Question: Situation - A retaining wall 7 m high supports a cohesionless s...

GEOTECHNICAL ENGINEERING. SOLVE FOR THE SITUATION PROBLEMS

Situation - A retaining wall 7 m high supports a cohesionless soil having a dry density of 1600 kg/m³, angle of shearing resistance is 33° and void ratio of 0.68. The surface of the soil is horizontal and level with the top of the wall. Neglect wall friction and use Rankine's formula for active pressure of a cohensionless soil.

Determine the nearest value to the total earth thrust on the wall in kN per lineal meter if the soil is dry.

A. 113.4 C. 125.7
B. 154.2 D. 138.4

Determine the nearest value to the thrust on the wall in kN per lineal meter if owing to inadequate drainage, it is waterlogged to a level 3 m below the surface.

A. 214 C. 312
B. 178 D. 236

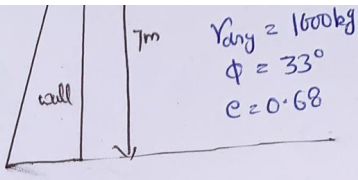
Determine the nearest value to the height above the base of the wall where the thrust acts during the waterlogged condition.

A. 1.58 m C. 1.97 m
B. 1.75 m D. 2.54 m

Expert Answer

$K_a = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-\sin 33^\circ}{1+\sin 33^\circ}$

$K_a = 0.2948$



$\gamma_{dry} = 1600 kg/m^3$
$\phi = 33^\circ$
$c = 0.68$

(1) total Earth thrust $P = \frac{1}{2} \times K_a \gamma_{dry} \times h \times h \times g$

$= \frac{1}{2} \times 0.2948 \times 1600 \times 7 \times 7 \times 9.81$

$P = 113.37 kN/m$ (A.)

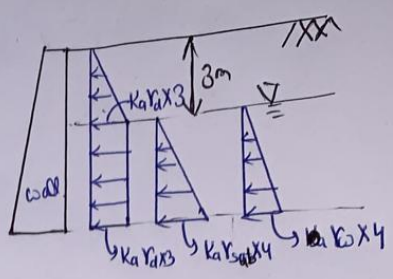
2

$\gamma_{sat} = \left(\frac{G_s + e}{1+e}\right)\gamma_w$

$\gamma_d = \frac{G_s \gamma_w}{1+e}$

$G_s = \frac{\gamma_d (1+e)}{\gamma_w}$

$\gamma_{sat} = \frac{\gamma_d (1+e) + e\gamma_w}{(1+e)} = \gamma_d + \frac{e}{1+e}\gamma_w$



$\gamma_{sat} = 1600 + \frac{0.68}{1.68} \times 1000$

$\gamma_{sub} = \gamma_{sat} - \gamma_w = 1000 - 77$

$\gamma_{sat} = 2004.77 kg/m^3$

$P = P_1 + P_2 + P_3 + P_4$

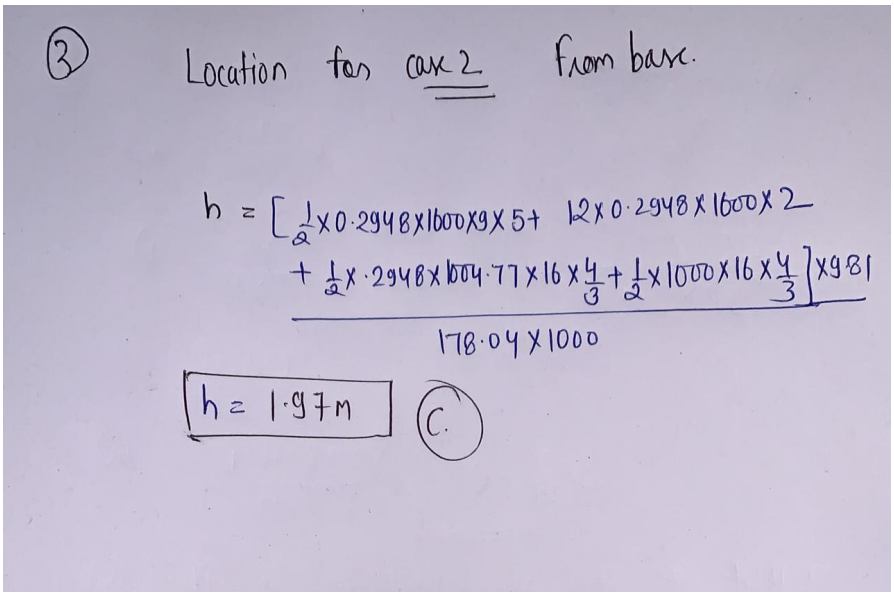
$P = \frac{1}{2} \times K_a \gamma_d \times 3 \times 3 + \frac{1}{2} \times 4 \times K_a \gamma_d \times 3 + \frac{1}{2} \times K_a \gamma_{sub} \times 4$

$+ \frac{1}{2} K_a \gamma_w \times 4$

$P = \left[\frac{1}{2} \times 0.2948 \times 1600 \times 9 + 12 \times 0.2948 \times 1600\right.$

$\left. + \frac{1}{2} \times 0.2948 \times \left(\frac{42100}{21} - 1000\right) \times 4 \times 4 + \frac{1}{2} \times 0.2948 \times 1000 \times 4\right] 9.81$

$P = 178.08 kN/m$ (B.)



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A: See answer 100% (2 ratings)

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A: See answer 100% (2 ratings)

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