Name Abdul Qadeer Khan.

Id 7756

Sec A

Subject Hydraulic structure

Instructor Engr Adeed

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Assignment for sessional.

Q=1

Ans

Given data

$H = 0.35m$

Depth = 0.3m

width = 1.2m

length = 40m

slope = 1 in 1000

$n = 0.0013$

0.3m neglect the velocity approach.

Required

we will design culvert.

Sollution

In the start we will try to find H/D ratio.

$H/D \leq 1.2$ for open channel.

$H/D = 0.35/0.3 = 1.16$ which is smaller than 1.2.

$H/D = 1.16 < 1.2$

Free open channel condition.

critical depth

$$y_c = \frac{2}{3}H = \frac{2}{3}(0.1) = 0.06m.$$

critical velocity

$V_c = \sqrt{gy_c}$ which comes from

$$Fr = \frac{V_c}{\sqrt{gy_c}}$$

For critical flow

$Fr = 1$

So

$$1 = \frac{V_c}{\sqrt{gy}}$$

put value.

$V_c = \sqrt{9.81 \times 0.06}$

$= 0.19$ m/sec

critical slope

$S_c = 0.00424$

discharge

$Q = ?$

we know that from fluid mechanics

$$Q = 2.92\, y_0 \left[1.2 y_0 / 1.2 + 2 y_0\right]^{2/3}$$

y_0	Q	y_c
0.1	0.057	0.06
0.2	0.165	0.124
0.3	0.3	0.185

$$y_c = \left(\frac{q^2}{g}\right)^{1/3}$$

At the inlet over short reach

$$H = Y_0 + \frac{V^2}{2g} + \frac{k_e V^2}{2g} \quad \text{---- (1)}$$

Entrance loss co-efficient k_e is follow

We know that

For squar edge = 0.5

For flat = 0.25

For Rounded = 0.05

So we will select for rectangular box culver . $k = 0.5$

So the k value 0.5 put in eq.

Y_0	H	Q
0.1	0.119	0.057
0.2	0.2	0.165
0.3	0.3	0.3
For orifice H/D ≥ 1.2	0.4	0.9

The above discharge is find through following formula

$$Q = Cd\,(1.2 \times 0.6)\left[2g\left(H - \frac{D}{2}\right)\right]^{1/2}.$$

where

$Cd = 0.62$ coefficient discharge

From energy equation discharge is found by this formula

$$Q = 2.08\,(H - 0.57)^{1/2}$$

Ans. b)

Loads on bridge foundation due to scour and their working mechanism.

Bridge scour is is the removal of sediment from around bridge abutment or pier like Sand and grave

scour is basically caused by swiftly moving water, can scoop out scour holes, compromising the integrity of a structure.

scour is basically erosional proress that can occure in rivers due to the interaction between any type of structure located under water and the river flow

For bridge failure scour of sediments around bridge foundation by the stream. it is the most significant contributing factor for failure. The scour failure tend to occur without perior warning and led to facalitres and ecnomic loss every year.
A significant ammount of work has been conducted on bridge scour such efforts can be broadly classified into two major categories.

These two categories are:

science driven

Engineering driven

Science driven

The science driven research focuses on understanding the scour mechanism and aims to scour due to different factors

Engineering driven

Engineering driven focuses on estimation, monitoring and counter measure of bridge scour.