Cimentaciones

JAIME SUAREZ DIAZ

FUNDACIONES

- **FUNDACIONES SOMERAS**
  - Capacidad de soporte
  - Asentamientos
- **FUNDACIONES PROFUNDAS**
  - Capacidad de carga
  - Asentamientos
  - Fricción negativa

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DISEÑO DE CIMENTACIONES SOMERAS

Capacidad de soporte

Factores a tener en cuenta:

Profundidad
Ancho de los cimientos
Calidad del suelo de cimerntacióm
Niveles freáticos

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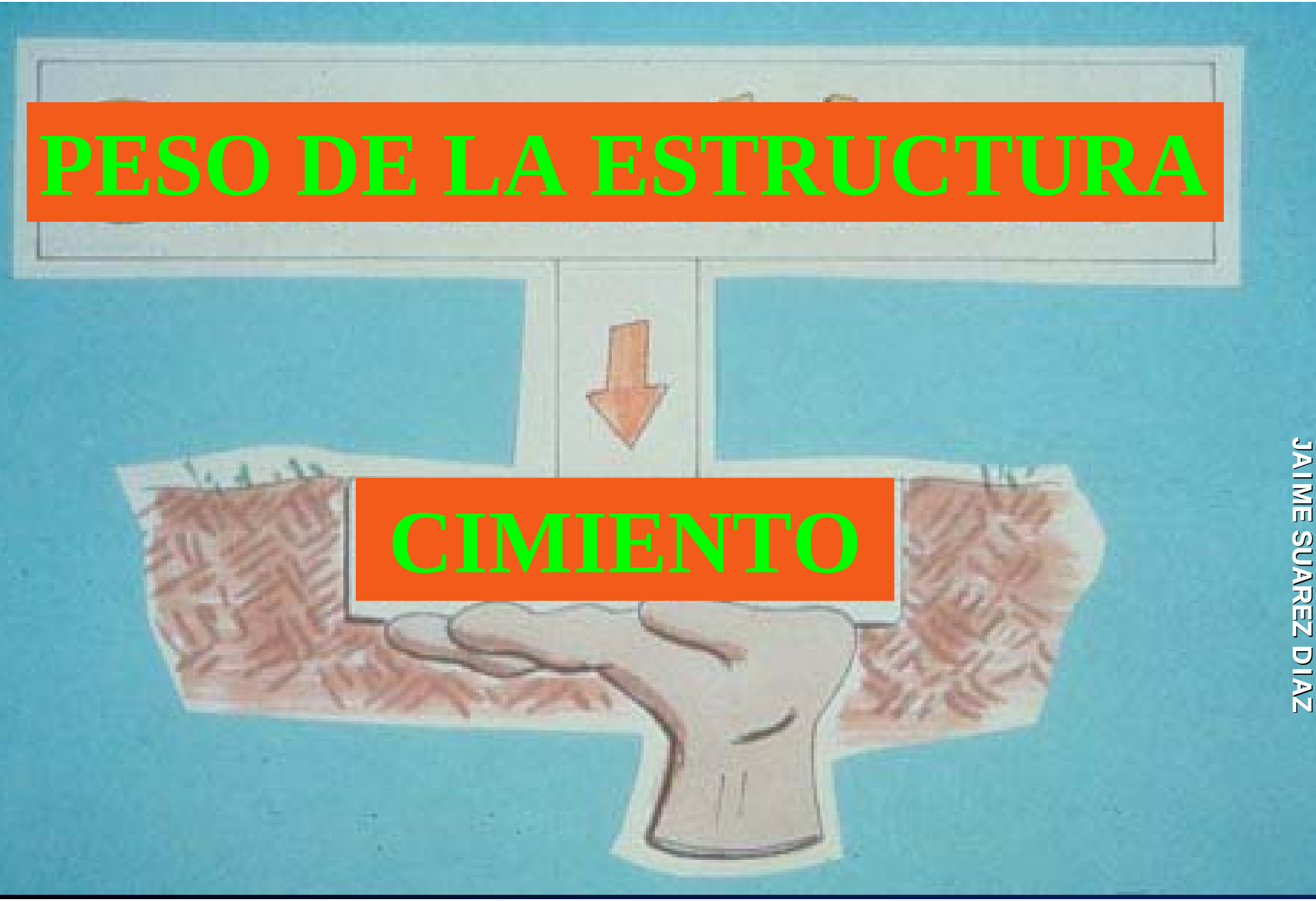
PESO DE LA ESTRUCTURA



