Factor de seguridad Rotura Plana

$$FS = \frac{\frac{C.H}{sen\alpha} + [R\cos(\alpha+\varepsilon) - U]\cdot\tan\phi}{R\ sen(\alpha+\varepsilon)}$$

$$FS = \frac{k_2}{sen(\beta-\alpha)\cdot sen(\alpha+\varepsilon)} + \frac{\tan\phi}{\tan(\alpha+\varepsilon)} - k_1.\tan\phi\,\frac{\sec\alpha}{sen(\alpha+\varepsilon)}$$

$$FS = \frac{cH/sen\alpha + [W_t(1+k_v)\cos\alpha - W_t k_h sen\alpha - U]\tan\phi}{W_t(1+k_v)sen\alpha + W_t k_h\cos\alpha_t}$$

$$k = \left[k_h^2 + (1+k_v)^2\right]^{1/2}, \quad R = W_T.k$$

$$\psi_1 = \frac{\gamma_w \cdot H_1^2}{2}, \quad W_T = \left[\frac{sen(\beta-\alpha)}{sen\beta\cdot sen\alpha}\right]\cdot\psi, \quad k_1 = \frac{\psi_1}{k.\psi}$$

$$\psi = \left\{\frac{\gamma_{sat}}{2}\cdot H_1^2 + \frac{1}{2}\left(H^2 - H_1^2\right)\gamma + q.H\right\}, \quad k_2 = \frac{C.H}{\psi\ k}sen\beta$$

$$tan\varepsilon = \frac{k_h}{(1+k_v)}, \quad K_v = \text{negativo cuando la fuerza sísmica es hacia arriba}$$

$$U = \frac{H_1^2}{2}\gamma_w(\cot\alpha - \cot\beta)\sec\alpha \qquad \frac{k_2\ sen(\beta-2\alpha-\varepsilon)}{sen^2(\beta-\alpha)} + \tan\phi - k_1\ \tan\phi\ \sec^2\alpha\ \cos(2\alpha+\varepsilon) = 0$$

Factor de seguridad con anclaje

$$(FS)_a = \frac{\frac{C.H}{sen\alpha} + [R\cos(\alpha+\varepsilon) - U + Fa.sen(\alpha-\Delta)]\cdot\tan\phi}{R\ sen(\alpha+\varepsilon) - Fa\ \cos(\alpha-\Delta)}$$

$$\tan(\alpha-\Delta) = \frac{\tan\phi}{(FS)_a} \qquad S = \left[\frac{H}{sen\beta}.\frac{T_a}{F_a}\right]^{1/2} \qquad L_t = \left[S.\frac{sen(\beta-\alpha))}{sen(\alpha-\Delta))} + 0{,}15H\right] + \left[\frac{m.Ta}{\pi.\phi_p.\tau_u}\right]$$

Factor de seguridad con terraplén

$$FS_{terraplen} = \frac{cH/sen\alpha + [R\cos(\alpha+\varepsilon) - U + W_{terraplen}\cos\alpha]\tan\phi}{R\,sen(\alpha+\varepsilon)}$$

$$W_{terraplen} = \left[\frac{1}{2}h_t^2 m + bh_t - \frac{1}{2}\frac{h_t^2}{\tan\beta}\right]\gamma_{terraplen}$$

Factor de seguridad con berma

$$W_{berma} = \left[bh_b + \frac{1}{2}mh_b^2 - \frac{1}{2}\frac{h_b^2}{\tan\beta}\right]\gamma_{berma} \qquad W_{t-b} = \left[\frac{sen(\beta-\alpha)}{sen\beta sen\alpha}\right]\psi - W_{berma}$$

Factor de seguridad Rotura en cuña

$$FS = \frac{(\cos\theta_2.\tan\phi_1) + (\cos\theta_1.\tan\phi_2)}{\tan(\alpha_s+\varepsilon).sen(\theta_1+\theta_2)} \qquad \tan\psi_s = \left[\frac{\tan\alpha_1\cos\psi_1 - \tan\alpha_2\cos\psi_2}{\tan\alpha_2 sen\psi_2 - \tan\alpha_1 sen\psi_1}\right]$$

$$\tan\alpha_s = [\tan\alpha_2\cos(\psi_2 - \psi_s)]$$

$$sen\theta_1 = sen\alpha_1.sen\alpha_s.\cos(\psi_s - \psi_1) + \cos\alpha_1\cos\alpha_s$$
$$sen\theta_2 = sen\alpha_2.sen\alpha_s.\cos(\psi_s - \psi_2) + \cos\alpha_2\cos\alpha_s$$
$$\cos\theta_{ab} = sen\alpha_1.sen\alpha_2.\cos(\psi_2 - \psi_1) + \cos\alpha_1\cos\alpha_2$$