Quiz / Assignment No: 2

Name : Hidayat Ullah Shah
ID : 7743
Section : C
Department: BE CIVIL
Instructor: Engr. Adeed
Subject : Hydroulic Structure
Dated : 24 Jun 2020

IQRA NATIONAL UNIVERSITY
PESHAWAR

Q NO : 1

Part (a) : Difference b/w Culvert and Couseway

Ans:. Culvert:.

Culvert is an opening through an embankment for the conveyance of water by mean of pipe or an enclosed chanel.

- Culvert is a tranverse channel under a road or railway for the draining of water.

- Culvert may be made from a pipe, reinforced concrete or other material.

- Culvert typically found in a natural flow of water and serves the purpose of bridge or a current flow controller.

- Culvert are upto 6m length.

Causeway:

In modern usage, a couseway 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 allow floods to pass over it. It may not have opening or vents for low water to flow.

Cousway is road built up on an embankment. In common use, a couseway is a bridge or railways.

Qno: 1 Part (b)

Cross drainage work:

In an Irrigation project, when the network of main canals, branch canals, distributaries, etc are provided, then these canal may have to cross the natural drainages like rivers, streams, nallahs etc at different points within the command area of the project. The crossing of the canals with such obstacle cannot be avoided. So, suitable structures must be constructed at the crossing point for easy flow of water of the canal and drainage in the respective directions. These structures are known as cross-drainage work.

"Cross drainage work is a structure constructed when when there is a crossing of canal and natural drain, to prevent the drain water from mixing into canal water."

Why Cross Drainage Work is Necessary?

The cross drainage work is required to dispose of the drainage water so that the canal supply remains uninterrupted.
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 like natural drainages may be present across the canal.
So the "cross drainage work" must be provided for running the irrigation system.

Types Of Cross Drainage Works

=> Type-I Irrigation canal passes over the drainage

This condition involves the construction of following.

• Aqueduct:

The hydroulic structure in which the irrigation canal is taken over the drainage is known as aqueduct.

These structure is suitable when bed level of canal is above the highest flood level of drainage.

Siphon Aqueduct:

In a hydraulic structure where the canal is taken over the drainage, but the drainage water cannot pass clearly below the canal.

It flow under siphonic action. So it is called Siphon Aqueduct.

Type - II Drainage Passes over the irrigation canal.

Super Structure :-

The hydroulic structure in which the drainage is taken over the irrigation canal is known as super passage

It is suitable when the bed level of drainage is above the full supply level of the canal.
The water of the canal passes clearly below the drainage.

Siphon Super Passage:

The hydroulic structure in which the drainage is taken over the irrigation canal, but the canal water passes below the drainage under siphonic action is known as siphon super passage.

It is suitable when the bed level of drainage is bellow the full supply level of the canal.

Type III: Drainage and canal intersect each other at same level.

Level Drainage:
When the bed level of the canal

and the stream are approximatly the same and quality of water in canal and stream is not much different, the cross drainage work constructed is called level crossing. Where water of canal and streams is allowed to mix.

Inlet and Outlet:

When irrigation canal meets a small stream or drain at same level, drain is allowe to enter the canal as in inlet. At same distance from this inlet point, a part of water is allowed to drain as outlet which eventually meet the original streom. Stone siph pitching is required at the inlet and outlet.

These type of CDW is called inlet and outlet.

QNO: 2

Part (A)

Ans:

Weir:

A weir in an imperivious barrier constructed across a river to raised the water level on the upstream side, the water is raised upto required height and then flow over the weir. Weir have traditionally been used to creat mill point.

Weir are also used to prevent flooding, measure discharge and help render a river navigable.

The crest of an overflow spillways on large dam is aften called weir.

Weir can be build of wood concrete or moraine material.

Barrage:

A river barrage is low headed diversion dam that is build to allow diversion of part of the water flow.

A barrage determines a little increase of upstream water profile and a little upstream Reservior.

The purpose of barrage is essentically to stabillize the upstream water level and river profile in order to ensure a long techinical life to the diversion facilities.