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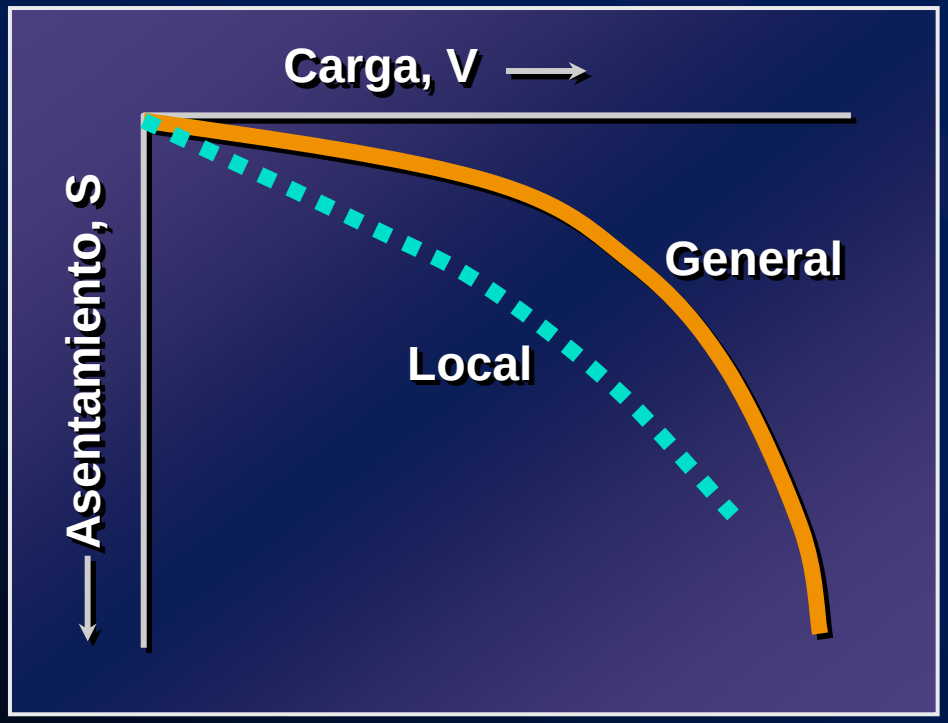
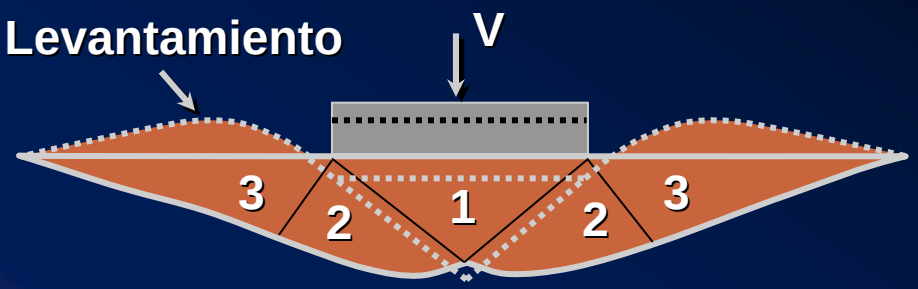
Modos de falla

