$$\alpha = \frac{3(\nu_u - \nu)}{B(1-2\nu)(1+\nu_u)} \quad ; \quad \beta = \frac{(1-2\nu_u)(1-\nu)}{(1-2\nu)(1-\nu_u)} \quad ; \quad \gamma = \frac{2GB(1-\nu)(1+\nu_u)}{3(1-2\nu)(1-\nu_u)}$$

$$c = \frac{2GB^2(1-\nu)(1+\nu_u)^2 k}{9(\nu_u - \nu)(1-\nu_u)\gamma_w} \quad ; \quad \eta = \frac{(1-\nu)}{(1-2\nu)} \quad ; \quad \Theta = \frac{\partial u_r}{\partial r} + \frac{u_r}{r} + \frac{\partial u_z}{\partial z} \tag{4}$$

In Equations (1)–(4), G is the linear shear modulus and ν is Poisson's ratio of the skeleton (i.e. the drained elastic parameters); ν_u is the undrained Poisson's ratio of the fluid-saturated medium; k is the hydraulic conductivity; B is Skempton's pore pressure parameter [32]; and ∇^2 is the axisymmetric form of Laplace's operator given by

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{\partial^2}{\partial z^2}. \tag{5}$$

Certain thermodynamic constraints need to be satisfied to ensure positive definiteness of the strain energy potential [33]; it can be shown that these constraints can be expressed in the form: $G > 0$; $0 \le B \le 1$; $-1 < \nu < \nu_u \le 0.5$. Alternative but equivalent 6 ia310.5(e 8(al a i kem a ailabl95.7(b 6)]TJ.7([32]f -38 -32.3

The acc ac f he e e en a i n in e m f S(r, z, t) and E(r, z, t) can be e ifi

$$\sigma_{zz}(r, 0, t) = 0 \qquad a < r < \infty \qquad (16)$$

$$\sigma_{rz}(r, 0, t) = 0 \qquad 0 < r < \infty \qquad (17)$$

he e Δ i he a ial di lacemen f he igid ci c la f nda i n. T e f he d ainage b nda

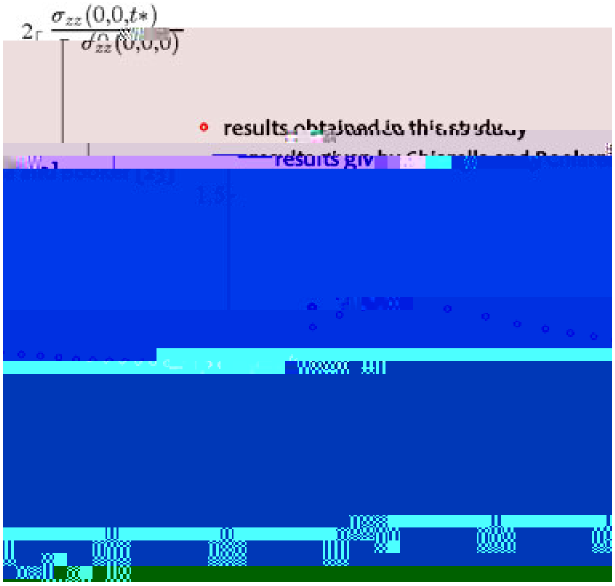
Beca e he c n ac e e a e ela ed he e ical face di lacemen h gh he c efficien ma i , he f ll ing e a i n i a lied a i f gl bal e ilib i m:

$$\sum_{i¼1}^{n} \widetilde{\sigma}$$

h a ma im m di c e anc f 7.6% hen $v = 0$, $v_u = 0.5$ b dec ea e 0.4% hen $v = 0.2$, $v_u = 0.5$ and $v = 0.4$, $v_u = 0.5$.

Fig e 3 c m a e he c n ac e a i , $\sigma_{zz}(0, 0, t^*)/\sigma_{zz}(0, 0, 0)$, i h he e l gi en in Chia ella and B ke [23]. The end f he e en e l i c n i en i h ha gi en b Chia ella and B ke [23]. The di c e anc i la ge a nd he ma im m c n ac e a a ima el 3.5%. I dec ea e a t* inc ea e . The di c e anc i 1.6% a t* = 1.

Fig e 4 c m a e he e l b ained f Ca e I (completely pervious surface) and Ca e II (completely impervious surface). The c n lida i n a e inc ea e a v inc ea e f b h ca e . I i



b e ed ha he c n lida i n a e i l e hen he face i c m le el im e i . The e l gi en b Y e and Sel ad ai [25] a e e e en ed b ci cle ; he end h n in he e en e l ma che ell i h ha f Y e and Sel ad ai [25].

