

Solutions to Structures ltd.



Ref.	Calculations 3 FERNFIELD RETAINING WALL H=5m	Output
	THE SOIL AT THE ABOVE SITE HAS BEEN EXPOSED AND FOUND TO BE A HARD CLAYEY, SANDY MATERIAL WITH THE FOLLOWING PROPERTIES $\phi = 40^\circ$ $C = 10 \text{ KPa}$ BUILDING THE WALL AT AN INCLINE OF 13° AGAINST AN EGGSHELL TYPE DRAINAGE MEMBRANE NO FRICTION BETWEEN SOIL AND WALL CAN BE CONSIDERED. Hence $\delta = 0^\circ$ $\alpha = 77^\circ$ $\beta = 0^\circ$ From Coulomb Theory $K_A = \left(\frac{\sin(\alpha - \phi) / \sin \alpha}{\sqrt{[\sin(\alpha + \delta)] + \left[\frac{\sin(\phi + \delta) \sin(\phi - \beta)}{\sin(\alpha - \beta)} \right]}} \right)^2$ $K_A = 0.15$ $Z_0 = \frac{2C}{\gamma K_A} = \frac{20}{18 \sqrt{0.15}} = 2.9 \text{ m}$ PRESSURE ON WALL $P_A = \frac{1}{2} K_A \gamma (H - Z_0)^2$ $= 0.5 \times 0.15 \times 18 (5 - 2.9)^2$ $= 6.113 \text{ KN}$ LEVER ARM $L_A = \frac{(H - Z_0)}{3} = \frac{(5 - 2.9)}{3} = 0.7 \text{ m}$ MOMENT $M = 4.33 \text{ KNm}$ SURCHARGE $P_s = V K_a H = 10 \times 0.15 \times 5 = 7.5 \text{ KN}$ LEVER $L_s = H/2 = 5/2 = 2.5 \text{ m}$ MOMENT $M_s = 18.75 \text{ KNm}$ TOTAL OVERTURNING MOMENT = $18.75 + 4.33 = 23.08 \text{ KNm}$	

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	WALL TO BE CONSTRUCTED OF 440mm BLOCKWORK @ 13° INCLINATION  VERTICAL REACTION OF WALL $5 \times 0.44 \times 18 = 39.6 \text{ KN}$ LEVER ARM $= 2.5 \sin 13 - t/2$ $= 0.562 \text{ m} - 0.22 \text{ m}$ $= 0.342 \text{ m}$ MOMENT DUE TO WALL $= 13.54 \text{ KN m}$ RESULTANT MOMENT ABOUT X $= 23.08 - 13.54 = 9.54 \text{ KN m}$ LEVER ARM TO RESULTANT $= \frac{M}{R_v} = \frac{9.54}{39.6} = 0.24 \text{ m}$ Eccentricity $= 20 \text{ mm} < \frac{440}{6} = 73 \text{ mm} \therefore$ <u>LOAD LIES WITHIN MIDDLE THIRD</u> <u>MAX BASE PRESSURE</u> $= \frac{R_v}{B} \left(1 + \frac{6e}{B} \right)$ $= \frac{39.6}{0.44} \left(1 + \frac{0.12}{0.44} \right)$ $= 114.5 \text{ KN/m}^2$ <u>CHECK SLIDING</u> $F = R_v \tan \delta_B / R_H$ $= 22.86 / 6.113 + 7.5$ $= 1.6 > 1.5 \text{ (PASSIVE RESISTANCE IGNORED.)}$ $\delta_B = 0.75 \phi$ $= 30^\circ$	