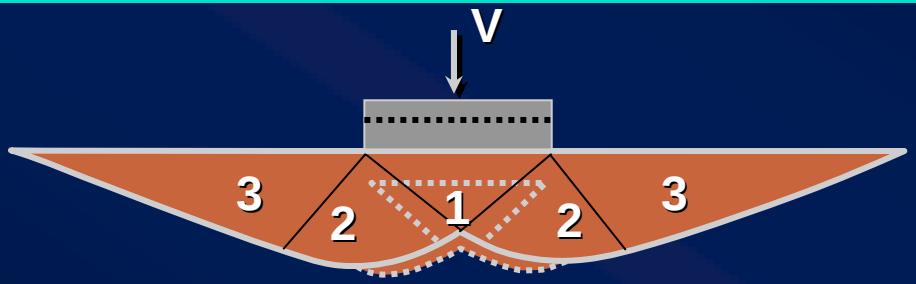


Falla general al cortante



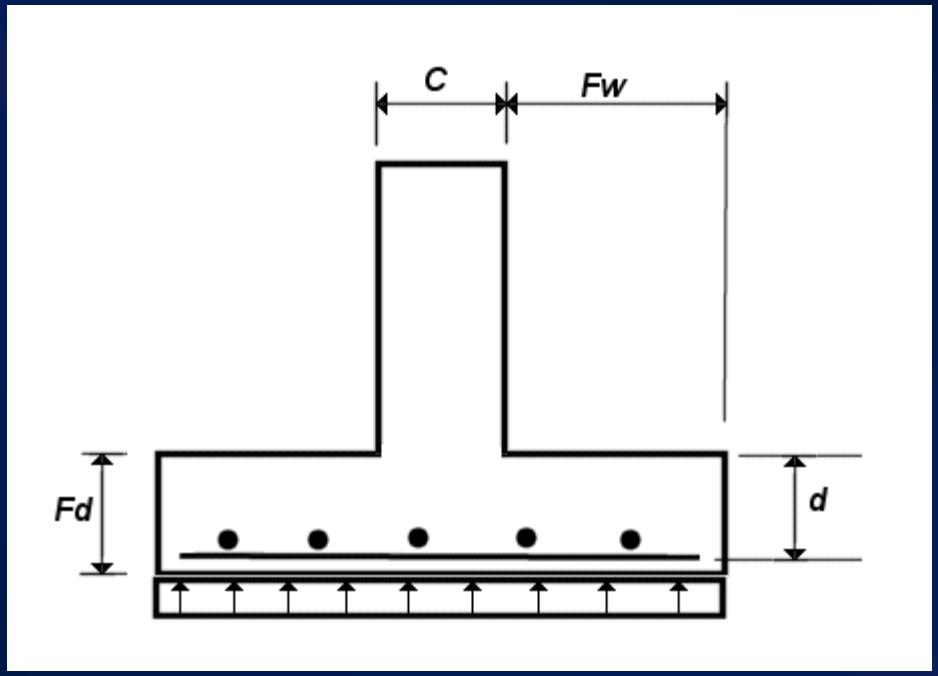
La zona 1 desplaza a las zonas 2 y 3

Falla local al cortante

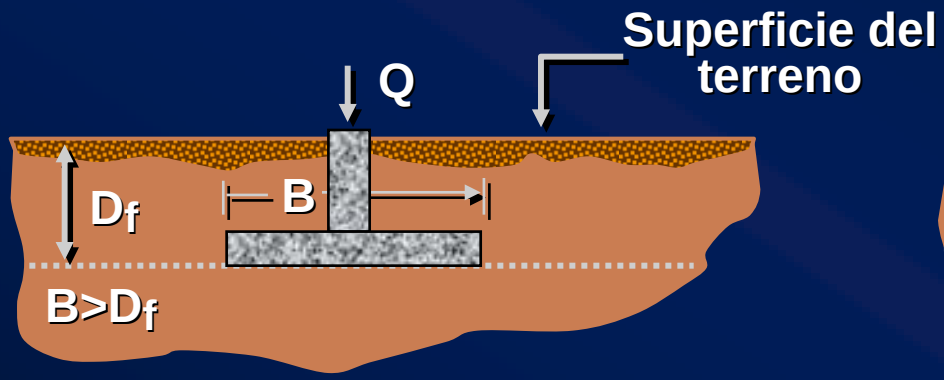


$$\text{Tan } Ø' = \frac{2}{3}\tan Ø \qquad C' = \frac{2}{3}C$$

El suelo desminuye de volumen

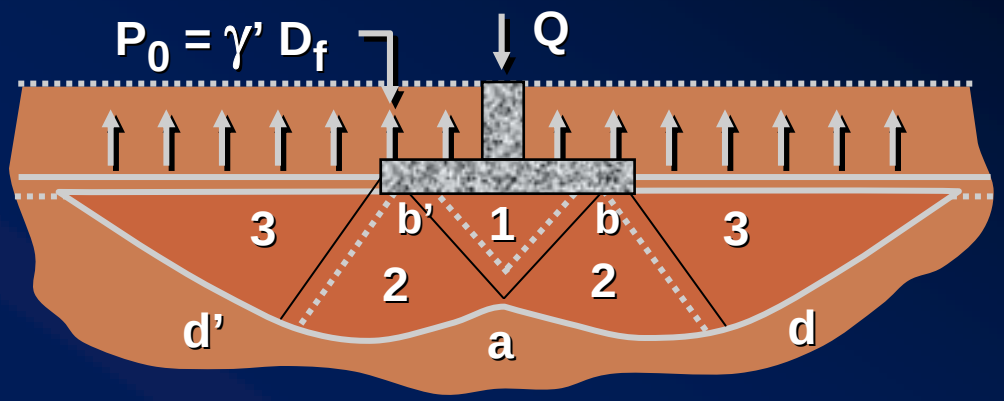

C
Fw
Fd
d

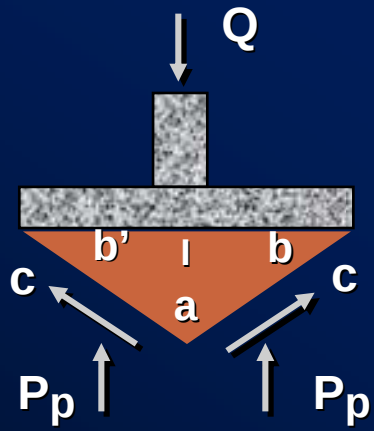
Mecanismo de capacidad de soporte



Resistencia al cortante

$S = c + \sigma' \tan \phi$





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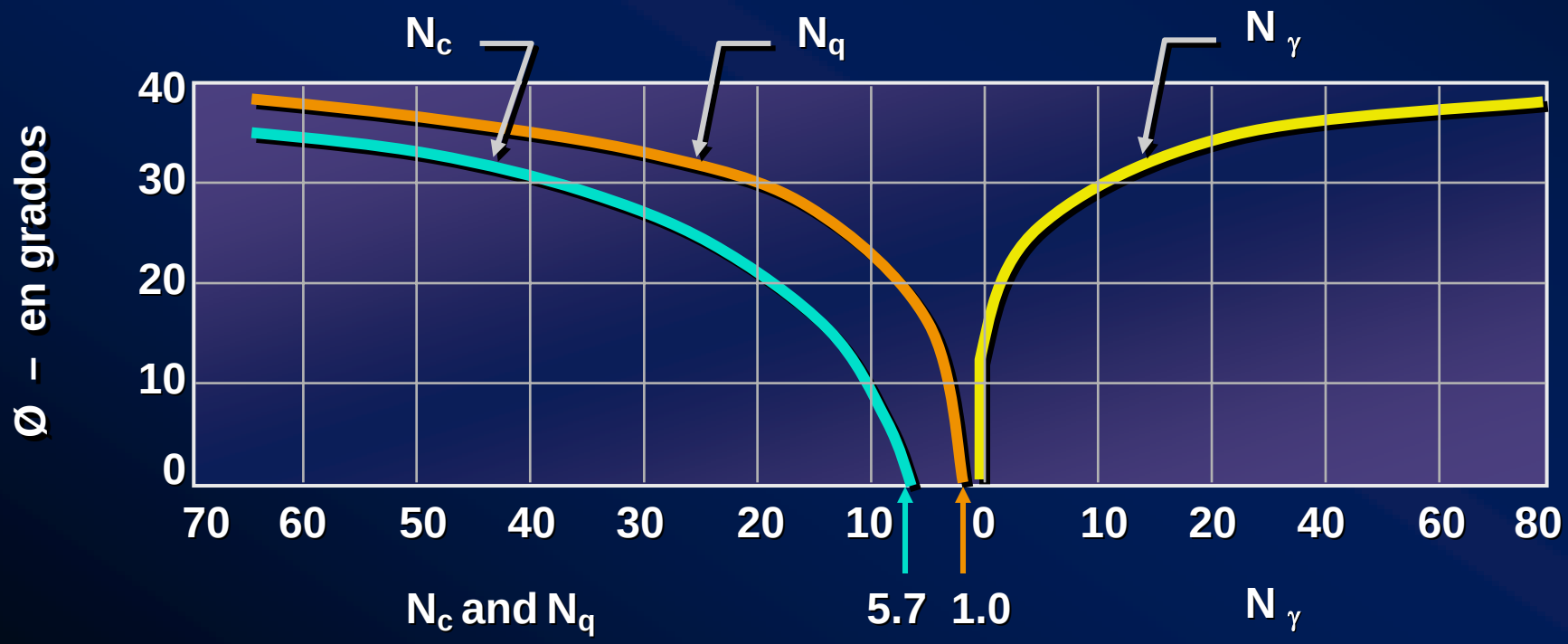
Capacidad de soporte

