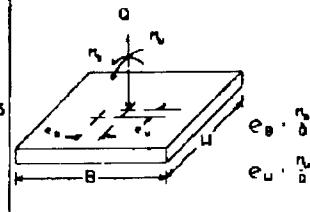
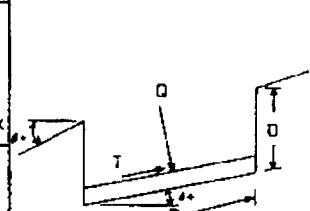


TABLE 4-5

Hansen Dimensionless Bearing Capacity and Correction Factors (Data from Hansen 1970)

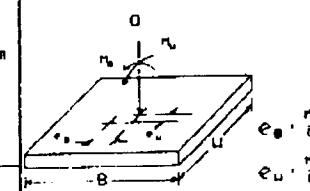
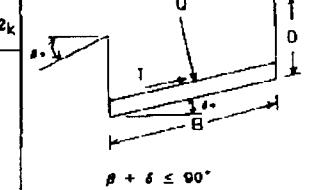
FACTOR		COHESION (c)	WEDGE (γ)	SURCHARGE (q)	DIAGRAM
BEARING CAPACITY N		N_c $\phi = 0$ $(N_q - 1)\cot \phi$	N_γ $\phi = 0$ $1.5(N_q - 1)\tan \phi$	N_q 1.00 $N_q e^{\tan \phi}$	
CORRECTION	FOUNDATION SHAPE WITH ECCENTRICITY s	f_{cs} Strip: 1.0 $0.2 \cdot \frac{B'}{W'}$ $1 + \frac{N_q B'}{N_c W'}$	$f_{\gamma s}$ 1.0	f_{qs} 1.0 $1 + \frac{B'}{W'} \tan \phi$	
	INCLINED LOADING δ	f_{ci} $\phi = 0$ $1 - \frac{[1 - \frac{T}{A_e c_a}]^{\frac{1}{2}}}{2}$ $\phi > 0$ $f_{qi} = \frac{1 - f_{ci}}{N_q - 1}$	$f_{\gamma i}$ $\phi = 0 \left[1 - \frac{0.7T}{Q + A_e c_a \cot \phi}\right]^5$ $\phi > 0 \left[1 - \frac{(0.7 - \delta/450)T}{Q + A_e c_a \cot \phi}\right]^5$	f_{qi} $\left[1 - \frac{0.5T}{Q + A_e c_a \cot \phi}\right]^5$	
	FOUNDATION DEPTH d	f_{cd} $\phi = 0$ $0.4k$ $\phi > 0$ $1 + 0.4k$	$f_{\gamma d}$ 1.0	f_{qd} 1.0 $1 + 2\tan \delta (1 - \sin \phi)^2 k$	
	BASE ON SLOPE β	f_{cb} $\phi = 0$ $1 - \frac{\beta}{147.3}$ $\phi > 0$ $f_{qb} = \frac{1 - f_{cb}}{147.3}$	$f_{\gamma b}$ $(1 - 0.5 \tan \beta)^5$	f_{qb} $(1 - 0.5 \tan \beta)^5$	
	TILED BASE δ	f_{ct} $\phi = 0$ $1 - \frac{\delta}{147}$ $\phi > 0$ $f_{qt} = \frac{1 - f_{ct}}{147.3}$	$f_{\gamma t}$ $e^{-0.0478 \tan \phi}$	f_{qt} $e^{-0.0356 \tan \phi}$	

Note: Eccentricity and inclined loading correction factors may not be used simultaneously; factors not used are unity.
Nomenclature:

