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Sec A

Subject Hydraulic Structure

Instructor Engr Adeed

Date 24-6-2020

Q=1 A

Culvert:-

A culvert is basically a transverse channel constructed under a road or railway track for the draining of water. it is also used to pass electrical and other type of cables from one side to another.

Causeway:-

It is a road that is raised as to be above water, marshland etc. it allow the flood at time of floody season to pass over cause way can be constructed of earth fill wood or concrete. it would be constructed in the format of an embankment or beam

Q 1b=

Ans:-

Cross drainage work:-

It is a structure carrying the discharge from a natural stream accross a canal intercepting the stream canal comess across obstructions like rivers, natural drains and other canals. The various types of structures that are built to carry the canal water across the above mentioned obstructions or vice versa are called cross drainage works.

Why cross Drainage work is necessary?

The cross drainage work is very important because it is used to dispose of drainage water so that the supply of canal remains uninterrupted.
It is also called drainage crossing. The canal at a cross drainage work is generally taken either over or below the drainage.
The crossing point at site condition may be such that without any suitable structure the water of canal and drainage cannot be diverted to

their natural directions. so the cross drainage works must be provided to maintain their natural direction of flow.

Types of cross Drainage works:

There are three types of cross drainage works.

Type - I

Irrigation canal passes over the Drainage:

The structures falling under this type are

- Aqueduct
- Syphon Aqueduck.

1 Aqueduct is that hydraulic structure in which the irrigation canal is taken over the drainage

This structure is suitable when bed level of canal is above the highest flood level of drainage. The drainage water passes clearly below the canal

2 **Siphon Aqueduct:**

It is that type of structure in which the drainage water cannot pass clearly below the canal. in this typ siphonic action take place.

Type II.

Drainage passes over the Irrigation canal:

It is that type hydraulic structure in which the drainage is taken over the irrigation canal. this condition is suitable only when the bed level of drainage is above the full supply level of the canal. The water flowing in canal passes clearly below the drainage.

siphon super passage:-

It is that type of hydraulic structure in which the drainge is taken over the irrigation canal.

in this case the canal water will pass below drainage under siphonic action. it will be possible only when the bed level of drainage is below the full supply level of the canal.

Type - III

- level crossing is that structure when the bed level of canal and the stream are about the same and the quality of water in canal and drainage are not much different. in the structure the water are misc.
- water is disposed through canal and stream in required quantity by using regulator in both canal and stream.

level crossing consist of following components.

1. crest
2. stream regulator.
3. canal regulator.

Q: 2 A

Ans:-

	Weir	Barrage
1	Weir is impermeable barrier which is relatively cheap structure.	Barrage is expensive structure.
2	Weir is used to rise the water level on upstream side.	Barrage is used to rise the water level on upstream side but it involve adjustable gates installed over a dam to maintain the water surface at different levels and at different times.
3	with passage of time silting take Place.	small ammount of silting take Place due to discharge from gates

In weir the water overflows the weir.	In Dam where Barrages are built water overflows through a special place called spillway.
There is no provision for transport communication accross the river	A road or a rail bridge can be convenently and economically combined with a barrage whenever necessary
It have high set crest	It have low set crest.

Q=2 b

Reynold's number:

Reynold's number is an important dimensionless quantity in fluid mechanics used to help predict flow pattern in.

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different fluid flow situation. 3
It is the ratio of inertial forces to viscous forces.
It is convenient parameter for predicting if a flow condition will be laminar or turbulent.

For laminar flow

For laminar flow the limit of reynold number is 2000. it should not be greater than 2000.
It is low velocity and particle move in straight line.

For turbulent flow

For this the limit of reynold number is greater than 4000. it should not be less than 4000. It is high velocity and particle move in irregular path.

For transion flow

From reynold number 2000 to 4000 it is transion flow. it is neither laminar nor turbulent.

