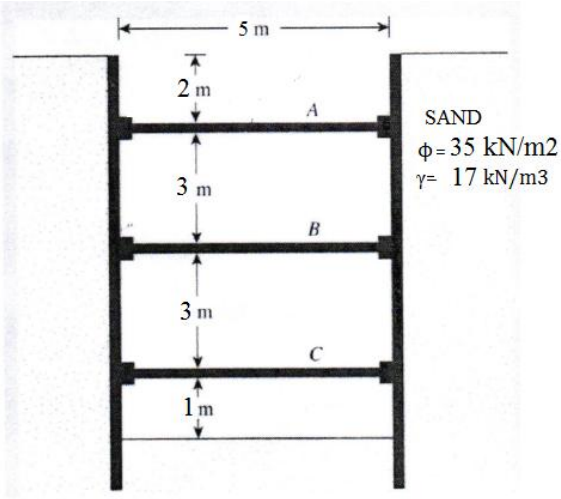
EXAMPLE 1.



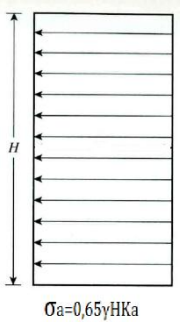
The cross-section braced cut shown in figure;

a)Draw the earth-pressure envelope and determine the strut loads at level A, B, C,
b) Calculate the maximum moment at wale.

Note: The struts are located 4 m on center in the plan.

SOLUTION 1.

Pressure envelope for cuts in sand;



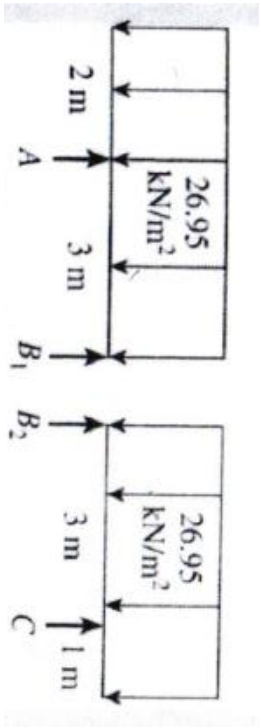
$$Ka = \tan^2(45 - \frac{\phi}{2})$$

$$Ka = \tan^2(45 - \frac{35}{2}) = 0.271$$

$$\sigma a = 0.65.\gamma.H.Ka$$

$$\sigma a = 0.65.17.9.0.271 = 26.95 kN/m^2$$

Load diagram;



$$\sum M_{B1} = 0$$

$$A = \frac{(26.95).(5).(\frac{5}{2})}{3}) = 112.29kN/m^2$$

$$B_1 = (26.95).(5) - 112.29 = 22.46kN/m^2$$

$$\sum M_{B2} = 0$$

$$C = \frac{(26.95).(4).(\frac{4}{2})}{3}) = 71.87kN/m^2$$

$$B_2 = (26.95).(4) - 71.87 = 35.93kN/m^2$$

The strut loads are;

$$(A).(s) = (112.29).(4) = 449.16kN$$

$$(B1 + B2).(s) = (22.46 + 35.93)(4) = 233.56kN$$

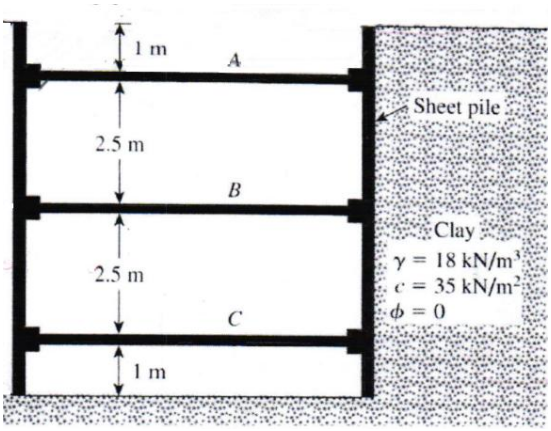
$$(C).(s) = (71.87).(4) = 287.48kN$$

Maximum moment at wale;

$$M\max = \frac{ql^2}{8}$$

$$M\max = \frac{(112.29).(4)^2}{8} = 224.58kNm$$

EXAMPLE 2.