- | | |
|--|---|
| ϕ = angle of internal friction, degrees | ϕ_a = friction angle between base and soil $\approx \phi$, degrees |
| N_c = $\tan^2(45 + \phi/2)$ | c_a = adhesion of soil to base $\approx c$, ksf |
| B' = effective width of foundation, $B - 2e_y$, ft | c = soil cohesion or undrained shear strength c_u , ksf |
| W' = effective length of foundation, $W - 2e_y$, ft | s = base tilt from horizontal, upward +, degrees |
| B = foundation width, ft | β = slope of ground from base, downward +, degrees |
| W = foundation length, ft | k = D/B if $D/B \leq 1$ OR $\tan^{-1}(D/B)$ if $D/B > 1$ (in radians) |
| e_y = eccentricity parallel with B , M_B/Q | D = foundation depth, ft |
| e_y = eccentricity parallel with W , M_W/Q | Q = vertical load on foundation, kips |
| M_B = bending moment parallel with B , kips-ft | T = horizontal load $\leq Q \tan \phi + A_e c_a$, right +, kips |
| M_W = bending moment parallel with W , kips-ft | A_e = effective area of foundation $B'W'$, ft^2 |

TABLE 4-6

Vesic Dimensionless Bearing Capacity and Correction Factors (Data from Vesic 1973; Vesic 1975)

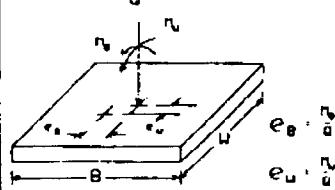
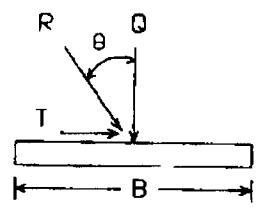
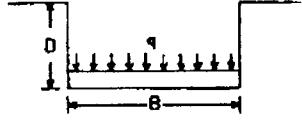
FACTOR		COHESION (c)	WEDGE (γ)	SURCHARGE (q)	DIAGRAM
BEARING CAPACITY N	$\phi = 0$ $\phi > 0$	N_c $N_c = 5.14$ $(N_q - 1)\cot \phi$	N_γ $N_\gamma = 0.00 \text{ OR } -2\sin\phi \text{ if } \beta > 0$ $2(N_q + 1)\tan \phi$	N_q $N_q = 1.00$ $N_q = \tan \phi$	
CORRECTION S	FOUNDATION SHAPE WITH ECCENTRICITY s	f_{cs} Strip: 1.0 $0.2 \frac{B'}{U}$ $1 + \frac{N_q B'}{N_c W'}$	$f_{\gamma s}$ $f_{\gamma s} = 1.0$ $1 - 0.4 \frac{B'}{U}$ (1.0 if strip)	f_{qs} $f_{qs} = 1.0$ $1 + \frac{B'}{U} \tan \phi$ (1.0 if strip)	
		f_{ci} $f_{ci} = 1 - \frac{mT}{A_e c_a N_c}$ $1 - f_{qi}$ $f_{qi} = \frac{N_q}{N_q - 1}$	$f_{\gamma i}$ $f_{\gamma i} = [1 - \frac{T}{Q + A_e c_a \cot \phi}]^{m+1} > 0$	f_{qi} $f_{qi} = [1 - \frac{T}{Q + A_e c_a \cot \phi}]^m$	
	FOUNDATION DEPTH d	f_{cd} $f_{cd} = 1 + 0.4k$ $1 + 0.4k$	$f_{\gamma d}$ $f_{\gamma d} = 1.0$ $1 + 2\tan\phi(1-\sin\phi)^2 k$	f_{qd} $f_{qd} = 1.0$	
		f_{cb} $f_{cb} = 1 - \frac{\beta}{147.3}$ $f_{cb} = \frac{1 - f_{qb}}{147.3}$	$f_{\gamma b}$ $f_{\gamma b} = (1 - \tan\phi)^2$	f_{qb} $f_{qb} = (1 - \tan\phi)^2$	
	TILTED BASE δ	f_{cd} $f_{cd} = 1 - \frac{\delta}{147}$	$f_{\gamma d}$ $f_{\gamma d} = (1 - 0.0176\tan\phi)^2$	f_{qd} $f_{qd} = (1 - 0.0176\tan\phi)^2$	
		f_{cd} $f_{cd} = \frac{1 - f_{qd}}{147.3}$			

Notes: Eccentricity and inclined loading correction factors may not be used simultaneously; factors not used are unity
Nomenclature:

- ϕ = angle of internal friction, degrees
 N_f = $\tan^2(45 + \phi/2)$
 B' = effective width of foundation, $B - 2e_g$, ft
 U' = effective length of foundation, $W - 2e_u$, ft
 B = foundation width, ft
 W = foundation length, ft
 e_B = eccentricity parallel with B , M_B/Q
 e_u = eccentricity parallel with W , M_u/Q
 M_B = bending moment parallel with B , kips-ft
 M_u = bending moment parallel with W , kips-ft
 θ_s = friction angle between base and soil = ϕ , degrees
 c_a = adhesion of soil to base $\leq c$, ksf
 c = soil cohesion or undrained shear strength C_u , ksf
 ϵ = base tilt from horizontal, upward +, degrees
 β = slope of ground from base, downward +, degrees
 k = D/B if $D/B \leq 1$ OR $\tan^{-1}(D/B)$ if $D/B > 1$ (in radians)
 D = foundation depth, ft
 O = vertical load on foundation, kips
 T = horizontal load $\leq Qtan\phi + A_e c_a$, right +, kips
 A_e = effective area of foundation $B'U'$, ft²
 m = $\frac{2 + R_{BW}}{1 + R_{BW}}$ $R_{BW} = B/W$ if T parallel to B
 $R_{BW} = W/B$ if T parallel to W

TABLE 4-3

Meyerhof Dimensionless Bearing Capacity and Correction Factors (Data from Meyerhof 1953; Meyerhof 1963)

FACTOR		COHESION (c)	WEDGE (γ)	SURCHARGE (q)	DIAGRAM
BEARING CAPACITY N	$\phi = 0$ $\phi > 0$	N_c $(N_q - 1)\cot \phi$	N_γ $(N_q - 1)\tan(1.4\phi)$	N_q $N_q e^{\frac{q}{N_q} \tan \phi}$	
	FOUNDATION SHAPE WITH ECCENTRICITY s	ζ_{cs} $\phi = 0$ $\phi > 10$ $0 < \phi \leq 10$	$1 + 0.2N_\phi \frac{B'}{W'}$ • •	ζ_{ys} 1.0 $1 + 0.1N_\phi \frac{B'}{W'}$ Linear Interpolation Between $\phi = 0$ and $\phi = 10$ Degrees	
CORRECTION ζ	INCLINED LOADING i	ζ_{ci} $\phi = 0$ $\phi > 0$	$[1 - \frac{\phi}{90}]$ $[1 - \frac{\phi}{90}]^2$ $0.5\phi [1 - \frac{\phi}{90}]^2$ $0.5\phi 0.0$	ζ_{ti} 1.0 $0.5\phi [1 - \frac{\phi}{90}]^2$ $0.5\phi 0.0$	
	FOUNDATION DEPTH d	ζ_{cd} $\phi = 0$ $\phi > 0$ $0 < \phi \leq 10$	$1 + 0.2(N_\phi)^{1/2} \frac{D}{B}$ • •	ζ_{yd} 1.0 $1 + 0.1(N_\phi)^{1/2} \frac{D}{B}$ Linear Interpolation Between $\phi = 0$ and $\phi = 10$ Degrees	

Note: Eccentricity and inclined loading correction factors may not be used simultaneously; factors not used are unity.

Nomenclature: ϕ = angle of internal friction, degrees

$N_c = \tan^2(45 + \phi/2)$

B' = effective width of foundation, $B - 2e_B$, ft

W' = effective lateral length of foundation, $W - 2e_W$, ft

B = foundation width, ft

W = foundation lateral length, ft

D = foundation depth, ft

Q = vertical load on foundation, qBW , kips

q = bearing pressure on foundations, ksf

T = horizontal load on foundation, right side, kips

R = resultant load on foundation, $(Q^2 + T^2)^{1/2}$

θ = angle of resultant load with vertical axis, $\cos^{-1}(Q/R)$, degrees

e_B = eccentricity parallel with B , $N_\phi/0$

e_W = eccentricity parallel with W , $N_\phi/0$

N_B = bending moment parallel with B , kips-ft

N_W = bending moment parallel with W , kips-ft