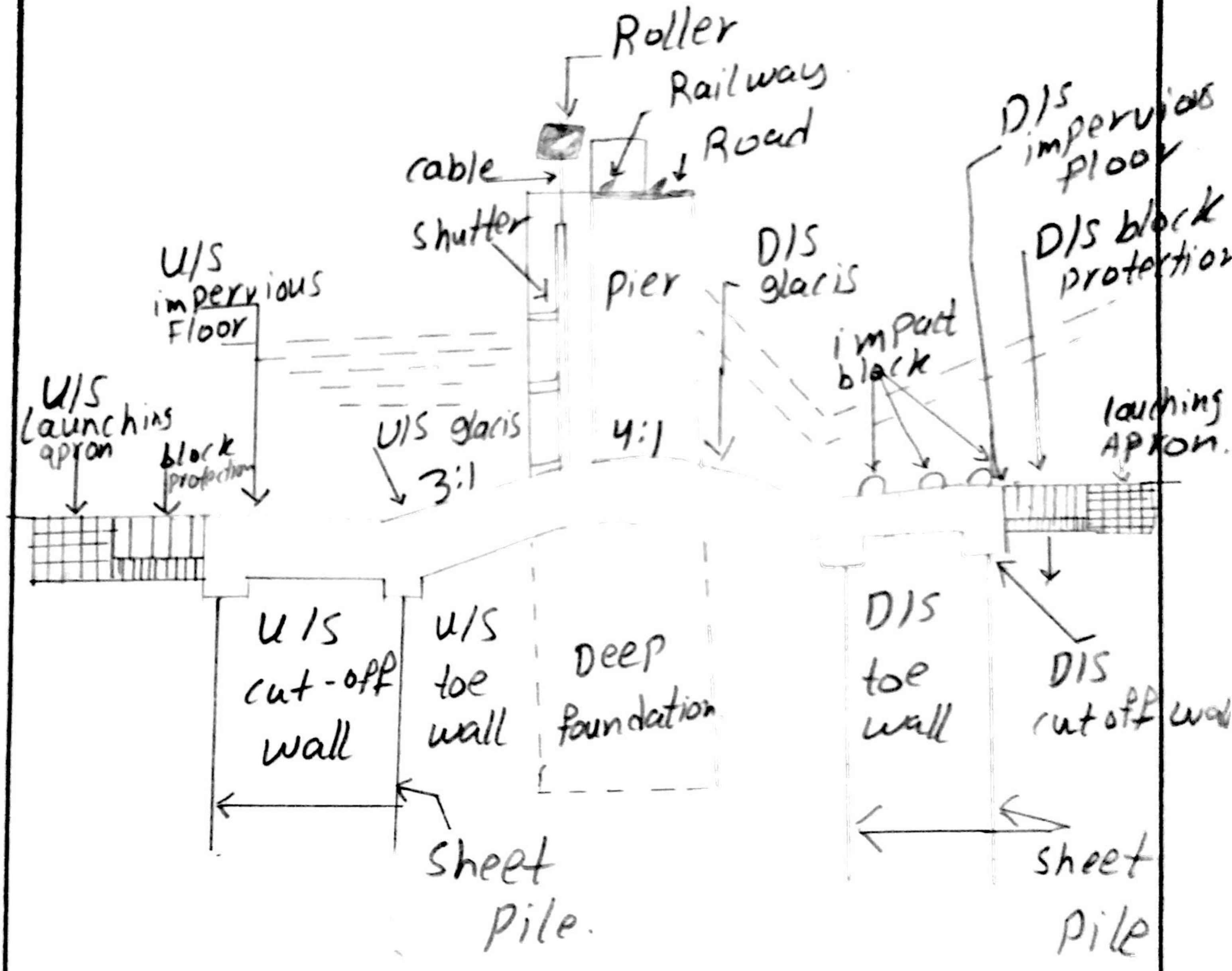
lower critical velocity

It is that velocity in which the flow enters from laminar flow to transion flow.