Ecuación de Terzaghi

$$q_u = cN_c + p_0N_q + \tfrac{1}{2}\gamma' BN_\gamma$$



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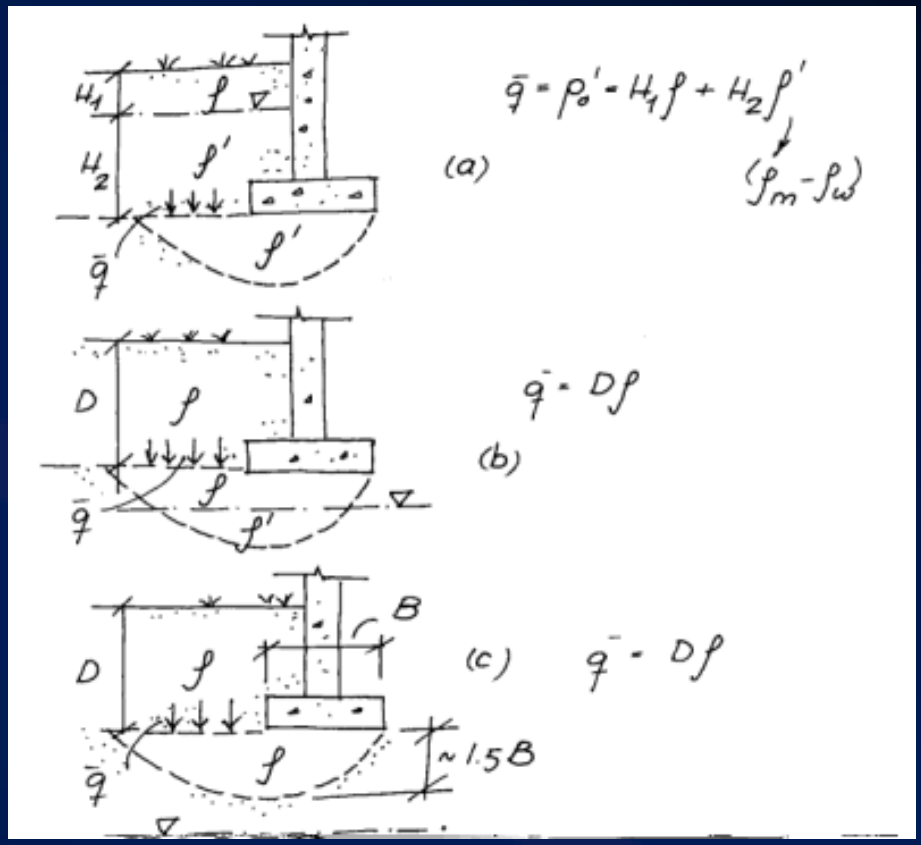
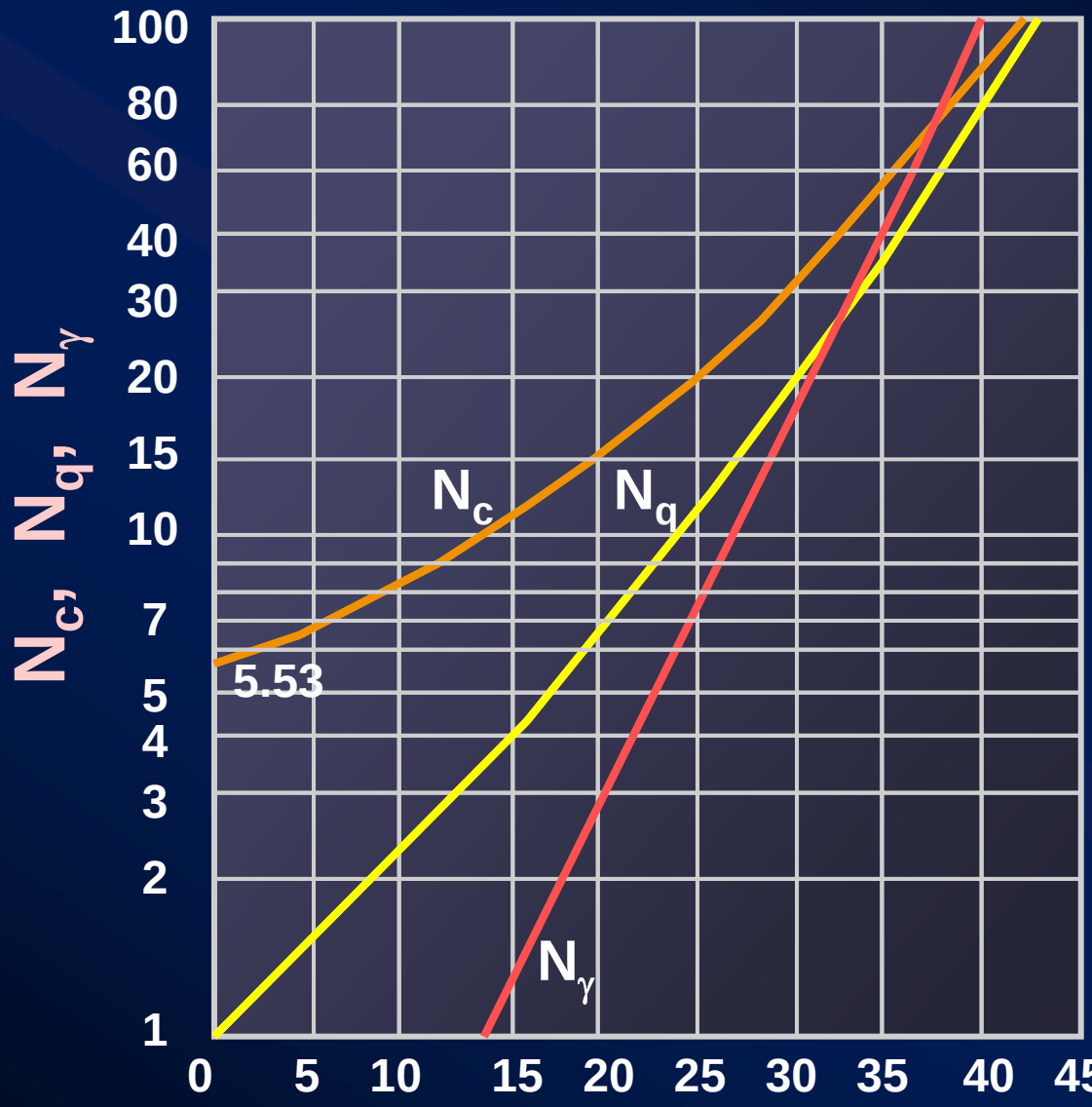
Ecuaciones de capacidad de soporte

