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SUBJECT = HYDRAULICS STRUCTURE

SUBMITTED TO = Engr Adeed Sir

ASSIGNMENT

Q Establish the stage discharge relationship for a concrete rectangular box culvert use suitable data of your own choice.

BOX CULVERT DESIGN:-

A box culvert is to be designed having inside disicssion 4x4m. The culvert is subjected to L.L 50 KN/m^2 of superimposed D.L of 12.8 KN/m^2. Unit wt of soil is 18 KN/m^3.
Angle of repose 30°. Use M25 grade concrete of Fe 415 steel. Design the box culvert for load combination of P.L, L.L and soil pressure.

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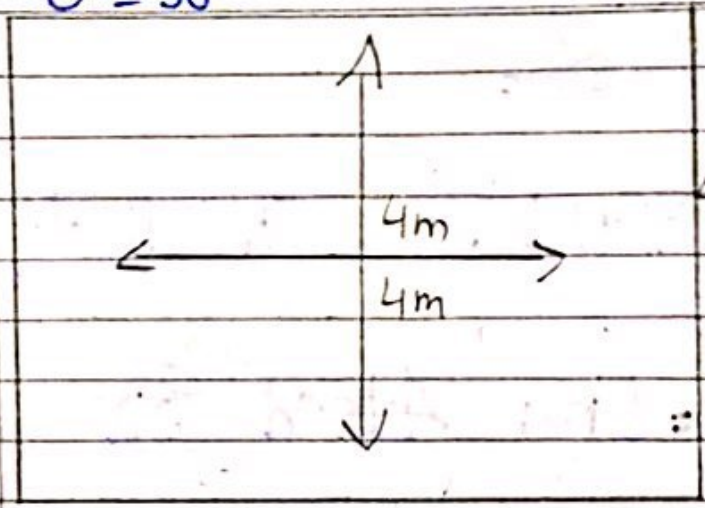
Data:-

L.L = 50 KN/m²

D.L = 12.8 KN/m²

θ = 30°



① LOAD CALCUIATION:-

Total load coming on top slob = soll wt of slob + L.L + D.L

self wt of topslob = 0.3 × 25 = 7.5 KN/m²

W = Total Load = 7.5 + 50 + 12.8 = 70.3 KN/m²

② COEFFCIENT OF EARTH PRESSURE:-

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

(i) LATRAL PRESSURE Dueto (DL+L.L).

= total vertical load (L.L+DL) × Ka

= (50+12.8)(0.33)

= 20.724 KN/m²

ii Lateral Pressure due to soil = $K_a \times \gamma h$

$= 0.33 \times 18 \times 4.3$

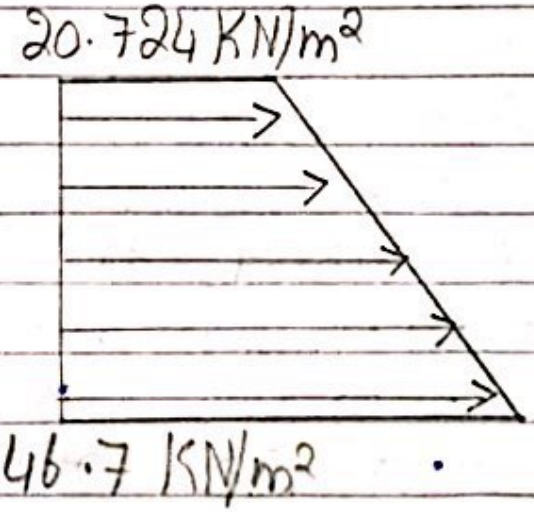
$= 25.7\ KN/m^2$

iii LATERAL PRESSURE At Top = LATERAL Pr due to (DL, L.L)

$= 20.724\ KN/m^2$

at bottom = Lateral Pr. due to (DL+L.L) + Lateral Pr. due to Soil

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



Q Also describe loads on bridge foundation due to scour and their working mechanism.

BRIDGE SCOUR:-

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

In United States, bridge scour is one of the three main causes of bridge failure (the others being collision and overloading). It has been estimated that 60% of all bridge failure result from scour and other hydraulic-related causes. It is most common cause of highway bridge failure in United States where 46 to 86 major bridge failures resulted from scour near piers from 1961 to 1976.

WORKING MECHANISM:-

The examination process is normally conducted by hydrologists and hydrologic technicians, and involves a review of historical engineering information

about the bridge, followed by a visual inspection. Information is recorded about the type of rock or sediment carried by river, and the angle at which the river flows towards and away from the bridges. The area under the bridge is also inspected for holes and other evidence of scour.

Bridge examination begins by office investigation. The history of the bridge and previous scour related problems should be noted. Once a bridge is recognized as a potential scour bridge, it will proceed to further evaluation including field review, scour vulnerability analysis and prioritizing. Bridges will also be rated in different categories and prioritized for scour risk. Once a bridge is evaluated as scour critical, the bridge owner should prepare a scour plan of action to mitigate the known and potential deficiencies. The plan may include installation of countermeasures, monitoring, inspections after flood events and procedures for closing bridges if necessary.