The cross-section braced cut shown in figure;

- **a)** Draw the earth-pressure envelope
- **b)** Determine the strut loads at levels A, B, C.

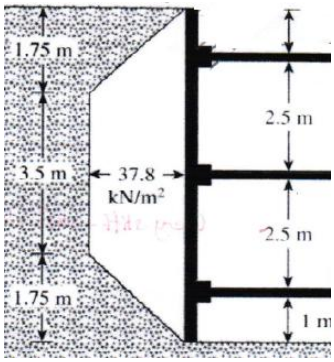
Note : The struts are placed at 3 m center to center in the plan

SOLUTION 2.

Check for stiffnes;

$\frac{\gamma H}{c} = \frac{(18)(7)}{35} = 3.6 \leq 4$ very stiff-stiff clay

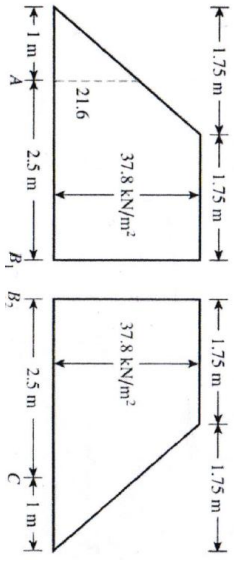
Pressure envelope for stiff clays;



$\sigma a = 0.3\gamma H$

$\sigma a = 0.3(18)(7) = 37.8kN/m^2$

Load diagram:



$$\sum M_{B1} = 0$$

$$A(2.5) - (\frac{1}{2})(37.8)(1.75)(1.75 + \frac{1.75}{3}) - (1.75)(37.8)(\frac{1.75}{2}) = 0$$

$$A = 54.02kN\ /\ m$$

$$\sum F_x = 0;$$

$$\frac{1}{2}(1.75)(37.8) + (37.8)(1.75) = A + B_1$$

$$33.08 + 66.15 - A = B_1$$

$$B_1 = 45.2kN\ /\ m$$

Due to symmetry;

$$B_2 = 45.2kN\ /\ m$$

$$C = 54.02kN\ /\ m$$

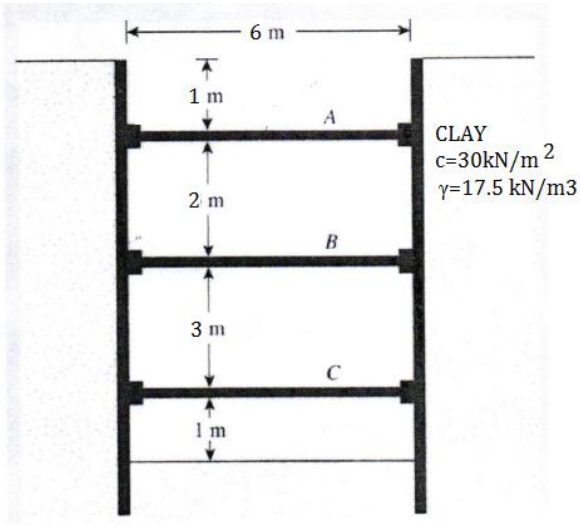
Strut loads at level A, B, C

$$P_A = (A)(s) = 54.02(3) = 162.06kN$$

$$P_B = (B1 + B2)(s) = (45.2 + 45.2)(3) = 271.2kN$$

$$P_C = (C)(s) = 54.02(3) = 162.06kN$$

EXAMPLE 3.



The cross-section braced cut shown in figure;

a) Draw the earth-pressure envelope
b) Determine the strut loads at levels A, B, C.

