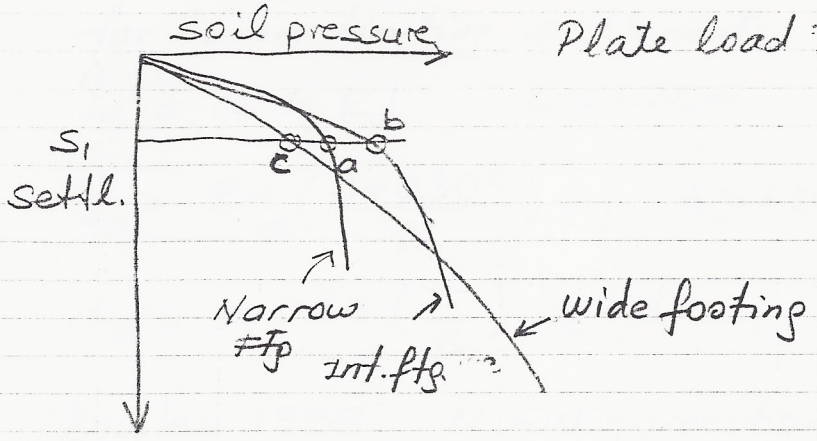
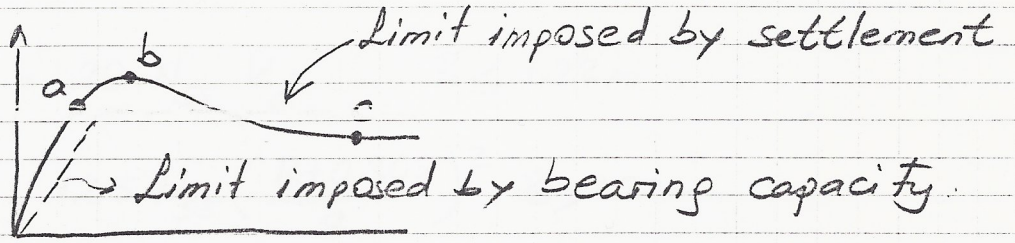
DATE

BEARING CAPACITY OF SHALLOW FOUND. from SPT:





Peck & Hanson & Thornburn Charts

for $B > 4$ ft (1.2m) → usually the case in practice

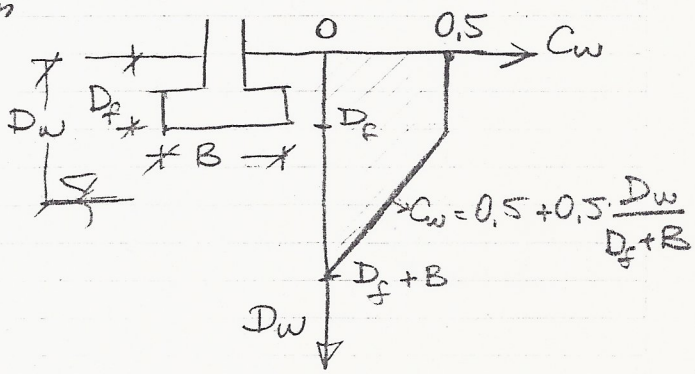
$$q_a = C_w (0.41) N'_{55} \Delta H$$

q_a = allowable net bearing pressure in kPa that will cause a settlement of ΔH in mm

N'_{55} = average corrected (C_N) standard penetration test blow count (Average of N within 2B depth from foundation level)

ΔH = settlement in mm

C_w = water table correction factor



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Meyerhof (1956, 1974): No GW correction for 25mm limiting settlements

$q_a = 12 N_{55} K_d \quad B \leq 1.22m$

$q_a = 8 N_{55} \left(\frac{B+0.305}{B}\right)^2 K_d \quad B > 1.22m$

$K_d = 1 + 0.33 \left(\frac{D}{B}\right) \leq 1.33.$

Bowles 1988 N GW correction: for 25mm settlement

$q_a = 20 N_{55} K_d \quad B \leq 1.22m$

$q_a = 12.5 N_{55} \left(\frac{B+0.305}{B}\right)^2 \quad B > 1.22m.$

K_d: same as above.

For mat foundations since limiting settlements are ~ 50 mm, you may double the bearing capacity for mat found.