- **Terzaghi:**
  - $q_{ult} = cN_c + P_oN_q + 1/2\gamma BN_\gamma$



- **Brinch Hanson**
  - $q_{ult} = cN_c\, s_c d_c i_c + P_o\, N_q s_q d_q i_q + 1/2\gamma BN_\gamma s_\gamma d_\gamma i_\gamma$

Factores de capacidad de soporte

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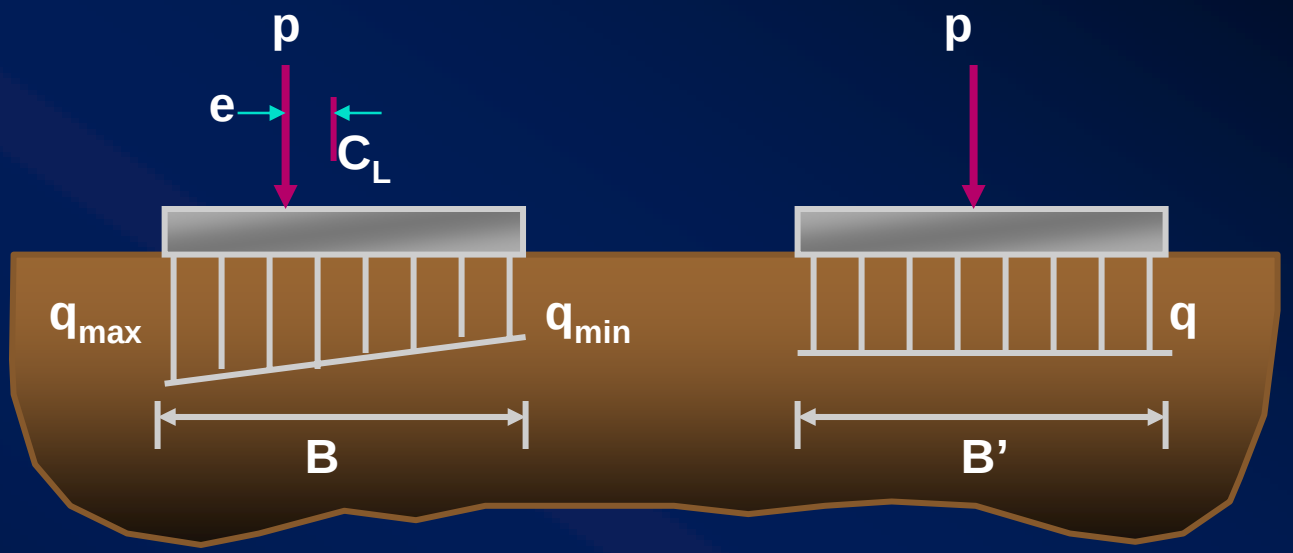
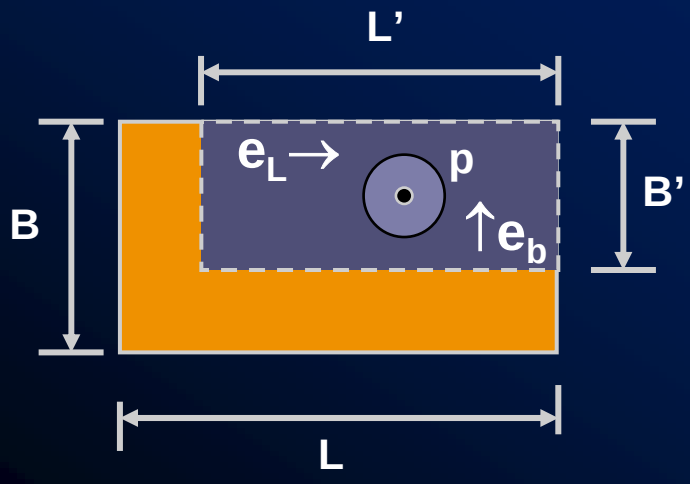
Cargas Excéntricas