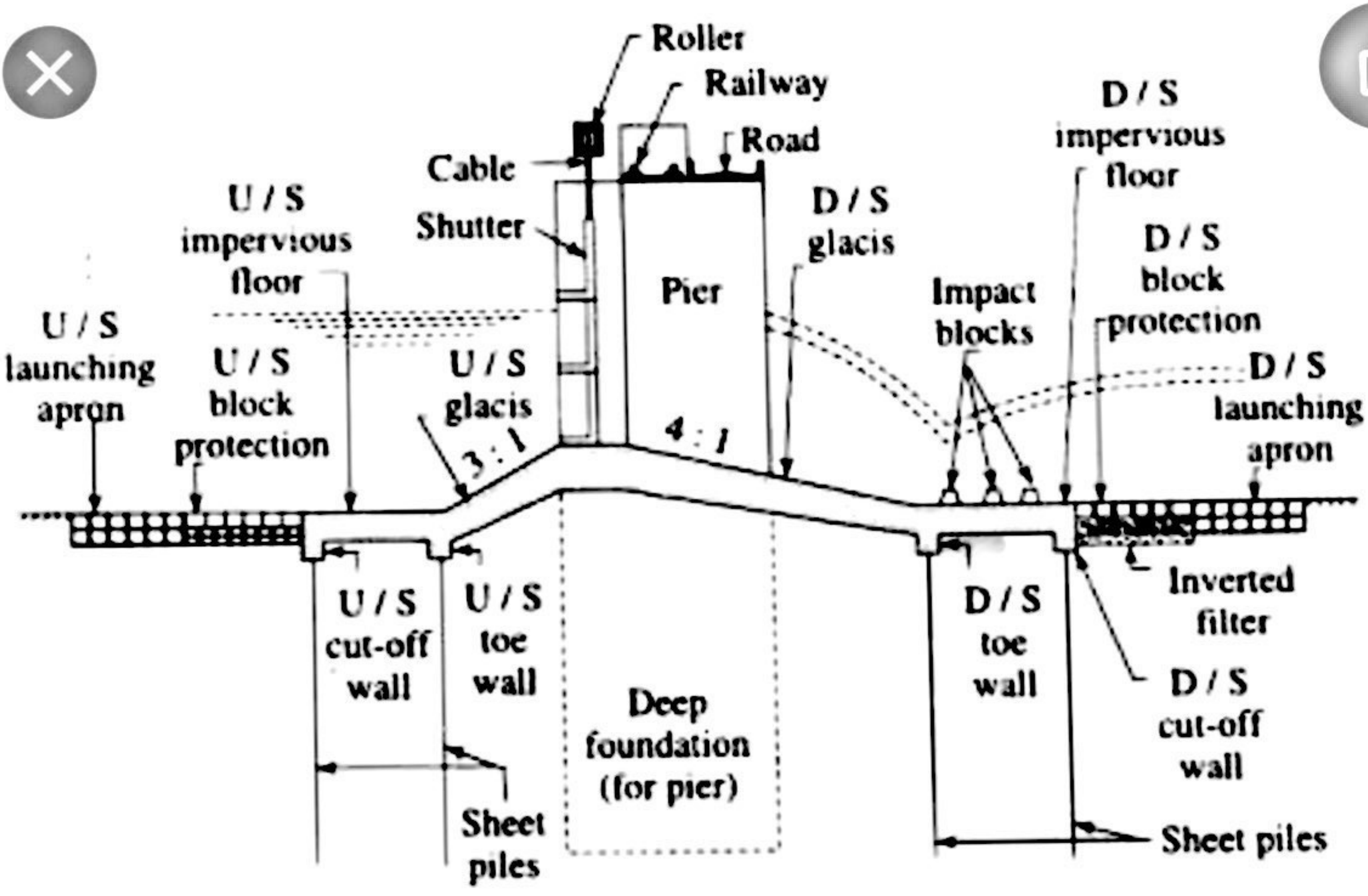
Higher critical Velocity

It is that velocity in which the flow enters from transion period to turbulent flow. it is also called upper critical velocity.

Ans 3 A



Roller
Railways
Road
cable
shutter
pier
D/S glacis
D/S impervious floor
D/S block protection
U/S impervious Floor
U/S Launchins apron
block protection
U/S glacis
3:1
4:1
impact block
lauching Apron.
U/S cut-off wall
U/S toe wall
Deep foundation
D/S toe wall
D/S cut off wall
Sheet Pile.
sheet Pile



Component parts of barrage

Q 3.b

Ans

After many experiment results several formulas are used to predict the maximum or equalibrium scour depth. In general these assume the relationship.

$$y_s/b = \phi(y_0/b' \; Fr \; d/b')$$

b' = pier width

y_0 = upstream flow depth

d = sediment size

Fr = Froude number

In 1962 experimental results underestimate the scour depths.

He compared to many Indian experiments which suggest the formula

$$y_s / b' = 4.2 (y_0 / b')^{0.78} Fr^{0.52}.$$

In Indian field data also suggest that the scour depth should be taken as two times the regime scour depth.

In case of live beds the formula

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

predicts the maximum equilibrium scour depth.

Q = 4

Ans.

Given data:

Live load = 1500 lb/ft^2

Dead load = 300 lb/ft^2

Section = 15' x 15'

Thickness = 0.92m = 3 ft

unit wt of soil = 100 lb/ft^3

Angle of repose = 30°

Unit wt of concrete = 156 lb/ft^3

156 is for RCC concrete.

f_y = 60 ksi

Sollution.

