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**Question:** The retaining wall is supporting two layers of soil with differen...

The retaining wall is supporting two layers of soil with different properties as shown in the figure below.

a. Determine the total active force acting on the wall considering 1m width, (kN)

b. Find the overturning moment. (kN-m)

c. Compute the total active force if a surcharge of 20 kPa is applied on top of the backfill considering 1 meter width, (kN)

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## Expert Answer



Anonymous answered this  
270 answers

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In order to solve this problem we need to apply the theory of earth pressure, particularly Rankine's Theory of earth pressure.

The solution has been carried out in the following images and it is accompanied by the pressure distribution diagram.

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theory of  $\sigma_z = 2.4 \text{ m}$   $\gamma = 17.4 \text{ KN/m}^3$

$K_a = \frac{1 - \sin \phi}{1 + \sin \phi}$  \* B  $\phi = 28^\circ$   $\nabla$

$\Rightarrow$  For upper layer  $3.6 \text{ m}$   $\gamma_{\text{sat}} = 18.2 \text{ KN/m}^3$

$K_{a1} = \frac{1 - \sin 28^\circ}{1 + \sin 28^\circ}$   $\phi = 26^\circ$  C

$= 0.36$

For second layer

$K_{a2} = \frac{1 - \sin 26^\circ}{1 + \sin 26^\circ}$

$= 0.39$

• At point B:

$\bar{\sigma}_z = 2.4 \times 17.4 = 41.76 \text{ KN/m}^2, u = 0$

$p_{a1} = 0.36 \times 41.76 = 15.03 \text{ KN/m}^2$

\* Below the interface  $p_a$  is given by

$p_a = 0.39 \times 41.76 = 16.29 \text{ KN/m}^2$

\* Location of line of action from  $= \frac{2.4}{3} + 3.6$

$= 4.4 \text{ m}$

• At point C:

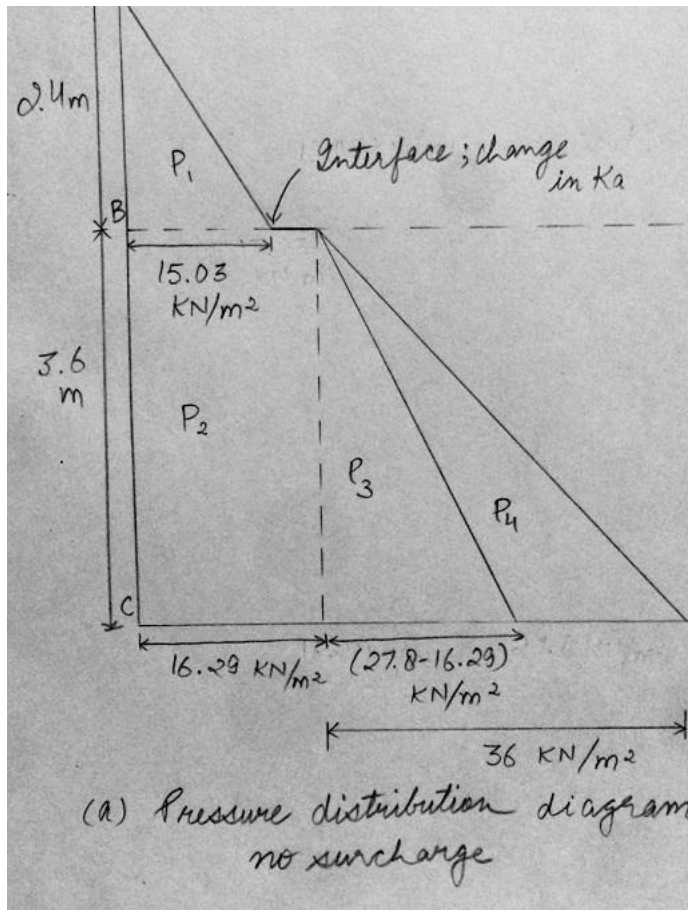
$\bar{\sigma}_z = 2.4 \times 17.4 + 3.6 \times (18.2 - 10) \left. \begin{array}{l} \gamma_w = 10 \text{ KN/m}^3 \\ \end{array} \right\}$

$= 71.28 \text{ KN/m}^2$

$u = 3.6 \times 10 = 36 \text{ KN/m}^2$

$p_{a2} = 0.39 \times 70.56$

$= 27.8 \text{ KN/m}^2$



The answers are found out to be as follows:

- a) 162.2 kN
- b) 287.1 kN-m
- c) 216.6 kN

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