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Subject = Hydraulic Structures

Submitted to: Engr. Adeed

Submission date: 24/6/2020

Assignment No II 02 (Final)

(1)

Q 1

a)

Culvert:-

A tunnel structure that allows running water to pass under a roadway or railway. Culvert is also useful for water drainage or bridging the gap over a physical obstruction.

The components of a culvert are comparatively simpler and include concrete boxes or cells (single or multiple), pipes atop deck or slabs and supporting parts.

Culverts are built at less than 20 feet high over the obstruction.

The length of culvert is typically not more than 6 meters.

Culverts are usually embedded in the soil which bears the major portion of the culvert load.

No deep foundation is required for a culvert.

The construction of a culvert can be done with a low budget.

Culverts can be pre-constructed or build at the site (in situ culverts).

A culvert is constructed when water needs to be conveyed through tunnels or channels under a roadway.

Causeway :-

In modern usage, a causeway is a road or railway on top of an embankment usually across a broad body of water or wetland.

A causeway is a paved dip which allows floods to pass over it. It may not have opening or vents for low water to flow.

Causeway is road built up on an embankment. In common ~~sense~~ use, a causeway is a bridge or railway

on top of an embankment usually over a large body of water or wet land.

Originally causeways were more like dykes, generally pierced to allow ~~pass~~ water, while other modern causeway look much the same as bridge or viaducts.

Q1:-

(b) Define cross drainage work. Why is necessary? Explain different types of cross drainge work in detail.

Ans:-

Cross drainage work:-

Cross drainage work is basically a structure which is build in a condition when a canel and natural drain comes to cross each other without interupting the ~~condition~~ continous supplies of both.

Necessity:-

On the basis of water Quality.

The necessity of cross drainage work is that if there is no cross drainge work then the water of natural drainage which is very bad in condition when both qualities are different.

On The basis of Water Quantity

Similarly canal is design for fixed quantity i.e having a fixed peak flow so as the water of both canal and natural drain mixed at crossing point then the quantity get disturbed which cause floods as well as hydralic structures failure etc.

Types of cross Drainage Work.

There are various types of cross Drainage work depending on crossing condition of natural drain and canal which are.

- By passing the canal over the drainage
- By passing the canal below the drainage
- By passing the drain through the canal.

By passing canel over the drainge.

This maybe accomplished either through

~~Ad~~ Aqueduct

Sypon - aqvedvet

~~Ad~~ Aqvduet :-

When the highest flow level of the drain is sufficiently below the bottom of the canel, so the drainge water flow freely under gravity, the structure is known as aqvedvet

Syphon - Adyquet :

When the highest flow level of the drain is above the canel bed and water passes through the aqueduct barrels under syphonic action such is called Syphon-adveduct.

By passing the canal below the drain

This may be accomplished either through

Super passage

Syphon Superpassage.

Super passage

When the flow surface level of the canal is sufficiently below the bottom of drain through, so that the canal water flows freely under gravity. Such is called Super Passage.

Syphon Super passage.

When the flow surface level of the canal is sufficiently above the bed level of the drain through so that the flow of canal is under syphonic action, such structure is called syphon Super.

By passing drain through canal

By passing the drain through canal, so that the canal water and drainage water are allowed to intermingle with each other.

This may accomplished through

- A level level crossing
- Inlet's and out lets.

Q2:- Difference between weir and barrage.

Weir	Barrage
A low dam built across a river to rise the level of water stream or regulate its flow.	An artifical barrier across a river or estuary to prevent flooding aid irrigation or navigation or to generate electricity to yield power.
wier has high cost.	Barrage has low cost.
The wier ponding is done against the raised crest and partly by shutter.	In barrage poning is done by means of gate.
In wier shutters are drapped to pass flood.	In barrage gate are raised clear off the high flood to pass flood.
In weir shutter in part length, has height of 2m.	In barrage gates over entire length and greater height.