DATE

SETTLEMENT PREDICTIONS FROM SPT:

* Unless underlain by very loose sands, footings subjected to conventional soil pressures rarely settle enough to cause distress in the structure
* Relative density and compressibility of sands vary significantly and erratically from place to place. Same footing on the same sand deposit same size settlements vary over a wide range. Fig. 50.2 (Mesri)

Methods:

i. Burland, Broms and De Mello: (Craig).

ii. Burland and Burbidge (Tomlinson & Mesri).

iii. Schultz & Sheriff. (Tomlinson)

iv. Meyerhof (Coduto)

v. Parry (Sheet)

DATE

SETTLEMENT from SPT

BURLAND & BURBIDGE (1985) METHOD

$S = \epsilon_z \cdot H$ — ϵ_z: strain; H: compressible layer thickness

$H = B^{0.7}$ $\quad \epsilon_z = \frac{q_n}{E_s}$ — q_n: net found. pressure; E_s: deformation modulus

$E_s \cong \frac{\bar{N}_{60}^{1.4}}{1.71}$

$S = q_n B^{0.7} \frac{1.71}{\bar{N}_{60}^{1.4}}$

S: mm; B: m; $q_n = kN/m^2$

$\bar{N}_{60}$: average N_{60} value over a depth of influence of Z_I (Apply correction for GWL $N = 15 + \frac{1}{2}(N-15)$)

$Z_I = 2B$ if $\bar{N}_{60}$ is decreasing with depth (not usual)

Z_I = From Fig. 2.27 (plate) if $\bar{N}_{60}$ is constant or increasing with depth.

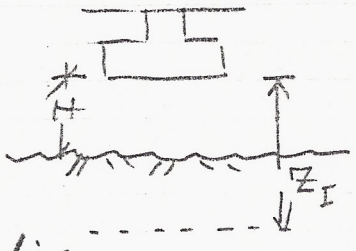
General Equation:

$$S = f_s f_e f_t \left[\left(q_n - \frac{2}{3} p_c'\right)\right] \cdot B^{0.7} \cdot \frac{1.71}{\bar{N}_{60}^{1.4}}$$

p_c' = max. past eff. overburden pressure

Shape factor $f_s = \left(\frac{1.25\ L/B}{L/B + 0.25}\right)^2$

$f_e = \frac{H}{Z_I}\left(2 - \frac{H}{Z_I}\right)$ $\quad H < Z_I$



$f_t = (1 + R_3 + R \log \frac{t}{3})$

$R \cong 0.2$ $\quad R_3 \cong 0.3$ static loading

$R \cong 0.7$ $\quad R_3 = 0.8$ for cyclic loading.

MODIFIED MEYERHOF'S METHOD

for $B \leq 4ft$ (1.2m)

$$\frac{\delta}{B_r} = \frac{0.44\, q_n / \sigma_r}{\overline{N_{60}}\, K_d}$$

for $B > 4ft$ (1.2m)

$$\frac{\delta}{B_r} = \frac{0.68\, q_n / \sigma_r}{\overline{N_{60}}\, K_d} \cdot \left[\frac{B}{B + B_r}\right]^2$$

δ: settlement

B_r: reference width = 1ft = 0.3m

q_n: net bearing pressure

σ_r: reference stress = 100 kN/m²

$\overline{N_{60}}$: average SPT N_{60} value between the bottom of the footing and a depth 2B below the bottom

B: width of footing

K_d: depth factor. $K_d = (1 + 0{,}33\,\frac{D}{B}) \leq 1.33$

formulas are valid for all shapes

Note: do not correct N_{60} for overburden but for dense silty sand below GWT:

$$N_{60} = 15 + 0.5\,(N_{60\,field} - 15)$$

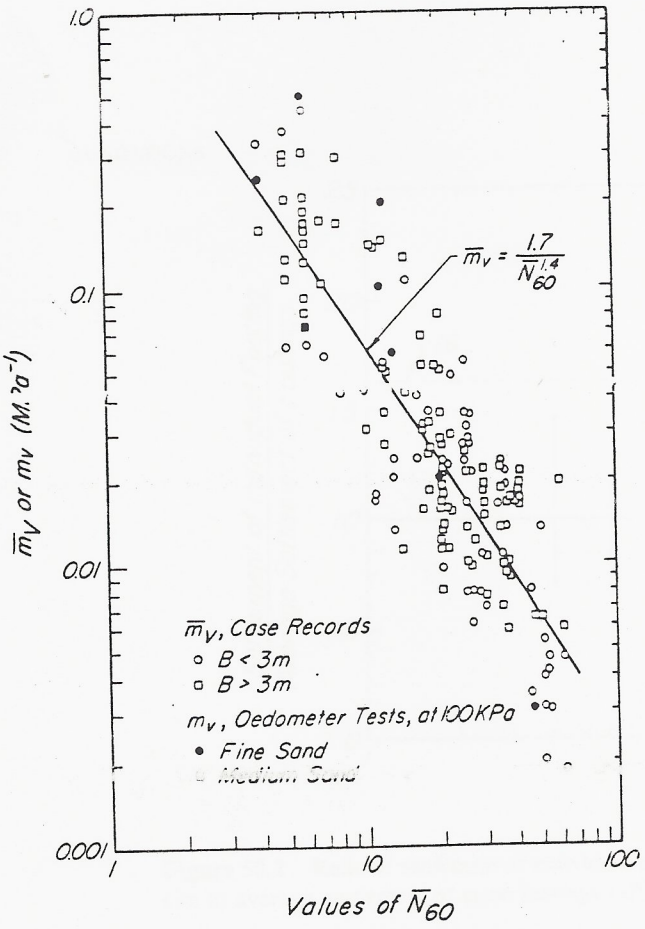


Figure 50.3 Relation between dynamic standard penetration test $\bar{N}_{60}$ values and compressibility $\bar{m}_V$ or m_v of sand (data from Burland and Burbidge 1985).

