Case IV. $e_L/L < \frac{1}{6}$ and $e_B/B < \frac{1}{6}$. Figure 3.23a shows the effective area for this case. The ratio B_2/B, and thus B_2, can be determined by using the e_L/L curves that slope upward. Similarly, the ratio L_2/L, and thus L_2, can be determined by using the e_L/L curves that slope downward. The effective area is then

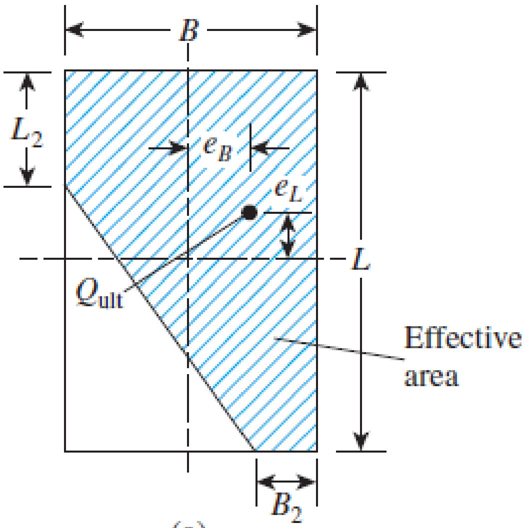
$$A' = L_2B + \tfrac{1}{2}(B + B_2)(L - L_2) \tag{3.64}$$

The effective width is

$$B' = \frac{A'}{L} \tag{3.65}$$

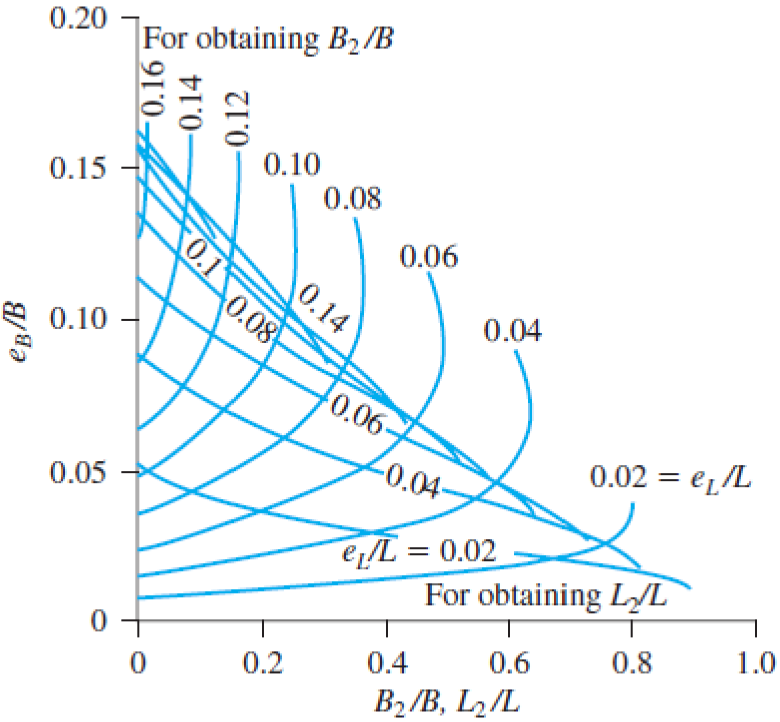
The effective length is

$$L' = L \tag{3.66}$$



(a)

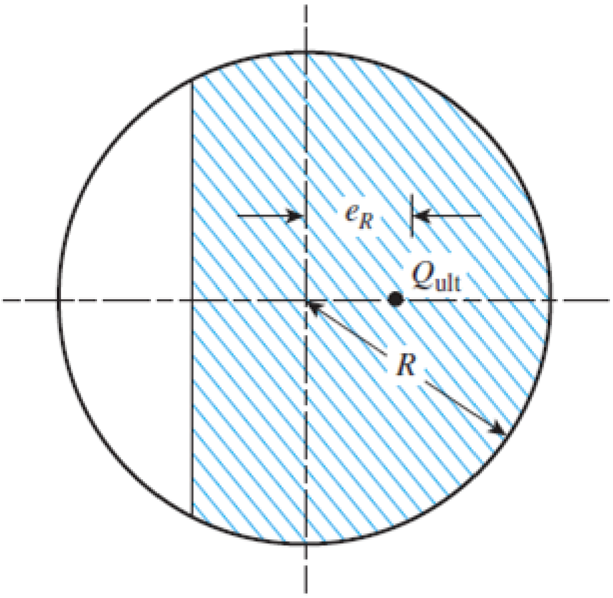
Case IV



(b)