We can often see mountain river.

Part (b)

Reynold's number:

The product of density times length divided by viscosity coefficiant.

These is proportional to the ratio of inertial forces and viscous forces in a fluid flow.

Leminor: If Renolds number is less than 2000 then it is leminar flow.

Turbolant: If the Renolds number is greater than ~~4000~~ 0,4000 then it is turbolant flow.

Neither leminor Nor Turbolant flow:

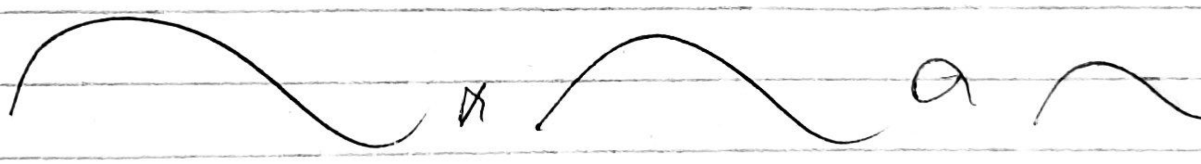
When the Renold's number in between 2000 and 2800, so those flow is neither leminor nor turbolant.

Higher Critical Velocity:

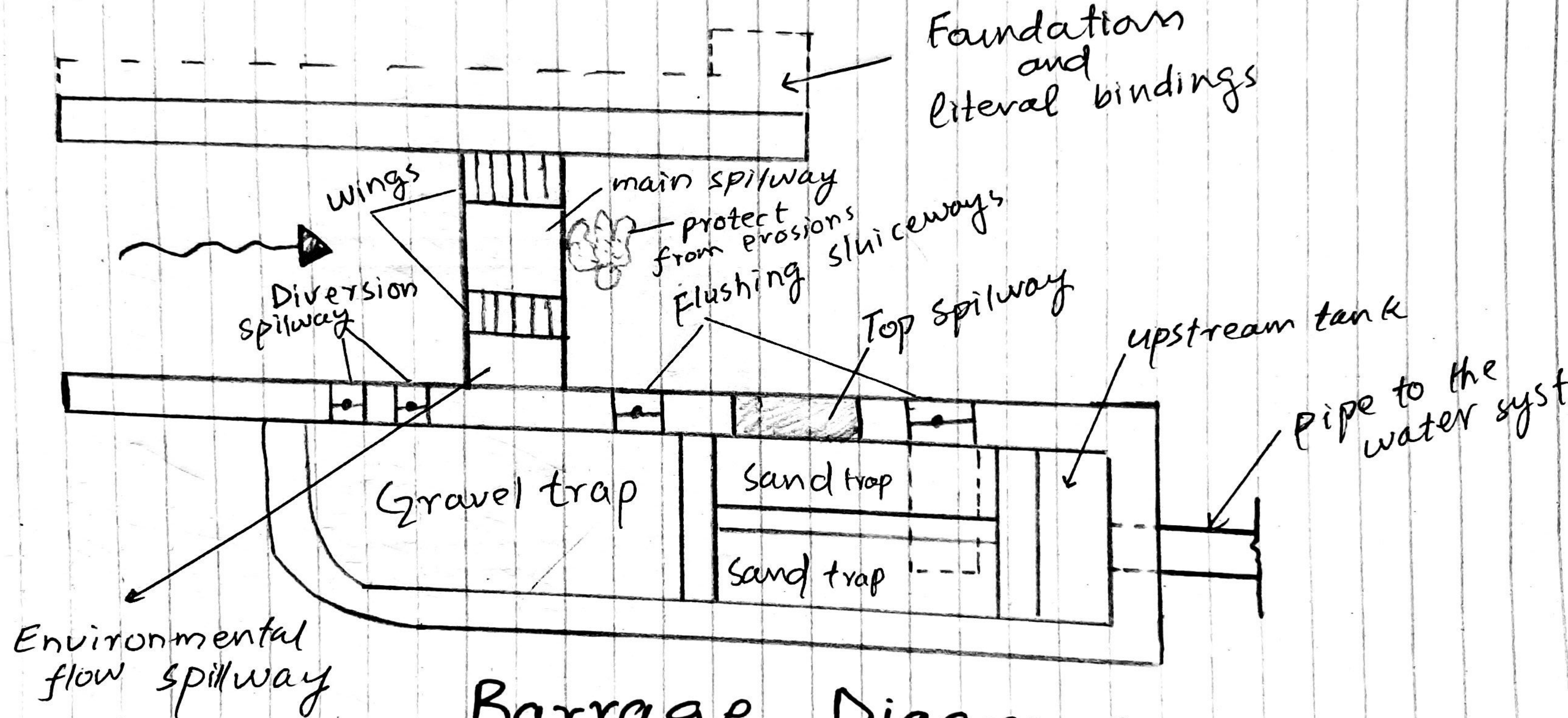
A velocity in which the flow changes from transition to turbolant is called Higher critical velocity.