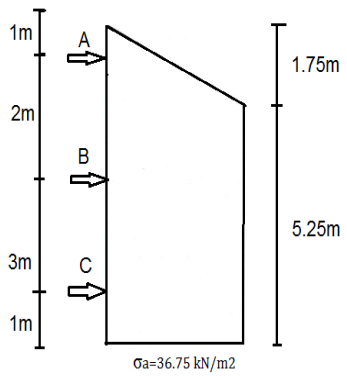
Note : The struts are placed at 3 m center to center in the plan

SOLUTION 3.

Check for stiffnes;

$\frac{\gamma H}{c} = \frac{(17.5)(7)}{30} = 4.08 > 4$ medium to soft clay

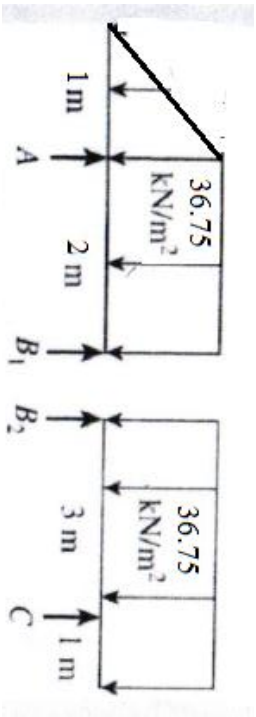
Pressure envelope for medium to soft clays;



$\sigma a = 0.3\gamma H$

$\sigma a = 0.3(17.5)(7) = 36.75 kN/m^2$

Load diagram;

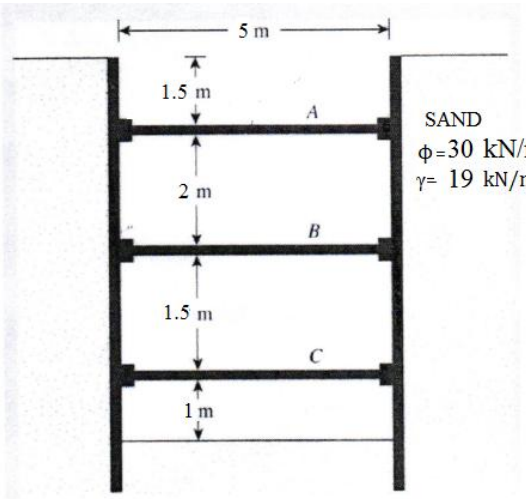


$$\sum M_{B1} = 0,$$
$$\sum M_{B2} = 0,$$
$$A = 43.81 kN/m$$
$$B = 83.27 kN/m$$
$$C = 98 kN/m$$

Strut loads at level A, B, C

$$P_A = (A)(s) = 43.82(3) = 131.46 kN$$
$$P_B = (B1 + B2)(s) = (83.27)(3) = 249.81 kN$$
$$P_C = (C)(s) = 98(3) = 294 kN$$

EXAMPLE 4.



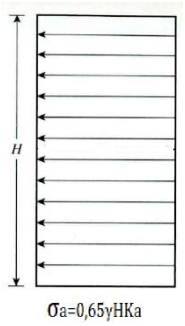
The cross-section braced cut shown in figure;

a) Draw the earth-pressure envelope
b) Determine the strut loads at levels A, B, C.
c) Calculate the maximum moment at wale.
d) Calculate the maximum moment at sheet pile.

Note : The struts are placed at 5 m center to center in the plan

SOLUTION 4.

Pressure envelope for cuts in sand;