Case V. (Circular Foundation) In the case of circular foundations under eccentric loading (Figure 3.24a), the eccentricity is always one way. The effective area A' and the effective width B' for a circular foundation are given in a nondimensional form in Table 3.8. Once A' and B' are determined, the effective length can be obtained as

$$L' = \frac{A'}{B'}$$



Case V

Table 3.8 Variation of A'/R^2 and B'/R with e_R/R for Circular Foundations

e_R'/R	A'/R^2	B'/R
0.1	2.8	1.85
0.2	2.4	1.32
0.3	2.0	1.2
0.4	1.61	0.80
0.5	1.23	0.67
0.6	0.93	0.50
0.7	0.62	0.37
0.8	0.35	0.23
0.9	0.12	0.12
1.0	0	0

Bearing Capacity of Foundations on Top of a Slope

In some instances, shallow foundations need to be constructed on top of a slope. In Figure 4.14, the height of the slope is H, and the slope makes an angle β with the horizontal. The edge of the foundation is located at a distance b from the top of the slope. At ultimate load, q_u, the failure surface will be as shown in the figure.

Meyerhof (1957) developed the following theoretical relation for the ultimate bearing capacity for *continuous foundations:*

$$q_u = c'N_{cq} + \tfrac{1}{2}\gamma B N_{\gamma q} \tag{4.37}$$

For purely granular soil, $c' = 0$, thus,

$$q_u = \tfrac{1}{2}\gamma B N_{\gamma q} \tag{4.38}$$

Again, for purely cohesive soil, $\phi = 0$ (the undrained condition); hence,

$$q_u = cN_{cq} \tag{4.39}$$

where c = undrained cohesion.

