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Subject Hydraulic Structure

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Q.No: 01 (A)

Differentiate b/w Culvert and Causeway.

* Culvert:

Culvert is a tunnel structure constructed under road ways or railways to provide cross drainage or to take electrical or other cables from one side to other.

Causeway:

Causeway is a road paved dip which allow the floods to pass over it. it may have or may not have opening or vent to allow low water flow

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Q No: 01 (B)

Cross Drainage work

In an irrigation Project when the network of main canals branch chanals distributaries etc. are provided then these canals may have to cross the natural drainages like rivers. streams, nallahs etc. at different Point within the command area of the Project. the crossing of the cannals with such abstacle cannot be avoided So. suitable structures must be constructed at the crossing Point for the easy flow of water of the cannal and drainage in the respective direction. these structure are known as cross drainage works.

Irrigational canals while carrying water from headworks to crop field. have to cross few natural drainages streams. nallaha etc. to cross those drainage safely by the canals. Some suitable structure are required to construct. work required to construct to cross the drainage

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called cross drainage work (CDWs). at the meeting point of canals and drainages, bed levels may not be Same. Depending on their bed levels, different structures are constructed and accordingly they are designated by different names.

Necessity of cross Drainage work

* the water shed canals do not cross natural drainages. but in actual orientation of the canal network this ideal condition may not be available and the ~~obstacles~~ obstacles like natural drainage may be present across the cannal. so the cross drainage works must be provided for running the irrigation System.

* the site condition of the crossing Point may be such that without any suitable structure the water of the canal and drainage can not be diverted to their natural directions. So the cross drainage work must be provided to maintain their natural direction of flow.

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* At the crossing point the water of the canal and the drainage get intermixed. So for the smoth running of the canal with its design discharge the cross drainage works are required.

Types of Cross Drainage work

* Types 1 (Irrigation cannal passes over the drainages)

(a) Aqueduct
(b) Siphon Aqueduct.

* Types II (Drainage passes over the Irrigation canal).

(a) Super Passage
(b) Siphon super passage.

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* Types III (Drainage and canal intersection each other of the same level).

(a) level crossing
(b) inlet and outlet.

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* Types I Irrigation canal Passes over the Drainage.

this condition involves the construction of following.

* Aqueduct :-

the hydraulic structure in which the irrigation cannal is taken over the drainage. is known as aqueduct.

* Siphon Aqueduct :-

In a hydraulic structure where the canal is taken over the drainage but the drainage water cannot pass. clearly below the channal. it flow under siphon Aqueduct.

* Types II Drainage passes over the irrigation. canal.

* Super Passage

the hydraulic structure in which the drainage is taken over the irrigation is known as Super Passage.

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* ~~Sa~~ Siphon super Passage

the hydraulic structure in ~~th~~ which the drainage is taken over the irrigation cannel but the canel water passes below the drainage under siphon action is ~~kn~~. known as siphon super passage.

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Q No 02 (A)

Difference b/w weirs and Barrages.

* Weir :-

* it is a solid construction put across a river to raise the water level in river.

* less costly

* No control over the water level

* No attention is required at the time of flood.

* After long time silting problem is there.

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* Barrages :-

* No solid construction is put accross the rivers. Heading up of water is affected by gates.

* Most costly.

* Batter control over the water level.

* At the time of floods the gates are raised and lowered.

* No sitting problem.

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Q No 02 (B)

Reynolds Number:

Osborne Reynolds was the first to demonstrate that laminar or turbulent flow can be predicted if the magnitude of a dimensionless number is called Reynolds.

equation:

$$N_r = \frac{VD\rho}{\mu} = \frac{VD}{\nu}$$

Where fluid density ρ, fluid viscosity ν, Pipe diameter D, and average of flow V.

* laminar:

the flow in a Pipe is laminar if the reynolds number is less than 2000.

$$Re < 2000$$

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Turbulant

if the reynolds number is greater than 4000 than it is called turbulant.

$$Re > 4000$$

Transitional flow

the flow occurs b/w laminar and turbulent flow. Reynolds number in b/w 2000 and 4000.

$$Re = 2000 - 4000$$

Lower critical velocity:

the velocity at which the flow changes from laminar to transition is known as lower critical velocity.

