DEVELOPMENTS IN GEOTECHNICAL ENGINEERING 47

THEORETICAL FOUNDATION ENGINEERING

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(5.129).

Example 5.11. Refer to Example 5.10. Other quantities remaining the same, if H=3 m determine β_{cr}.

Solution.

$$\theta = \cos^{-1}\left[1-\left(\frac{H\gamma}{c}\right)\ \frac{(1-\sin\phi)}{2\tan^2(45+\phi/2)}\right]$$

So

$$\theta = \cos^{-1}\left[1-\frac{(3)(17.5)}{16}\ \frac{1-\sin12°}{2\tan^2(45+12/2)}\right]$$

$$= \cos^{-1}\left[1-\frac{(3.281)(0.792)}{3.05}\right] = \cos^{-1}(0.148) = 81.49°$$

However

$$\theta_c = 90-\phi = 90-12 = 68°$$

So, $\theta>\theta_c$. Now, θ=81.49°=θ''. Substituting ϕ=12° and θ''=81.49° in Eq. (5.130) gives

$$\beta_{cr} = \tan^{-1}\left\{\frac{(3)(17.5)}{16}\ x\ \frac{\cos12(1-\sin12)}{2(1+\sin12)\left[\left(\frac{\pi}{180}\ 81.49\right)-\sin81.49-\pi/2+\left(\frac{\pi}{180}\ 12\right)+\cos12°\right]}\right\}$$

$$= \underline{87°}$$

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