→ Self Wt of slab

thickness × unit Wt of RCC concrete

$= 3\,ft \times 156\ lb/ft^2$

$= 468\ lb/ft^2.$

→ Total load.

L.L + D.L + Self Wt.

$1500 + 300 + 468$

$= 2268\ lb/ft^2$

→ coeffient of earth pressure

$$\frac{1-\sin\theta}{1+\sin\theta}$$

$$= \frac{1-\sin(30)}{1+\sin(30)} = 0.33$$

→ Lateral pressure.

Vertical pressure at top

$(L.L + D.L) \times Ka$

$(1500 + 300)\,0.33$

$= 594\ lb/ft^2$

→ Pressure of soil.

$Ka \times h \times$ unit Wt of soil.

$0.33 \times (15' + 3') \times 100$

$= 594\ lb/ft^2$

→ Lateral pressure at top

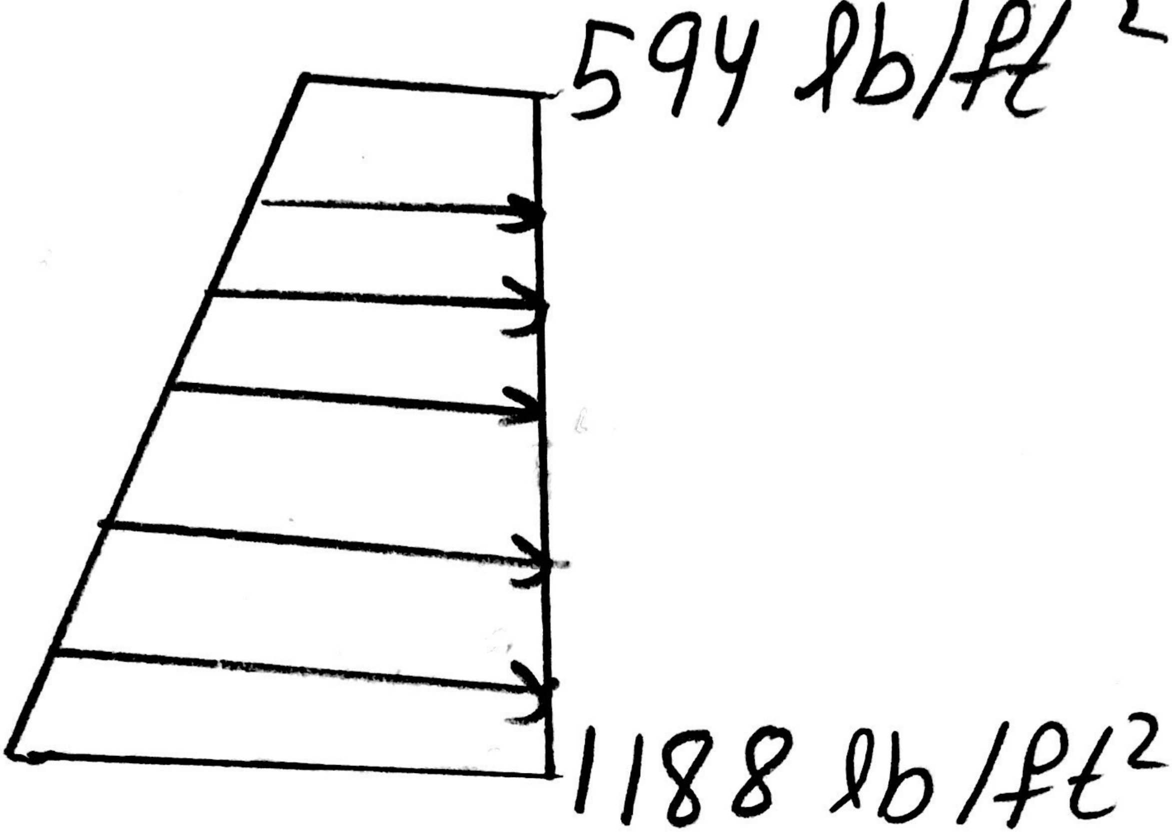
$= 594\ lb/ft^2$

Pressure at bottom.

= top + pressure of soil

$= 594 + 594$

$= 1188\ lb/ft^2$.


594 lb/ft²
1188 lb/ft²