53:139 Foundation Engineering

Department of Civil & Environmental Engineering

The University of Iowa

Supplement to Assignment #7

For a vertical retaining wall of height H and a sloping granular backfill of unit weight γ and friction angle ϕ, making angle α with respect to the horizontal, the resultant Rankine active and passive forces acting on the wall are given by the following relations:

$$P_a = \frac{\gamma H^2}{2}\cos\alpha\left[\frac{\cos\alpha - \left(\cos^2\alpha - \cos^2\phi\right)^{1/2}}{\cos\alpha + \left(\cos^2\alpha - \cos^2\phi\right)^{1/2}}\right]$$

$$P_p = \frac{\gamma H^2}{2}\cos\alpha\left[\frac{\cos\alpha + \left(\cos^2\alpha - \cos^2\phi\right)^{1/2}}{\cos\alpha - \left(\cos^2\alpha - \cos^2\phi\right)^{1/2}}\right]$$

The resultant forces act parallel to the sloping granular backfill that makes angle α with respect to the horizontal. **Derive both of these results using fundamental principles**.