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Higher critical velocity:

the velocity at which the flow changes from transition to turbulant is known as higher critical velocity.

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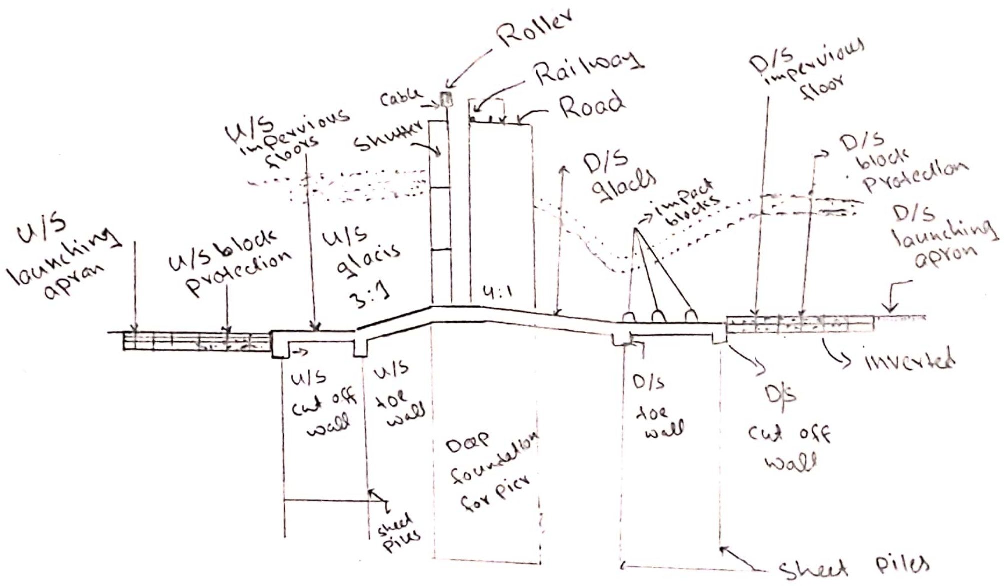
QNo: 03 A



Component Parts of barrage

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Q: No: 03 (B)

Ans:: Several formula based on experimental results have been proposed to predict the maximum or equilibrium scour depth (y_s, below general bed level) around bridge piers. In general these assume the relationship.

$$y_s/b' = \phi(y_o/b', Fr\ d/b')$$

Where b' is the pier width
y_o, is the upstream flow depth
d, is the sediment size,
and Fr is the flow froude number.

Laursen,s (1962) experimental results underestimate the scour depths compared to many indian experiment which suggest the formula.

$$y_s/b' = 4.2(y_o/b')^{0.78} Fr^{0.52}$$

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the indian field data also suggest that the scour depth should be taken as twice the regime scour depth.

In the case of live beds ~~(a stream with bed~~ (a stream with with bedload transport) the formula.

$$y_s / y_0 = (B / b')^{5/7} - 1$$

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Q No = 04

Given data

L.L = 1500 lb/ft^2

D.L = 300 lb/ft^2

Section = 15' × 15'

thickness = 0.92m = 3 ft

unit of soil = 100 lb/ft^3

Q = 30°

unit wt of concrete = 156 lb/ft^3

f_y = 60 ksi

Sol :-

Self wt of slab

thickness × unit weight of R.cc concrete

$3 \times 156 = 468 \; lb/ft^2$

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Total load

(L.L + D.L + self wt)

(1500 + 300 + 468)

= 2268 lb/ft²

Coefficient of earth pressure

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

Lateral Pressure

① vertical pressure at top

(L.L + D.L) Ka

(1500 + 300) 0.33 = 594 lb/ft²

(ii) Pressure of soil

Ka × h × unit wt of soil

0.33 × (15 + 3) × 100 = 594 lb/ft³

0.33 × (18) × 100

(iii) Pressure at top 594 lb/ft²

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(iv) Pressure at Bottom (Top + lateral soil pressure)

$= 594 + 594 = \boxed{1188 \text{ lb/ft}^2}$