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$$q_u = 0.5\gamma B N_\gamma s_\gamma g_\gamma i_\gamma + C N_c s_c g_c i_c \quad (1)$$

$$N_c = \frac{C}{s_c} \left(\frac{B}{s_\gamma} \right)^{0.5} \left(\frac{q_u}{\gamma} \right)^{0.5} \left(\frac{g_\gamma}{i_\gamma} \right)^{0.5}$$

∴ []

$$(f(\sigma_{ij}) = 0)$$

$$\dot{\epsilon}_{ij}^p = \dot{\lambda} \frac{\partial f(\sigma_{ij})}{\partial \sigma_{ij}}$$

σ_{ij}

$$\dot{\epsilon}_{ij}^p = \dot{\lambda}$$

$$F = \frac{\tan \phi}{\tan \phi_d} = \frac{C}{C_d} \quad (2)$$

ϕ C

$$\phi_d = C_d$$

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[] (Giger & Krizek)

[] (Michalowski)

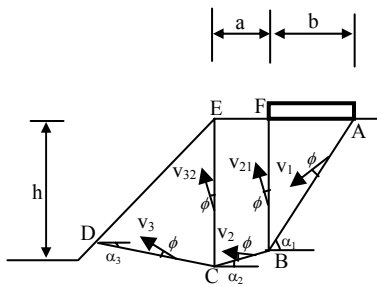
ϕ

$\psi = \phi$

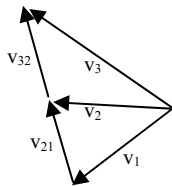
[]

TRASS

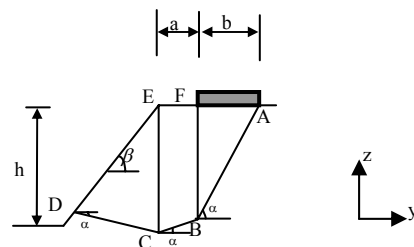
TRASS



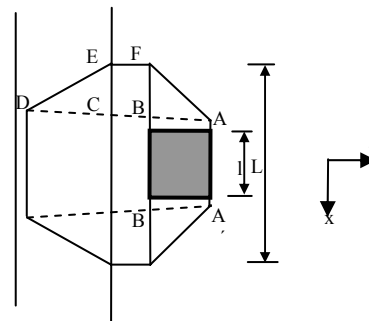
(الف)



(ب)



(الف)



(ب)

ϕ

$$\begin{pmatrix} V_3 & V_2 & V_1 \\ V_{32} & V_{21} \end{pmatrix}$$

(P)

(W_k)

(E)

$$E = P.V_0 + k.P.(V_1)_h + \sum_{k=1}^3 W_k.(V_k)_v + \sum_{k=1}^3 k.W_k.(V_k)_h$$

()

$$(V_i)_h \quad (V_i)_v \quad k$$

i

()

(i)

: ()

$$I = C \cos \phi \left(\sum_{k=1}^3 V_k S_k + \sum_{k=2}^3 V_{k,k-1} S_{k,k-1} \right) \quad (1)$$

) . ϕ C

($V_{k,k-1}$ k V_k

S_k k-1 k

k

$S_{k,k-1}$

k-1 k

P

(a)

$$P.V_o + k.P.(V_1)_h + \sum_{k=1}^3 W_k.(V_k)_v + \sum_{k=1}^3 k.W_k.(V_k)_h$$

$$= C \cos \phi \left(\sum_{k=1}^3 V_k S_k + \sum_{k=2}^3 V_{k,k-1} S_{k,k-1} \right)$$

()

q_u

P/b

ϕ_d C_d

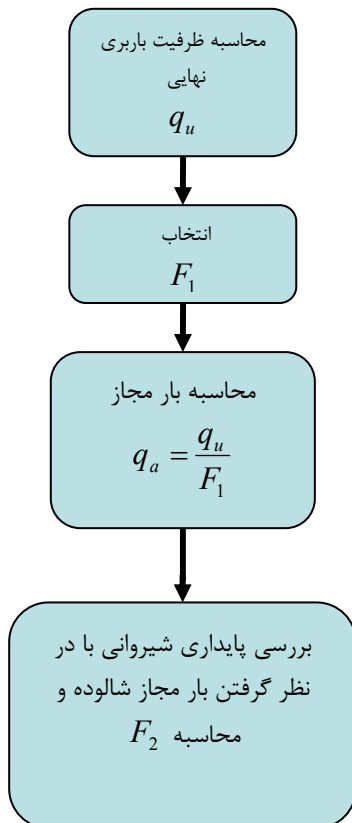
C

ϕ_d C_d

F ϕ

F

F_{3D}



()

