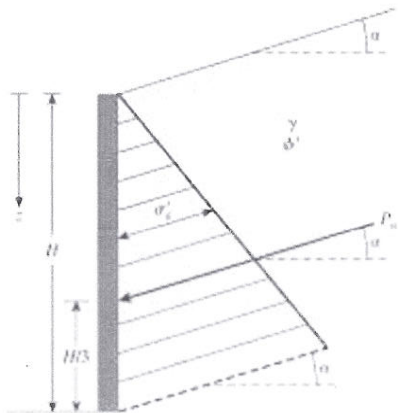


# ENCE 4340 Foundation Engineering Fall 2011 Homework # 3 (due: 10-3-2011)

Problem #1: Refer to Figure 7.10. Given:  $H = 22\text{ft}$ ;  $\gamma = 115\text{pcf}$ ;  $\phi' = 25^\circ$ ;  $c' = 250\text{psf}$ ; and  $\alpha = 10^\circ$

Calculate the Rankine active force per unit length of the wall after the occurrence of tensile crack



Depth of Tensile crack

$$z_c = \frac{2c'}{\gamma} \sqrt{\frac{1+\sin\phi'}{1-\sin\phi'}} = \frac{2(250)}{115} \cdot \sqrt{\frac{1+\sin 25^\circ}{1-\sin 25^\circ}} = 4.38\text{ft. } 6.82\text{ ft}$$

$$\text{At } z=22', \quad \frac{c'}{\gamma z} = \frac{250}{115(22)} = 0.099 \approx 0.1$$

From table 7.2  $K'_a = 0.296$  (active Earth pressure coefficient)

$$\text{At } z=22', \quad \text{Lat Earth Pressure, } \sigma'_a = \gamma z K'_a \cos \alpha = 115(22)(0.296) \cos 10^\circ = 737.5\text{ psf}$$

Figure 7.10 Notations for active pressure—Eqs. (7.19), (7.20), (7.21)

Total Force  $\Rightarrow$

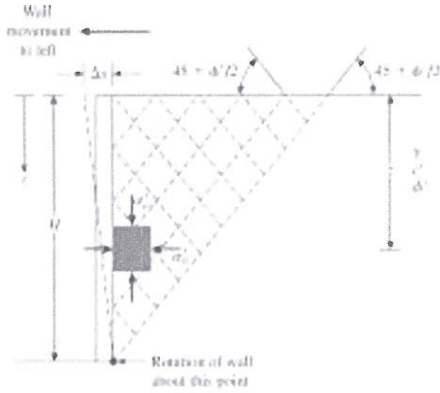
$$P_a = \frac{1}{2} \sigma'_a (H - z_c) = .5 (737.5) (22 - 4.38) = 6497.4 \frac{\text{lb}}{\text{ft}}$$

$$\bar{z} = \frac{H - z_c}{3} = \frac{22 - 4.38}{3} = 8.81' \text{ from btm.}$$

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Problem #2: Given the height of the retaining wall, H is 21 ft; the backfill is a saturated clay with  $\phi = 0^\circ$ ;  $c = 630$  psf;  $\gamma_{sat} = 113$ pcf.

- (a) Determine the Rankine passive pressure distribution diagram behind the wall.
- (b) Estimate the Rankine passive force per foot length of the wall and also the location of the resultant.

(a):  $K_p = \tan^2\left(45 + \frac{\phi}{2}\right) = 1$

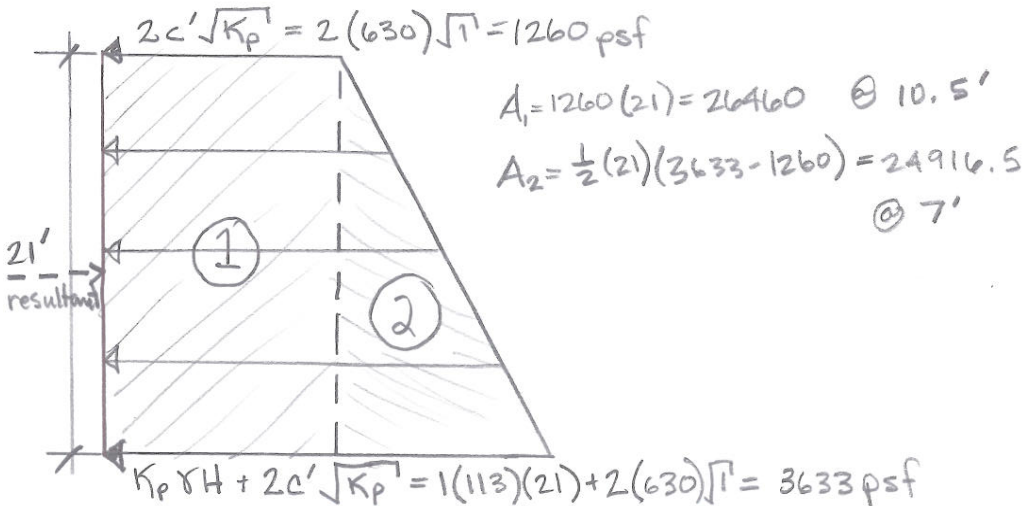
(b):  $\sum A_i = P_p = 51377 \frac{lb}{ft}$

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$\sum F_x = 0$

$-26460(10.5) - 24916.5(7) + 51377(\bar{x}) = 0$

$\bar{x} = 8.8 ft$



$P_p = 51377 \frac{lb}{ft}$  @ 8.8' from btm