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section : B  
12 (Batch-14)

semester

Assignment : Hydraulic structure

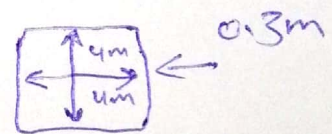
Submitted To : Engr. Adeed Khan

Problem:-

A box culvert is to be designed having inside dimension  $4 \times 4 \text{ m}$ . The culvert is subjected to L.L  $50 \text{ kN/m}^2$  of superimposed D.L of  $128 \text{ kN/m}^2$  unit wt of soil is  $18 \text{ kN/m}^3$ . Angle of repose  $30^\circ$  use M25 grade concrete of steel. Design the Box culvert for load combination of D.L, L.L and soil pressure.

Data:

L.L =  $50 \text{ kN/m}^2$   
D.L =  $128 \text{ kN/m}^2$   
 $\phi = 30^\circ$



① Load calculation.

Total load carrying on top slab =  
self wt of slab + L.L + D.L

self wt of top slab =  $0.3 \times 25 = 7.5 \text{ kN/m}^2$

$w = \text{Total load} = 7.5 + 50 + 128 = 185.5 \text{ kN/m}^2$

② Co-efficient of earth pressure.

$$K_a = \frac{1 - \sin 30}{1 + \sin 30} = \frac{1 - \sin 30}{1 + \sin 30} = 0.33$$

① Lateral Pressure due to (D.L+L.L)

$$= \text{Total vertical load (L.L+D.L)} \times K_a$$

$$= (50 + 12.8) (0.33)$$

$$= 20.724 \text{ KN/m}^2$$

② Lateral Pressure due to soil

$$= K_a \times \gamma h$$

$$= 0.33 \times 18 \times 4.3$$

$$= 25.7 \text{ KN/m}^2$$

③ Lateral Pressure @ top =

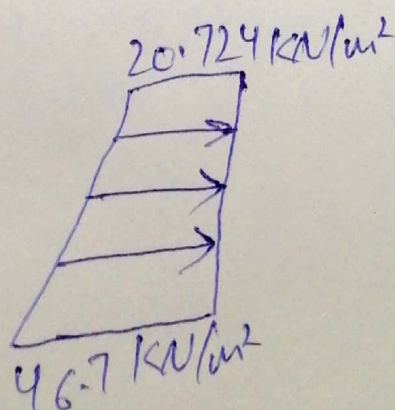
Lateral due to (D.L+L.L)

$$= 20.724 \text{ KN/m}^2$$

④ Bottom = Lateral due to (D.L+L.L) +

Lateral due to soil.

$$= 20.724 + 25.7 = 46.7 \text{ KN/m}^2$$



Bridge scour is the removal of sediment such as sand and gravel from around abutments or piers. Scour by swiftly moving water, can scoop out scour holes, compromising the integrity of a structure.

In the United States, bridge scour is one of the three main causes of bridge failure. It has been estimated that 60% of all bridge-related causes is the most common cause of highway bridge failure in the United States. Where 46 of 86 major bridge failures resulted from scour near piers from 1961 to 1976.