In weir no control of river in low floods.	But barrage has perfect control on river flow.
In weir operation of shutter is slow and take more time.	In barrage gate convenient to operate
In weir excess afflux in high flooded.	In barrage has very minimum afflux problem.
Raised crest causes silting upstream.	Less silting upstream due to low crest.
Shorter construction period.	Longer construction period.
No means for silt disposal.	Silt removal is done through under sluices
No possiable to provide Rail - Road bridge in weir.	Rail Road bridge can be constructed in Barrage.

Q2. (11)

(b) :-

Reynolds Number:

The reynolds number is defined as the product of density times velocity times length divided by the viscosity co-efficient. This is proportional to the ratio of inertial force and vicous force (force resistance to change and heavy and shred forces) in a fluid flow.

limit of reynolds number

For laminar flow

In case of laminar flow the Reynold number limit is less to than 2000 $Re < 2000$.

For Turbulent flow

In case of turbulent flow the reynold number is greater than 4000. $Re > 4000$

For transition flow

In case of transition flow the reynold number limit is between 2000 and 4000

$$2000 \leq Re \leq 4000$$

lower critical velocity

→ A velocity at which laminar flow stop

OR

→ The velocity ~~at which turbulent flow starts~~.

OR The velocity at which the flow enters from laminar to transition period is known as lower critical velocity.

Higher critical velocity

A velocity at which turbulent flow starts.