()

()

()

() F_2 $F_2(2D)$ (q_u)

(F_1)

F_2 F_1 (q_a)

$F_2(3D)$ () (F_2)

F_2

(q_a)

F_2

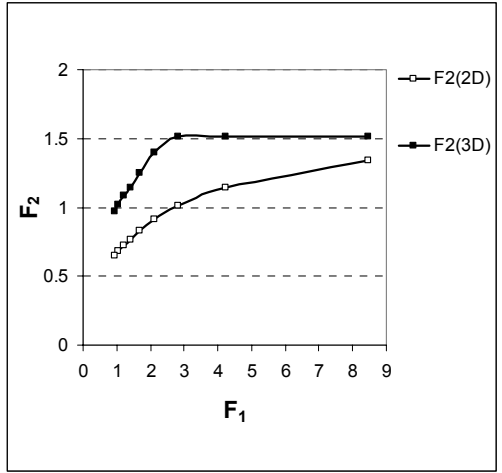
F_2 F_1 F_2 F_1

(F_1) (F_2) (F_2) (F_1)

F_2 F_2 (F_1) F_2 $F_2(2D)$

(F_1) (F_2) F_2 F_1 F_2

$F_2(3D)$



()

(F_1)

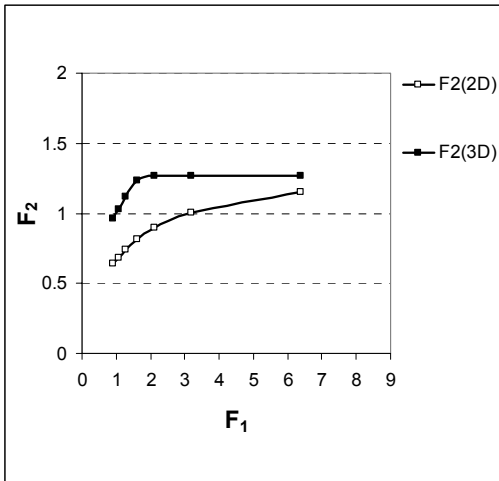
(L)

(F_1)

(F_1)

(F_2)