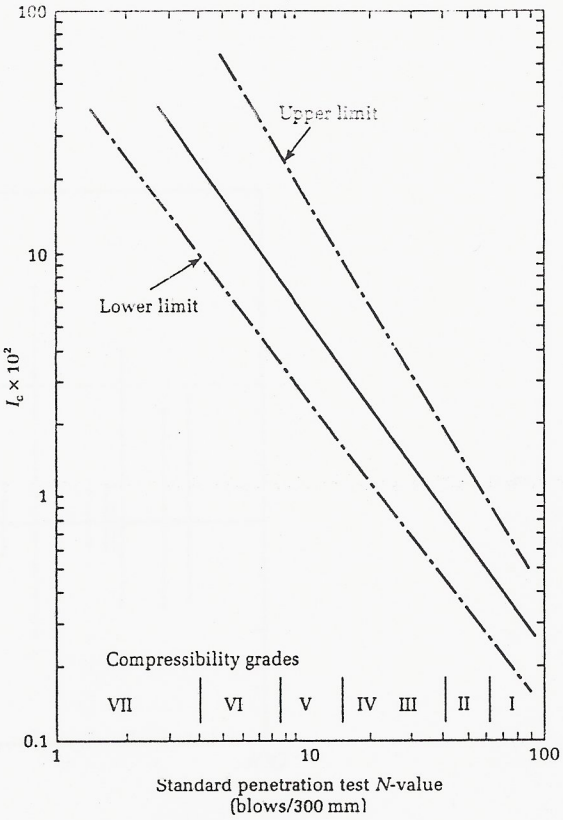


Figure 2.26 Values of the compressibility index for sands and gravels (after Burland and Burbidge[2.17]).

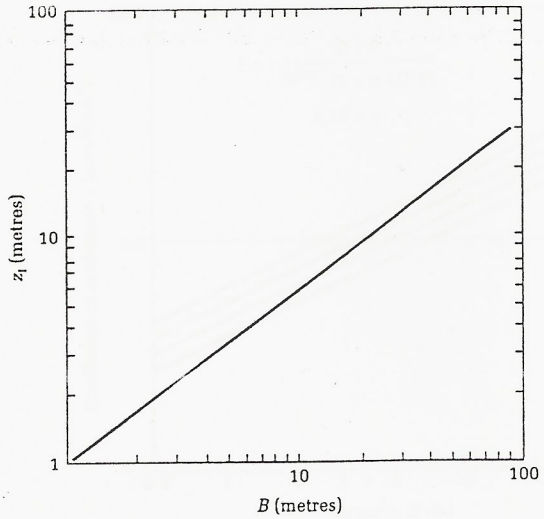


Figure 2.27 Relationship between breadth of loaded area and depth of influence z_1 (after Burland and Burbidge[2.17]).

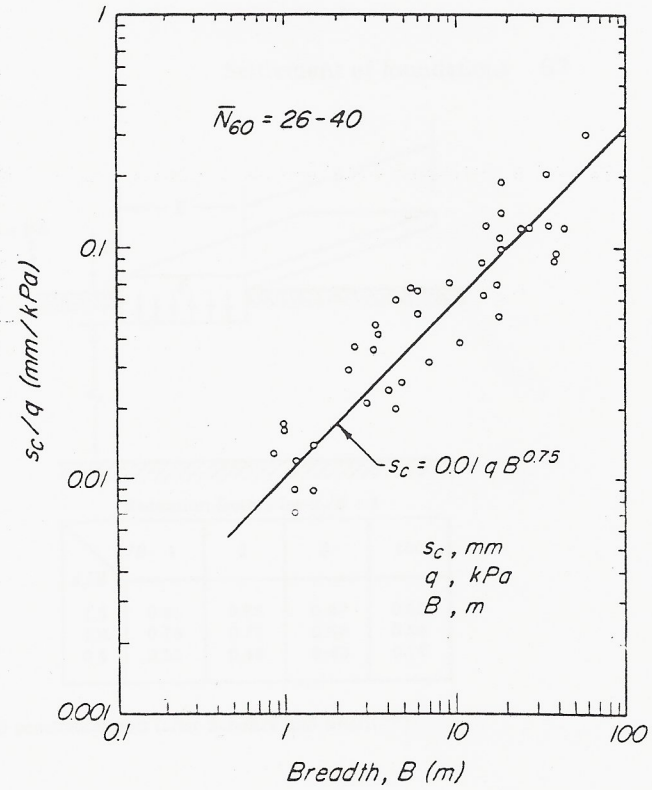


Figure 50.5 Relation between settlement at end of construction of footing on sand and width of footing, for sands having standard penetration resistances $\bar{N}_{60}$ between 26 and 60 (after

