UNIVERSIDAD DE CHILE
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CASILLA 228-3 • SANTIAGO CHILE

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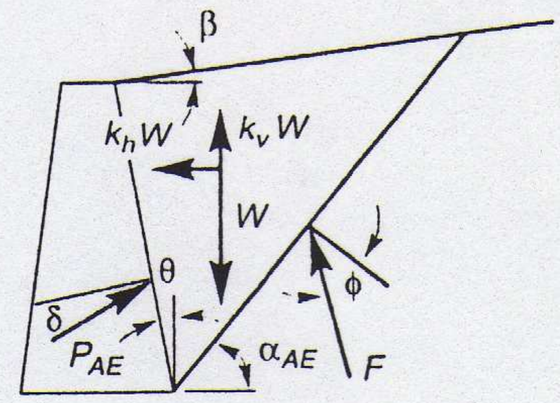
MONONOBE - OKABE

Active Earth Pressure Conditions.

$$P_{AE} = \tfrac{1}{2}K_{AE}\gamma H^2(1 - k_v)$$

where the dynamic active earth pressure coefficient, K_{AE}, is given by

$$K_{AE} = \frac{\cos^2(\phi - \theta - \psi)}{\cos\psi \cos^2\theta \cos(\delta + \theta + \psi)\left[1 + \sqrt{\dfrac{\sin(\delta + \phi)\sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi)\cos(\beta - \theta)}}\right]^2}$$



(a)

Figure 11.11 (a) Forces acting on active wedge in Mononobe–Okabe analysis.

where $\phi - \beta \geq \psi$, $\gamma = \gamma_d$, and $\psi = \tan^{-1}[k_h/(1 - k_v)]$. The critical failure surface, which is flatter than the critical failure surface for static conditions, is inclined (Zarrabi-Kashani, 1979) at an angle

$$\alpha_{AE} = \phi - \psi + \tan^{-1}\left[\frac{-\tan(\phi - \psi - \beta) + C_{1E}}{C_{2E}}\right]$$

where

$$C_{1E} = \sqrt{\tan(\phi - \psi - \beta)\left[\tan(\phi - \psi - \beta) + \cot(\phi - \psi - \theta)\right]\left[1 + \tan(\delta + \psi + \theta)\cot(\phi - \psi - \theta)\right]}$$

$$C_{2E} = 1 + \{\tan(\delta + \psi + \theta)\left[\tan(\phi - \psi - \beta) + \cot(\phi - \psi - \theta)\right]\}$$

Passive Earth Pressure Conditions. The total passive thrust on a wall retaining a dry, cohesionless backfill (Figure 11.12) is given by

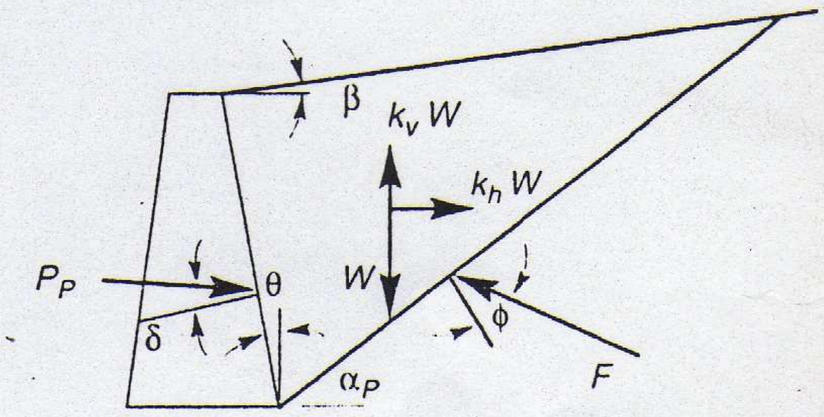
$$P_{PE} = \tfrac{1}{2}K_{PE}\gamma H^2(1 - k_v)$$

where the dynamic passive earth pressure coefficient, K_{PE}, is given by

$$K_{PE} = \frac{\cos^2(\phi + \theta - \psi)}{\cos\psi \cos^2\theta \cos(\delta - \theta + \psi)\left[1 - \sqrt{\dfrac{\sin(\delta + \phi)\sin(\phi + \beta - \psi)}{\cos(\delta - \theta + \psi)\cos(\beta - \theta)}}\right]^2}$$

The critical failure surface for M-O passive conditions is inclined from horizontal by an angle

$$\alpha_{PE} = \psi - \phi + \tan^{-1}\left[\frac{\tan(\phi + \psi + \beta) + C_{3E}}{C_{4E}}\right]$$



(a)

Figure 11.12 (a) Forces acting on passive wedge in Mononobe–Okabe analysis

where

$$C_{3E} = \sqrt{\tan(\phi + \beta - \psi)\left[\tan(\phi + \beta - \psi) + \cot(\phi + \theta - \psi)\right]\left[1 + \tan(\delta + \psi - \theta)\cot(\phi + \theta - \psi)\right]}$$

$$C_{4E} = 1 + \{\tan(\delta + \psi - \theta)\left[\tan(\phi + \beta - \psi) + \cot(\phi + \theta - \psi)\right]\}$$

"Geotechnical Earthquake Engineering"
Steven L. Kramer
(Prentice Hall)