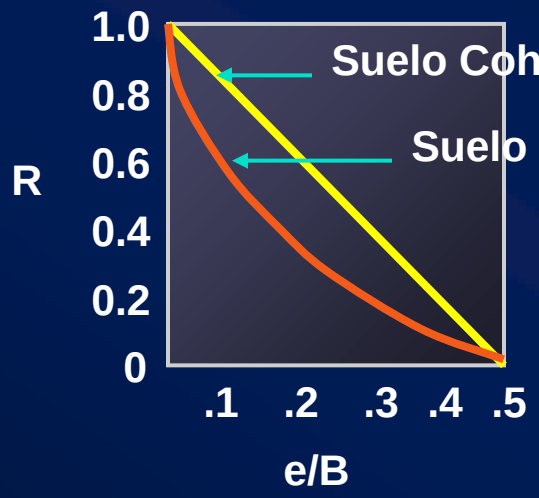
$B' = B - 2e$



$B' = B - 2e_b$

$L' = L - 2e_L$

Use B' y L' en lugar de B y L



$q'_{ult} = Q_{ult}(R)$

R = FACTOR DE REDUCCION POR EXCENTRICIDAD

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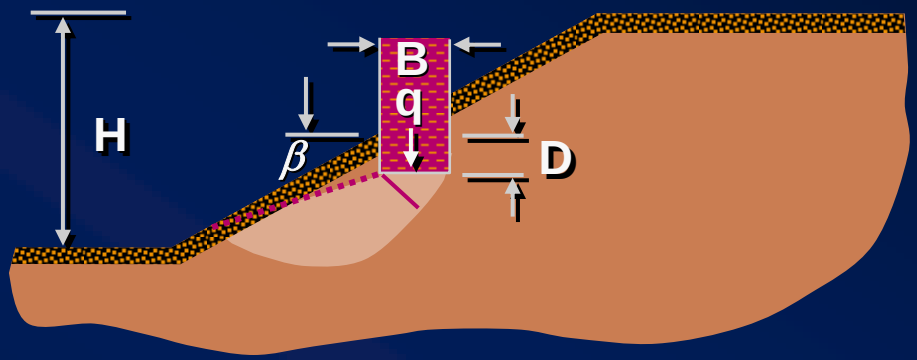
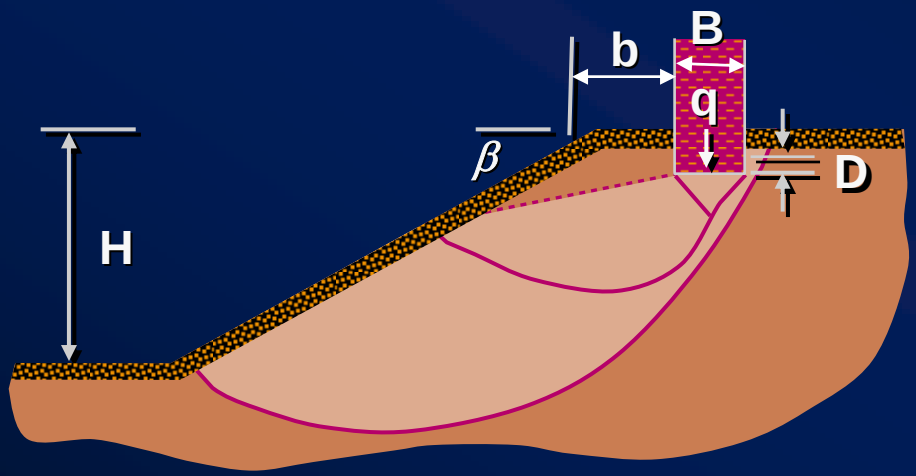
Capacidad de soporte en taludes

Cimentaciones sobre un talud



Cimientos cerca a corona de talud



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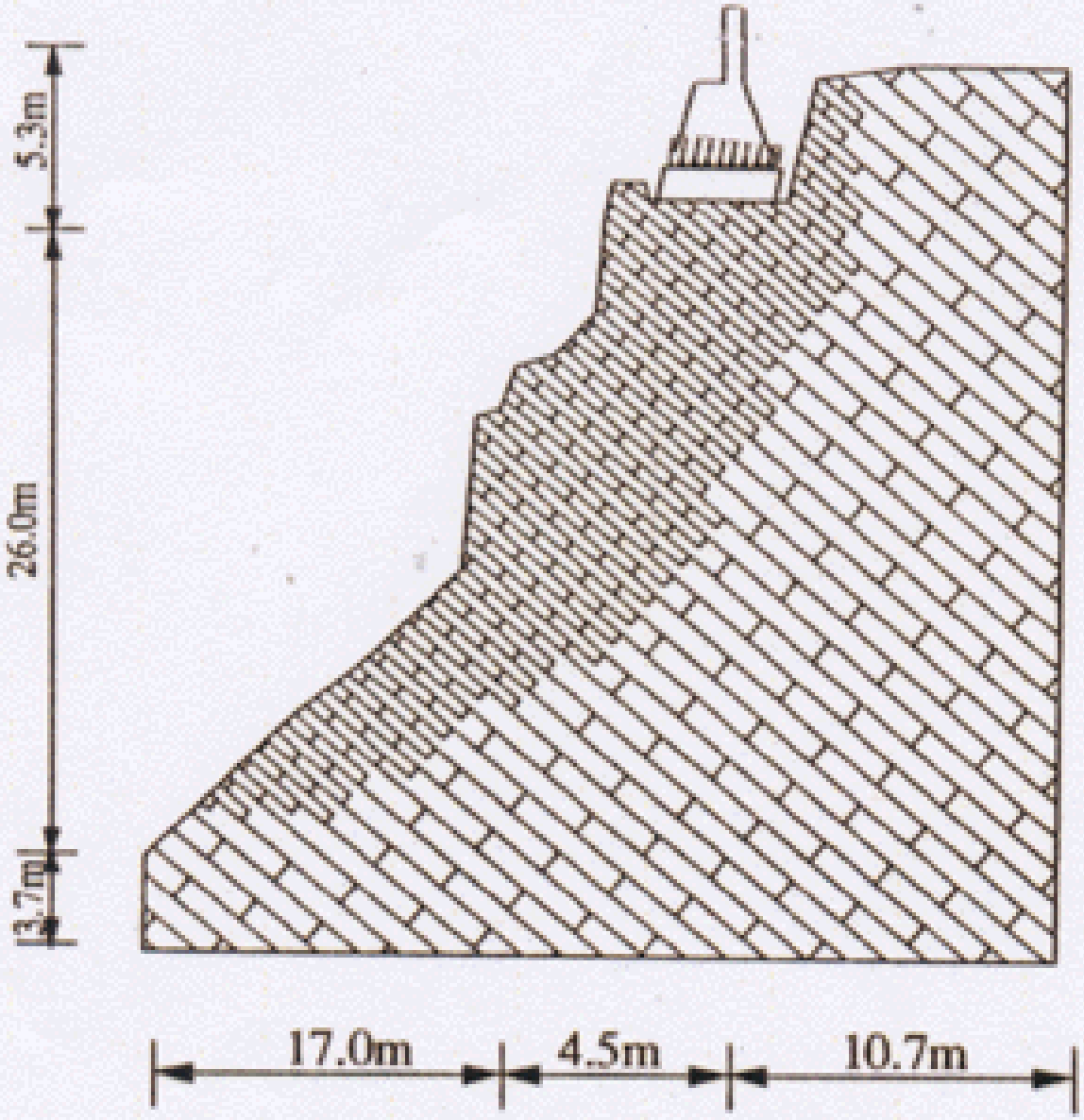