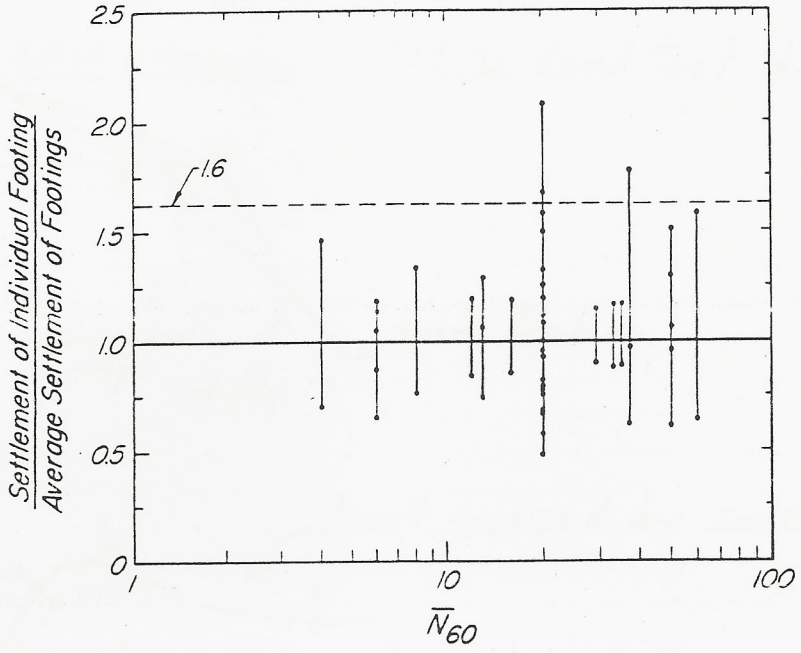
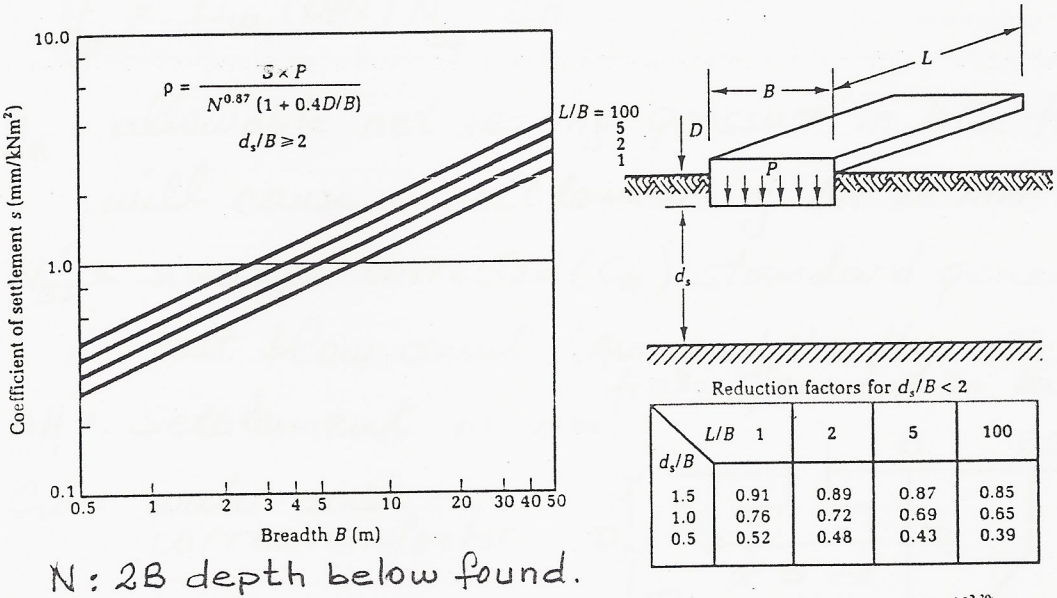


Figure 50.2 Ratio of settlement of individual equally loaded footings of same size at a given site to average settlement of same footings (after Burland and Burbidge 1985).



d_s/B \ L/B	1	2	5	100
1.5	0.91	0.89	0.87	0.85
1.0	0.76	0.72	0.69	0.65
0.5	0.52	0.48	0.43	0.39