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7386

Hydraulic Structure

BOX CULVERT DESIGN:-

Problem:- A box culvert is designed to be having inside Dimensions 4×4m. The Culvert is subjected to L.L 50kN/m² of Super-Imposed D.L of 12.8kN/m² Unit wt of Soil is 18kN/m³. Angle of Reposa 30° use M25 grade Concrete of FE 415 Steel. Design the box Culvert for load Combination of D.L, L.L and Soil Pressure

DATA:-

L.L = 50kN/m².

D.L = 12.8kN/m²

$\alpha = 30°$

① LOAD CALCULATION:-

Total Load Carrying on Top Slab = Self wt of Slab + L.L + D.L

Self wt. of top Slab = 0.3 × 25 = 7.5 kN/m²

w = Total Load = 7.5 + 50 + 12.8 = ~~Tot~~ 70.3kN/m²

② CO-EFFICIENT OF EARTH PRESSURE:-

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

(i) LATERAL PRESSURE DUE TO (D.L + L.L):-

= Total Vertical Load (L.L + D.L) × K_a

= (50 + 12.8)(0.33)

= 20.724 kN/m²

(ii) LATERAL PRESSURE DUE TO SOIL = $K_a \times \gamma \times h$

= 0.33 × 18 × 4.3

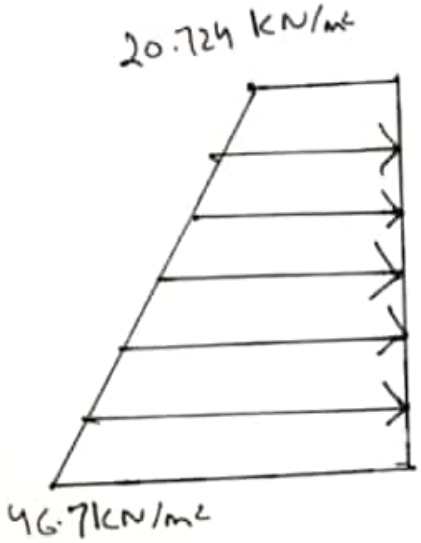
= 25.7 kN/m²

(iii) LATERAL PRESSURE @ TOP = LATERAL PR DUE TO (D.L + L.L)

= 20.724 KN/m²

@ bottom = Lateral due to (D.L + L.L) + Lateral Pressure due to Soil

= 20.724 + 25.7 = 46.7 KN/m²



BRIDGE SCOUR:-

Bridge Scour is removal of Sediment such as Sand and gravel from around the bridge abutments or Piers. Scour caused 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 (The others being Collision and overloading. It has been estimated that 60% of all bridge failures result from Scour and other hydraulic related Causes. It is the most common cause of Highway bridge failure in United States. where 46 of 86 Major bridge failures Resulted from Scour near Piers from 1961 to 1976.

The Examination Process is normally Conducted by hydrologists and hydrologic technicians, and involves a review of Historical Engineering information about the bridge, followed by visual inspection. Information is recorded about the type of rock of Sediment Carried by the river, and the angle at which the river flows towards and away from the bridge. The area Under the bridge is also inspected for holes and other Evidences 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 Potential Scour bridge.