

SUBMITTED TO

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SUBMITTED BY

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SECTION

B

SUBJECT:

HYDRAULIC STRUCTURES

QUESTION #1

Establish the stage discharge relationship for a concrete rectangular box culvert suitable data of your own choice.

Assumed;

$$H = 0.45\text{m} \quad , \quad D = 0.40\text{m} .$$

$$W = 1.2\text{m} \quad , \quad L = 40\text{m} .$$

Manning = 0.0013, neglect the velocity from 0-3m.

Calculations;

STEP #1

$$H/D = \frac{0.45}{0.40} = 1.12 .$$

As 1.12 is less than 1.2 so.

STEP # 02.

$$y_c = \frac{2}{3} H$$

∴ CRITICAL DEPTH

$$y_c = \frac{2}{3} (0.45)$$

$$y_c = 0.1 \text{ m.}$$

$$V_c = \sqrt{g y_c}$$

∴ CRITICAL VELOCITY

$$V_c = \sqrt{9.8 \times 0.1}$$

$$V_c = 0.31 \text{ m/sec.}$$

$$S_c = \frac{V_m^2}{R^{4/3}} = 0.0042$$

STEP # 03.

∴ Discharge.

$$Q = 0.292 y_0 \left[\frac{1.2 y_0}{1.2 + 2 y_0} \right]^{2/3} \rightarrow \textcircled{1}$$

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

$$q = Q/w$$

By putting values we got.

γ_0 ;

0.15 , 0.3 , 0.45

Q ;

0.31 , 0.3 , 0.53

γ_c ;

0.09 , 0.185 , 0.27

STEP #4.

$$H = \gamma_0 + \frac{v^2}{2g} + \frac{Kv^2}{2g}$$

Entrance coefficients are .

For Square = 0.5

flat = 0.25

Rounded = 0.05

Use 0.5 for Rectangular.

$$H = y_0 + \frac{v^2}{2g} + K_e \frac{v^2}{2g}$$

y_0 ;

$$0.15, 0.3, 0.45$$

H ;

$$0.17, 0.32, 0.47$$

Q ;

$$0.11, 0.3, 0.53$$

For orifice $H/D = 1.2$, $C_d = 0.62$.

$$Q = C_d (1.2 \times 0.6) (2g(H - d/2))^{1/2}$$

$$Q = 1.29 \text{ m}^3/\text{s}$$

LOADS ON BRIDGE FOUNDATION DUE TO SCOURING:

Maximum amount of load can cause failure in foundation. The failure can not be expected due to inadequate bearing capacity but by scouring action and leaching of mortar joints of well foundations, the increased moments due to MBG loading would create more bending stress in the string especially in the cap and seating junction. In the event of failure of well foundation the well cap made of stone masonry would be fail in bending.

MECHANISM AND WORKING:

→ A significant amount of work has been conducted on bridge scour, such efforts can be classified into two major categories.

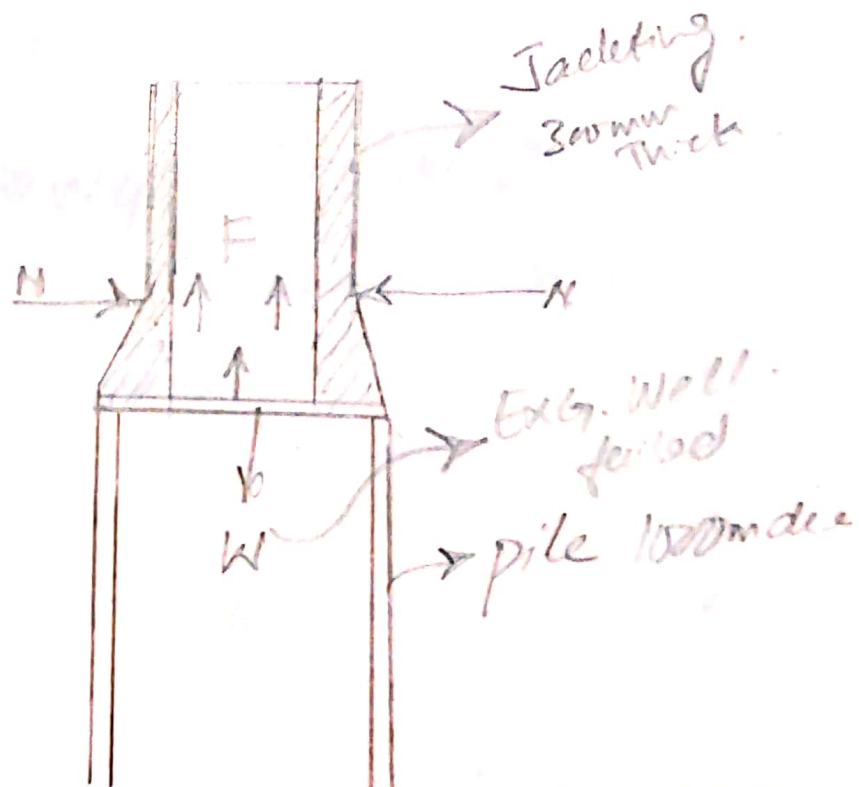
- ① Science.
- ② Engineering.

ENGINEERING Mechanism:

The Engineering mechanism of bridge foundation is based on its construction techniques.

The ends of bars are driven to the well and connected to the well cap and pier by dowel bars would then become futile. Some have opined that even in the event of failure of well

the daniel bars connect to well cap upto height of 1.70m. above the well cap would give rise to a lot of friction and prevent the pier from collapsing. Friction would generate when there is normal reaction perpendicular to the moment of pier.



To prevent the pier from collapsing.

We should have $N = F = 4N$.

$W =$ deadload + live load

$F =$ Frictional Force.

$N =$ compressive reaction.

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