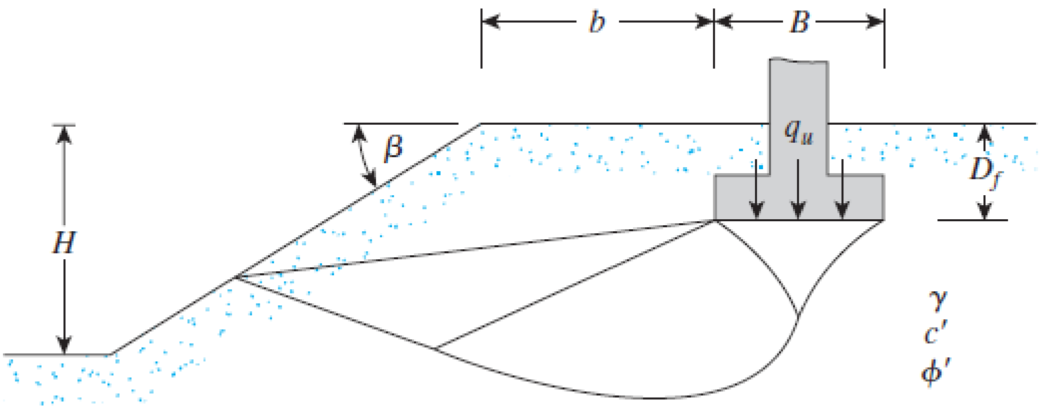


Figure 4.14 Shallow foundation on top of a slope

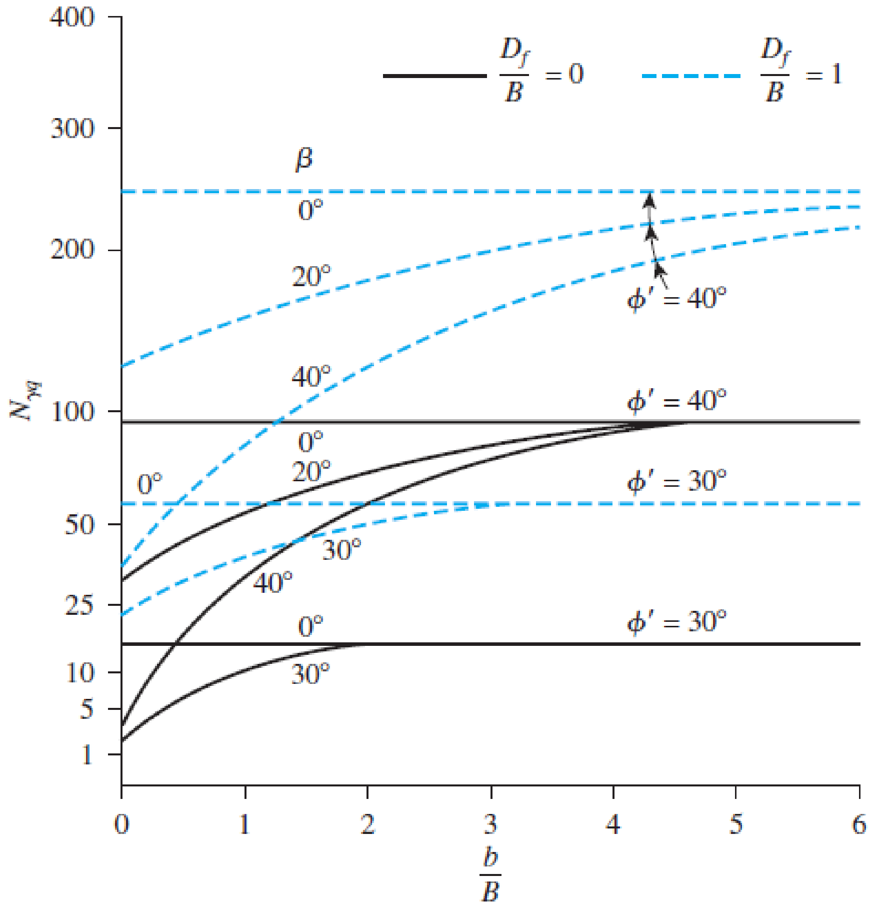


Figure 4.15 Meyerhof's bearing capacity factor $N_{\gamma q}$ for granular soil $(c' = 0)$

The variations of $N_{\gamma q}$ and N_{cq} defined by Eqs. (4.38) and (4.39) are shown in Figures 4.15 and 4.16, respectively. In using N_{cq} in Eq. (4.39) as given in Figure 4.16, the following points need to be kept in mind:

1. The term

$$N_s = \frac{\gamma H}{c} \tag{4.40}$$

is defined as the stability number.
2. If $B < H$, use the curves for $N_s = 0$.
3. If $B \geqslant H$, use the curves for the calculated stability number N_s.

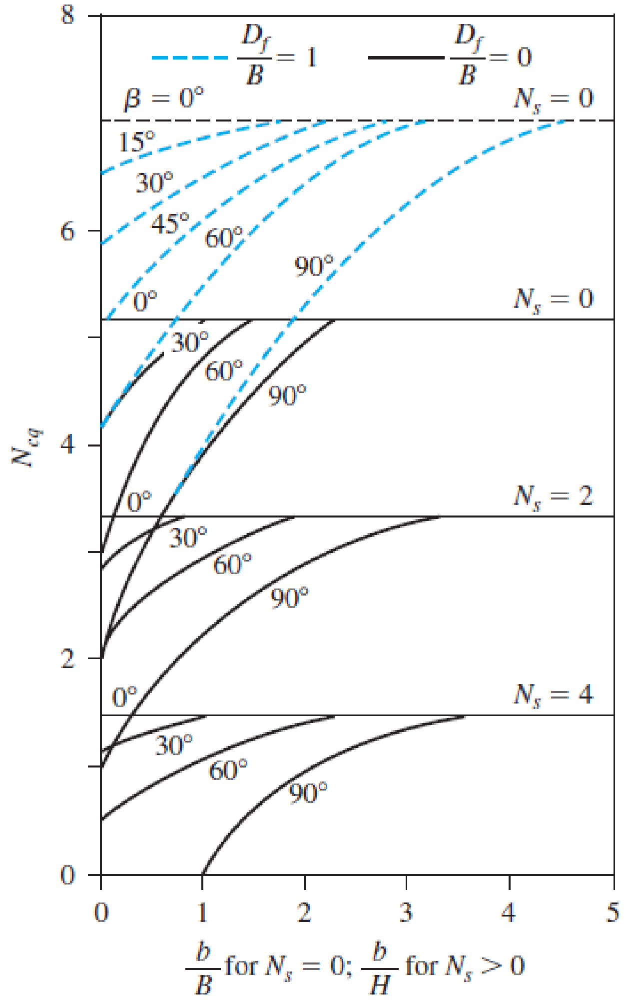


Figure 4.16 Meyerhof's bearing capacity factor N_{cq} for purely cohesive soil