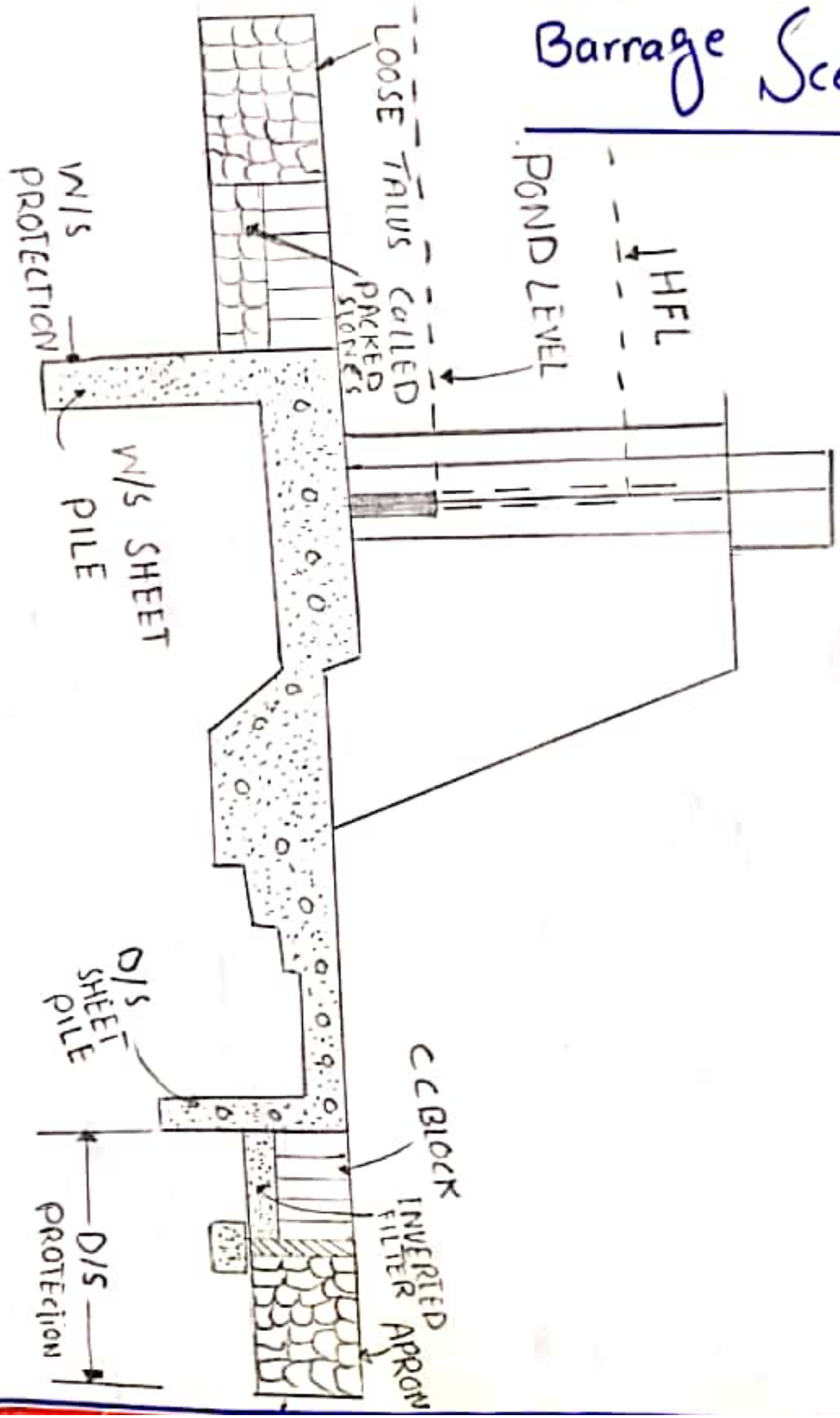
OR

A velocity in which flow enters from transition period to turbulent flow is known as higher critical velocity.

Q3:-

Part(A)

Barrage Scetch:-



Que: 3

Part (b)

We can predict the maximum or equilibrium scour depth around bridge pier's from several formulas:

based on experimental results which assure the relationship as;

$$y_s/b' = f(y_0/b', Fr, d/b')$$

where b' is the pier width, y_0 is the upstream flow depth, d is the sediment size and Fr is the flow froude number.

Laursen's Experiment

Laursen's (1962) experimental results underestimate the scour depths compared to many Indian experiments which suggested the formula (approach flow normal to the bridge pier.

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

Indian field data

The Indian field data also suggested that the scour depth should be taken as twice the regime scour depth.

In case of live beds (a stream with bed load transport) the formula

$$y_s/y_o = (B/b')^{5/4} - 1$$

Question No 4:-

Given data:-

Inside dimension = 15 ft × 15 ft

live load = 1.5 kg/ft² = 1500 lb/ft²

Dead load = 300 lb/ft²

Unit weight of soil = 100 lb/ft³

Angle of repose = 30°

Use concrete of 1:2:4 ratio

f_y = 60 ksi

Thickness = 0.92 m = 3 ft

Required data :-

Design a box culvert = ?

(18)

Sol:-

1:- Load calculation

Total load carry on top slab :

= self weight of slab + L.L + D.L

Self weight of slab = 3 x 150

= 450 lb/ft²

W = 450 + 1500 + 300 = 2250 lb/ft²

2. Co-efficient of Earth pressure:-

$$k_a = \frac{1 - \sin\phi}{1 + \sin\phi}$$

$$k_a = \frac{1 - \sin(30)}{1 + \sin(30)}$$

$$k_a = 0.33$$

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

= Total vertical load (L.L + D.L) x ka

= (1500 + 300) x 0.33

= 594 lb/ft²

4. Lateral Pressure due to Soil.

ka x γh

= 0.33 x 100 x 18

= 594 lb/ft²

5. Lateral Pressure

@ Top;

= lateral pressure due to (D.L + L.L)

= 594 lb/ft²

6. @ Bottom;

= lateral pressure due to (D.L + L.L) + lateral pressure due to soil

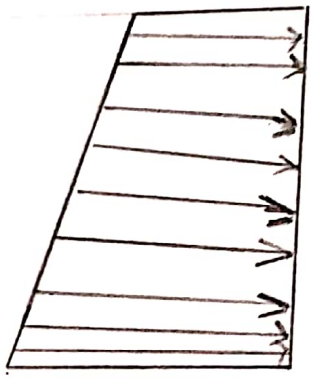
= 594 + 594

= 1188 lb/ft²

Ans

(20)

594 lb/ft²



1188 lb/ft²