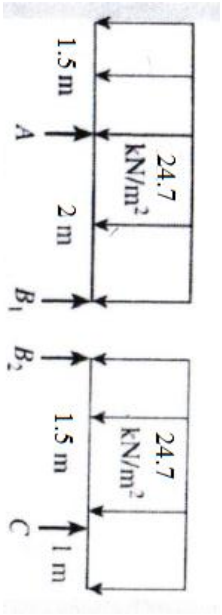
$$Ka = \tan^2(45 - \frac{\phi}{2})$$

$$Ka = \tan^2(45 - \frac{30}{2}) = 0.33$$

$$\sigma a = 0.65.\gamma.H.Ka$$

$$\sigma a = 0.65.19.6.0.33 = 24.7kN/m^2$$

Load diagram;



$$\sum M_{B1} = 0$$

$$A = \frac{(24.7)(3.5)(\frac{3.5}{2})}{2}) = 75.64kN/m^2$$

$$B_1 = (24.7)(3.5) - 75.64 = 10.81kN/m^2$$

$$\sum M_{B2} = 0$$

$$C = \frac{(24.7).(2.5).(\frac{2.5}{2})}{1.5}) = 51.48kN/m^2$$

$$B_2 = (24.7).(2.5) - 51.48 = 10.27kN/m^2$$

The strut loads are;

$$(A).(s) = (75.64).(5) = 378.2kN$$

$$(B1 + B2).(s) = (21.08)(5) = 105.4kN$$

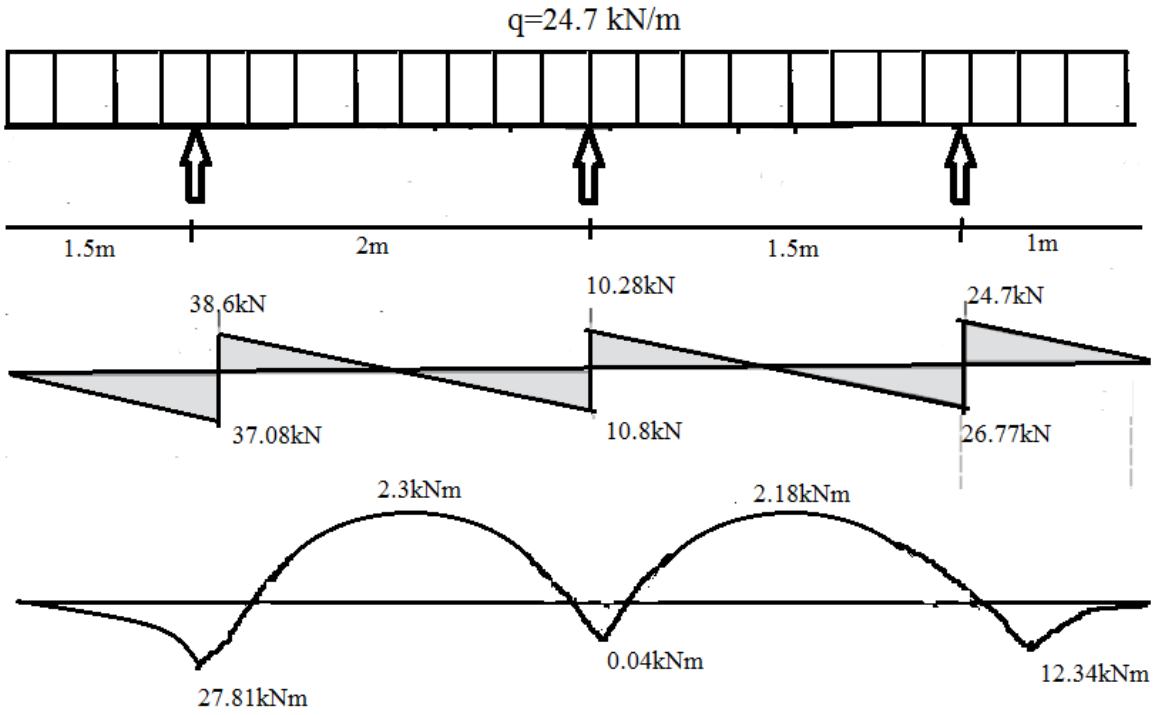
$$(C).(s) = (51.48).(5) = 257.4kN$$

Maximum moment at wale;

$$M\max = \frac{ql^2}{8}$$

$$M\max = \frac{(75.65).(5)^2}{8} = 236.41kNm$$

Maximum moment at sheet pile;



Mmax=27.81 kNm at sheet pile.