Fig e 5 h he effec f P i n' a i n he c n lida i n a e f Ca e I. When v i e 0, he c n lida i n a e dec ea e a v_u inc ea e . On he he hand, hen v_u i fi ed a 0.5, he c n lida i n a e inc ea e a v inc ea e (ee al Fig e 4). The c e nding e l gi en b Y e and Sel ad ai [25] a e den ed b ci cle in Fig e 5. The ag eemen i e g d (le han 4% hen $t^* > 10^{\square 2}$) e ce f he ca e, $v=0$, $v_u=0.5$. The di c e anc bec me e la ge nea he ini ial and final e n e (ee Table II).

The effec f P i n' a i n he c n lida i n a e f Ca e II i e en ed in Fig e 6. A b e ed in Fig e 5, he c n lida i n a e inc ea e a v_u dec ea e hen v i fi ed a 0, hile he c n lida i n a e inc ea e a v inc ea e hen v_u i 0.5 (ee al Fig e 4). The c e nding e l gi en b Y e and Sel ad ai [25] a e den ed b ci cle in Fig e 6. The ag eemen be een

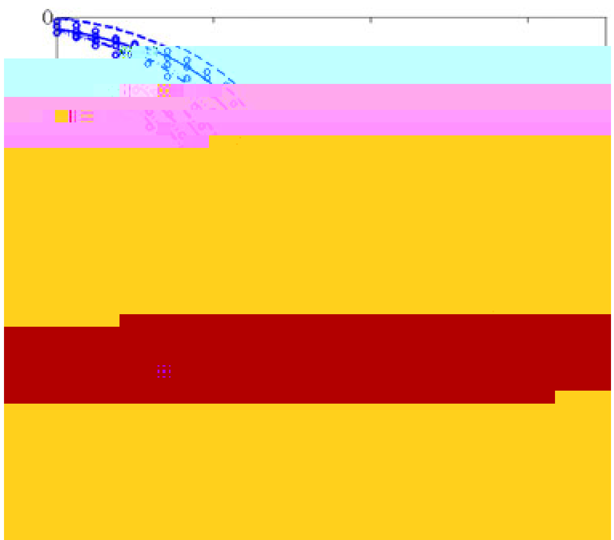


Fig e 5. C n lida i n a e f diffe en P i n' a i hen the surface is completely pervious.

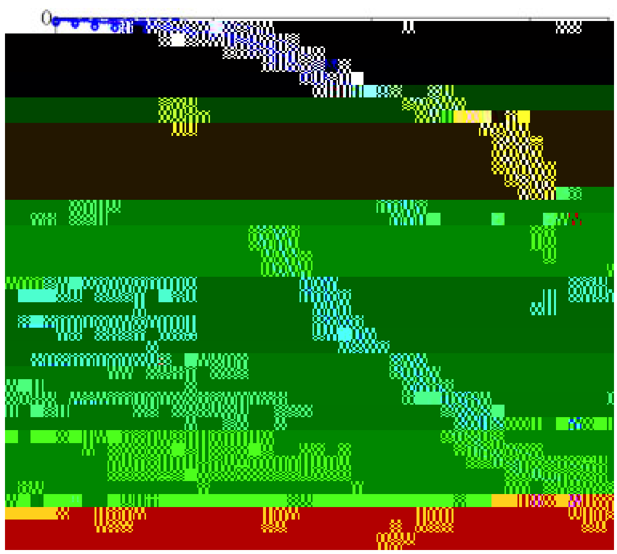


Fig e 6. C n lida i n a e f diffe en P i n' a i hen the surface is completely impervious.

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he e en e l and he e l gi en b Y e and Sel ad ai [25] i again g d i h ma im m e f 6% e ce f he ca e $\nu = 0$, $\nu_u = 0.5$.

7. CONCLUDING REMARKS

C n ac blem f he ela ic half ace in l e mi ed b nda c ndi i n a he lane face f he half ace in e m f he di lacemen , e e and e fl id e e. The l i n ced e f he mi ed b nda c ndi i n in l e a e f d al in eg al e a i n in he La lace an f m d main ha cann be l ed ing a c n en i nal in eg al an f m (Hankel and La lace an f m) a ach. An al e na i e a ach, he e he c n ac e i di c e i ed in

APPENDIX B

The final e e i n f he di lacemen in he z-di ec i n a e gi en b

Ca e I: The en i e face i completely permeable

$$u_z(r, z, t) = \frac{p^* a^*}{2G} \int_{\varsigma - i\infty}^{\varsigma + i\infty} \int_0^{\infty} \left\{ \frac{\left[\eta\left(\varphi^2 - \xi^2\right)(\Gamma + \xi z(\Gamma - 1) - (\Gamma + 1)) - \varphi(2\Gamma\eta\xi - \xi)\right] e^{-\xi z}}{(\varphi - \xi)[\eta(\Gamma - 1)(\varphi + \xi) - (2\Gamma\eta\xi - \xi)]\xi} \right.$$

$$+ \frac{\varphi \; 2}{\qquad}$$

17. Sel ad ai APS (Ed).