Lower Critical velocity:

The velocity at which the flow changes from Leminar to transition is called Lower critical velocity.



QNo:3
Part (A)



Barrage Diagram

QNO: 3

Part (b)

We can predict the maximum or equilibrium scour depth around bridge ~~depth~~ piers from several formulas based on experimental results which assume the relationship as;

$$y_s/b' = Q\left(y_o/b',\ Fr,\ d/b'\right)$$

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

Lawsen's Experiment

Lawsen's (1962) experiment results underestimate. The scour depth compared many indian experiment which suggested the formula (approch flow is equal to the bridge pier.

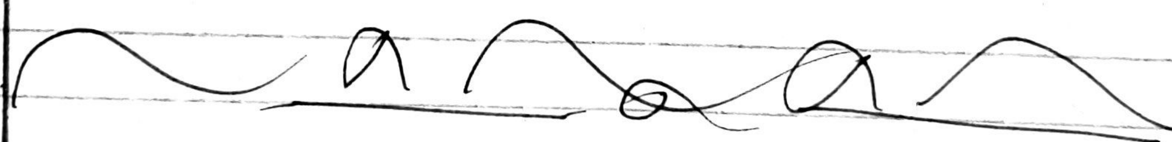
$$y_s/b' = 4.2\left(y_o/b'\right)^{0.78} Fr^{0.52}$$

Indian Field data:

The indian field data also suggest that the scoure depth should be take as twice the regime scour depth.

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

$$y_s/y_0 = \left(B/b'\right)^{5/7} \quad \text{--- } 1$$



Q No: 4
Ans:

=> Given Data:
Inside diomension = 15 ft x 15 ft
live load = 1.5 K/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 = ?

Solution:
1. Load colculation:
Total load carry on top slab = self weight of slab + L.L + D.L

Self weight of Slab = 3 x 150
= 450 lb/ft²

$W = 450 + 1500 + 300 = 2250\ lb/ft^2$

2. Coefficient Of Earth pressure

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

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

$$Ka = 0.33$$

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

= total vertical load (L.L + D.L) x Ka

$(1500 + 300) \times 0.33$

$= 594\ lb/ft^2$

4. Literal Pressure due to Soil:

$= Ka \times \gamma h$

$0.33 \times 100 \times 18$

$= 594\ lb/ft^2$

5. Literal Pressure

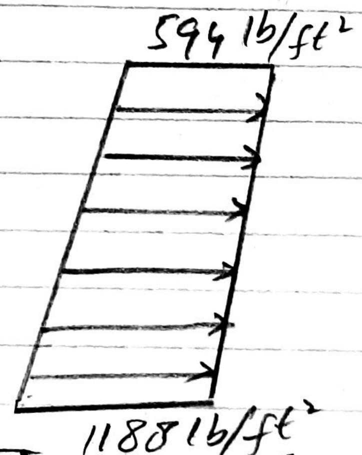
@Top:- literal pressure due to (D.L + L.L)

$= 594\ lb/ft^2$

@Buttom:-
literal pressure due to (D.L + L.L) + lateral pressure due to soil

$= 594 + 594$

$= 1188\ lb/ft^2$



Ans

The End