Generation and progress of cracks in the discontinuous rock foundation due to loading

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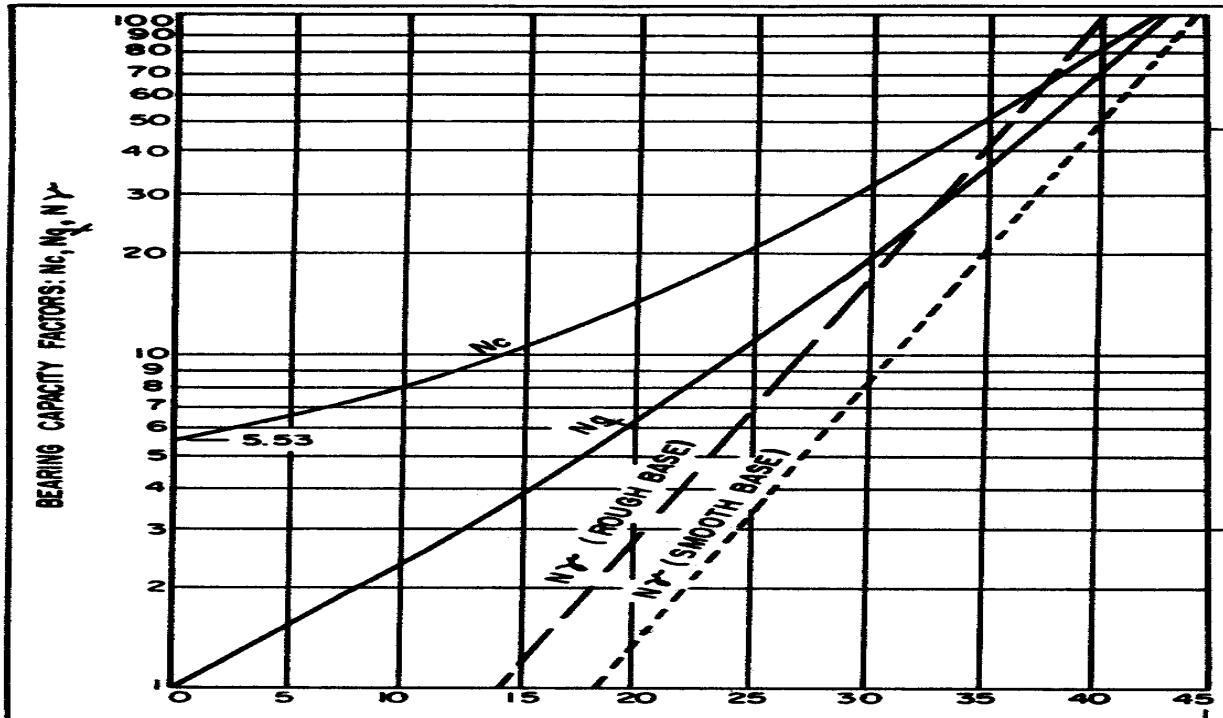
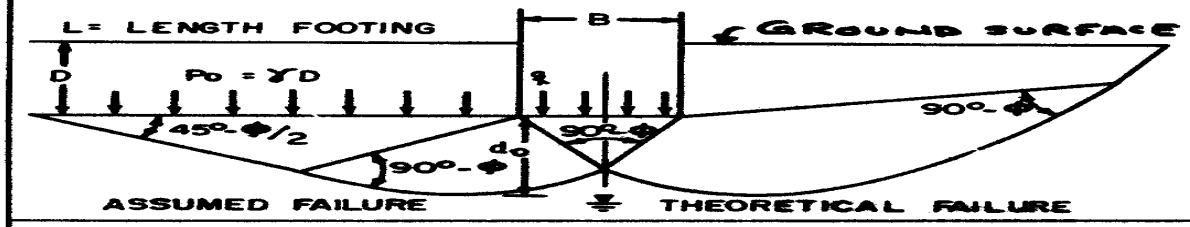
Capacidad de soporte – Cargas concéntricas





ASSUMED CONDITIONS:
1. $D \leq B$
2. SOIL IS UNIFORM TO DEPTH $d_o \geq 1.5B$
3. WATER LEVEL LOWER THAN d_o BELOW BASE OF FOOTING. IF $\geq 1.5B$
4. VERTICAL LOAD CONCENTRIC.
5. FRICTION AND ADHESION ON VERTICAL SIDES OF FOOTING ARE NEGLECTED.
6. FOUNDATION SOIL WITH PROPERTIES C, ϕ, γ

ULTIMATE BEARING CAPACITY = q_{ult}

$L > 9B$

CONTINUOUS FOOTING; GENERAL CASE

$q_{ult} = q' + q''$

q' = PORTION OF BEARING CAPACITY ASSUMING WEIGHTLESS FOUNDATION SOIL

q'' = PORTION OF BEARING CAPACITY FROM WEIGHT OF FOUNDATION SOIL

$q' = cN_c + \gamma D N_q$

$q'' = \gamma \frac{B}{2} N_\gamma$

$q_{ult} = cN_c + \gamma D N_q + \frac{\gamma B}{2} N_\gamma$

SQUARE OR RECTANGULAR FOOTING:

$q_{ult} = cN_c(1 + .3\frac{B}{L}) + \gamma D N_q + 0.4 \gamma B N_\gamma$

CIRCULAR FOOTING: RADIUS = R

$q_{ult} = 1.3 cN_c + \gamma D N_q + 0.6 \gamma R N_\gamma$

FOR CONESIONLESS FOUNDATION SOILS ($c = 0$)

CONTINUOUS FOOTING:

$q_{ult} = \gamma D N_q + \frac{\gamma B}{2} N_\gamma$

SQUARE OR RECTANGULAR FOOTING:

$q_{ult} = \gamma D N_q + 0.4 \gamma B N_\gamma$

CIRCULAR FOOTING:

$q_{ult} = \gamma D N_q + 0.6 \gamma R N_\gamma$

FOR CONESIVE FOUNDATION SOILS ($\phi = 0$)

CONTINUOUS FOOTING:

$q_{ult} = cN_c + \gamma D$

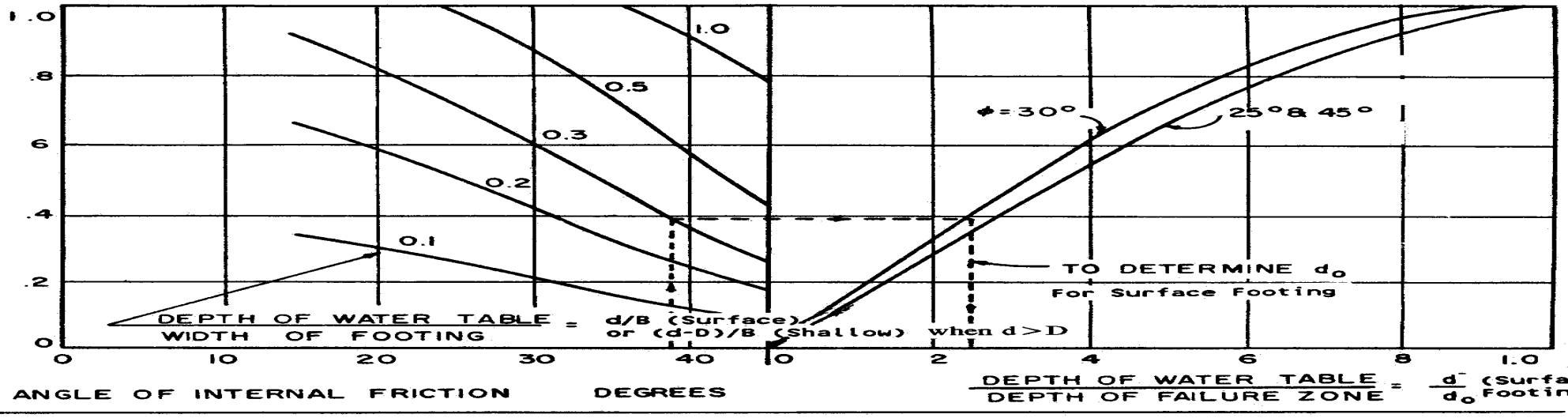
SQUARE OR RECTANGULAR FOOTING:

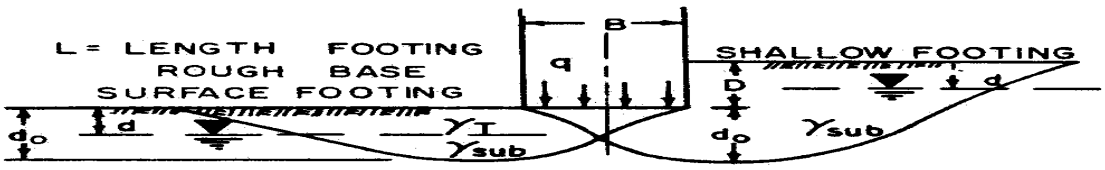
$q_{ult} = cN_c(1 + .3\frac{B}{L}) + \gamma D$

CIRCULAR FOOTING:

$q_{ult} = 1.3 cN_c + \gamma D$

Efecto del nivel de agua sobre la capacidad de soporte





ASSUMED CONDITIONS:
1. GROUNDWATER LEVEL IS HORIZONTAL
2. PRESENCE OF GROUNDWATER HAS NO EFFECT ON COHESIVE SOIL WITH $\phi = 0$.

CONTINUOUS FOOTING:

SURFACE FOOTING: D = 0

$$q_{ult} = cN_c + [\gamma_{sub} + F(\gamma_T - \gamma_{sub})] \frac{B}{2} N\gamma$$

SHALLOW FOOTING: D ≤ B

IF $d \leq D$

$$q_{ult} = cN_c + [\gamma_{sub} D + (\gamma_T - \gamma_{sub}) d] Nq + 0.5 \gamma_{sub} BN\gamma$$

IF $D < d \leq (D + d_o)$

$$q_{ult} = cN_c + \gamma_T DNq + [\gamma_{sub} + F(\gamma_T - \gamma_{sub})] \frac{B}{2} N\gamma$$

VALUES OF BEARING CAPACITY FACTORS N_c N_q AND $N\gamma$ ARE SHOWN IN FIGURE 14

RECTANGULAR FOOTING:

SURFACE FOOTING: D = 0

$$q_{ult} = cN_c (1 + .3 \frac{B}{L}) + [\gamma_{sub} + F(\gamma - \gamma_{sub})] 0.4 BN\gamma$$

SHALLOW FOOTING: D ≤ B, IF d ≤ D

$$q_{ult} = cN_c (1 + .3 \frac{B}{L}) + [\gamma_{sub} D + (\gamma_T - \gamma_{sub}) d] Nq + 0.4 \gamma_{sub} BN\gamma$$

IF $D < d \leq (D + d_o)$

$$q_{ult} = cN_c (1 + .3 \frac{B}{L}) + \gamma_T DNq + [\gamma_{sub} + F(\gamma_T - \gamma_{sub})] 0.4 BN\gamma$$

CIRCULAR FOOTING: RADIUS = R = B/2

SURFACE FOOTING: D = 0

$$q_{ult} = 1.3 cN_c + [\gamma_{sub} + F(\gamma_T - \gamma_{sub})] 0.6 RN\gamma$$

SHALLOW FOOTING: D ≤ 2R, IF d ≤ D

$$q_{ult} = 1.3 cN_c + [\gamma_{sub} D + (\gamma_T - \gamma_{sub}) d] Nq + 0.6 \gamma_{sub} RN\gamma$$

IF $D < d \leq (D + d_o)$

$$q_{ult} = 1.3 cN_c + \gamma_T DNq + [\gamma_{sub} + F(\gamma_T - \gamma_{sub})] 0.6 RN\gamma$$

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