F_2)
 (F_1)
 $F_2(3D)$
)
)
)
) F_1) / F_1
 / / (F_1 420÷2/4



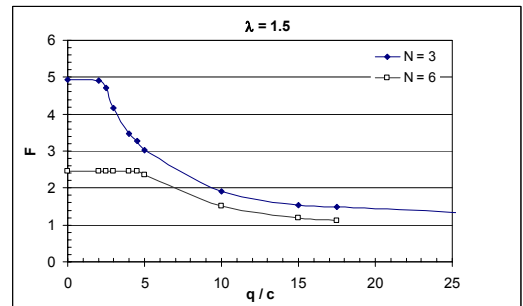
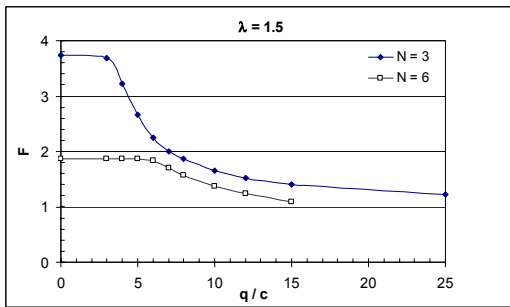
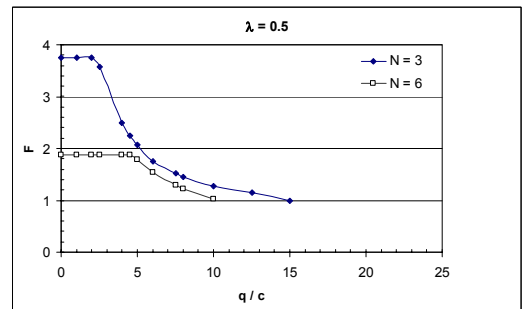
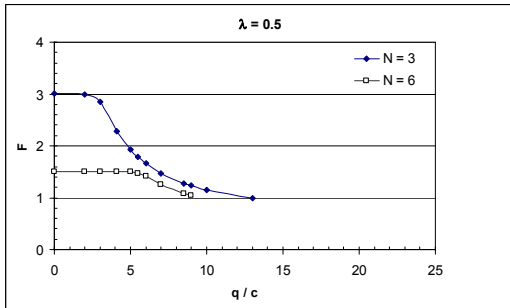
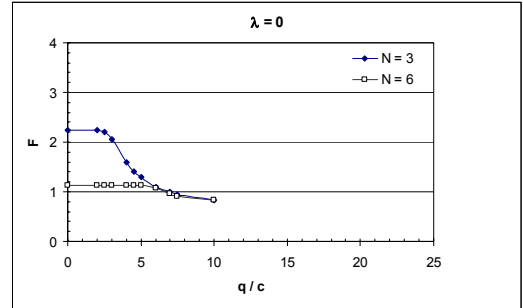
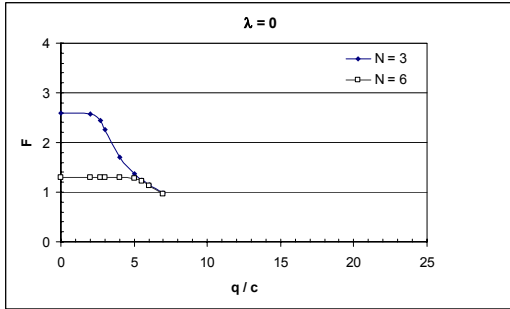
:
 (F_1) /
 (F_2))
)
) / F_1 ÷ 1/8
 / F_1 /
 $F_2(3D)$
 :
 $N = \gamma h / c$)
 (F_2)
)
 $(F_2(2D))$)
 h γ

N

$$\lambda = (\gamma h / c) \tan \phi$$

()

λ



q/c :

q/c :

N و λ

N و λ

h/b / a/b -

F_2 F -

()

q -

() ()

:

N ()

(L)

N

λ

(q_u)

q_a

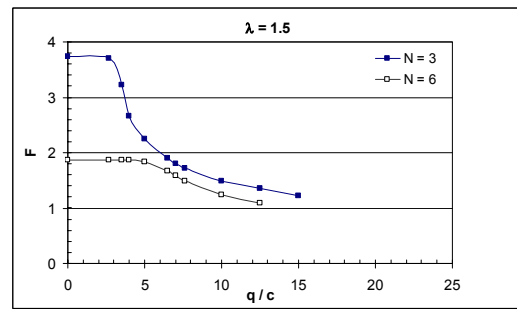
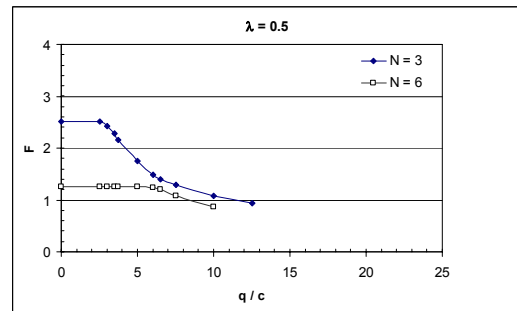
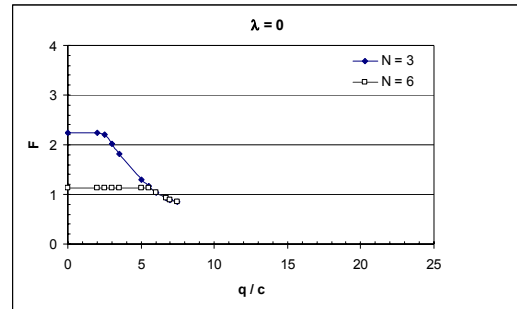
($q_a = \frac{q_u}{F_1}$)

(F_1)

(F_2)

(F_2)

(F_1)



q/c

N , λ

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