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Road Blockage due to Slope Failure in Flood

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Abstract -*The slope stability is considered during construction of road but it get failure during flood condition because unaccepted amount of water comes in contact for long period with sub structure. Such condition interfere the sub-structure material and result into failure of slope.*

Key Words: Slope stability, Flood condition, Slop failure.

1. INTRODUCTION

The precaution is taken regarding required slope along the sides of road. It remains stable in regular condition. The provision for drain of rain water is also provided which prevent interfering of sub-structure, but when flood condition occurs the slope area comes under water for long period. This leads to problem of interfering of sub- structure and saturation of soil content in sub-structure created which ultimately leads to failure of slop.

2. OBJECTIVE

- To prevent slope failure
- To prevent traffic problems and accident.
- To avoid the erosion of side slope

3. METHODOLOGY

1. Surveying
2. Collection of post history
3. Traffic effect during flood condition
4. Calculations of slope stability
5. Problem statement
6. Scope of work

4. TYPES OF SYSTEM

We consider the following geometric feature for design of road slope

- Number of lanes
- Parking lanes pitching of slope
- Longitudinal slope
- Grouting of slope
- Width of shoulder

5. LITRATURE REVIWE

In the field of reliability analysis of slopes was found to be very advantageous because of its simplicity and its ability to construct a new vector from a combination of all existing vectors. Reliability analysis also depends upon the choice of the type of probability distribution i.e. normal or lognormal distribution for random variables, Metya and Bhattacharya (2012). Normal distribution of random variables gives lower reliability index compared to lognormal distribution.

Ref, Two Dimensional (2D) Slope-Stability Analysis- A review Arunav Chakraborty1, Dr. Diganta Goswami2 1Civil Engineering Department, Tezpur University, Assam, India.

6. DESIGEN CONSIDERATION

The figure 1.1 shows normal condition of river. In which the flow of water can not affect the side slope because it is away from the main flow of water. Such slope also able to drain rain water and cannot affect the substructure. Bridge and approach remains in good condition for long period of time thin such normal condition

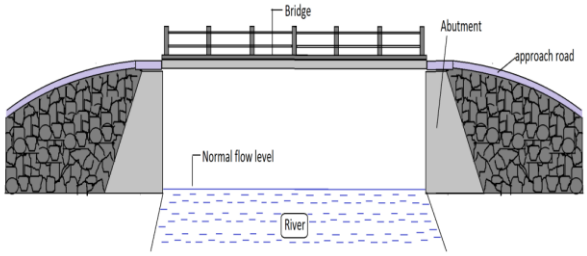

Fig 1.1 Normal condition of River

The figure 1.2 shows the flood condition of the river. The fig. 1.2 represents the regular situation almost at every year. Such flood condition is not severing, but indirectly affect the structure.

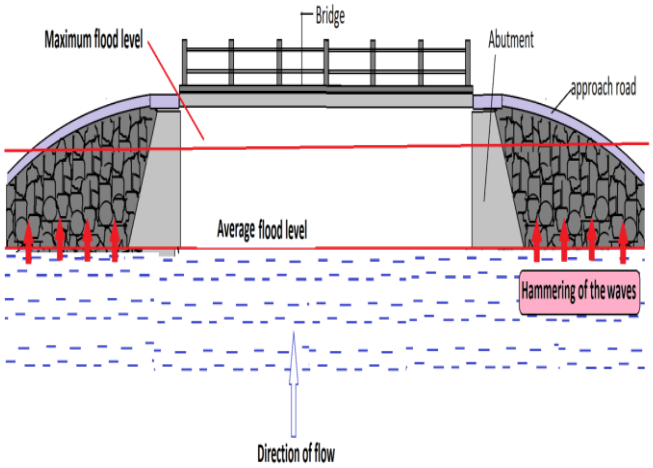

Fig.1.2 hammering of waves on slope

As shown the figure the waves are continuously hammering on the side slope of road. This action creates the affect of erosion on the pitched stone, it also get penetrate from the side wall into the inner substructure. Due to higher saturation slope instability occurs and slope becomes failure. This is shown in the fig 1.3

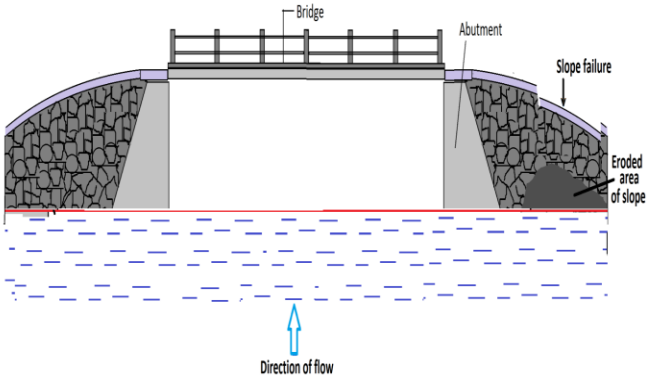

Fig.1.3 Failure of slope

To overcome such problem the slope is provided by the transverse pipes at least 1m dia. which has high strength of resistance to pressure and lined by water proofing material internally. As shown in the fig 1.4 this designing technique prevent hammering effect of flood water on the slope structure .As surface area of slope get reduced it becomes easy to make water resistant. This ultimately prevents the interference of substructure.

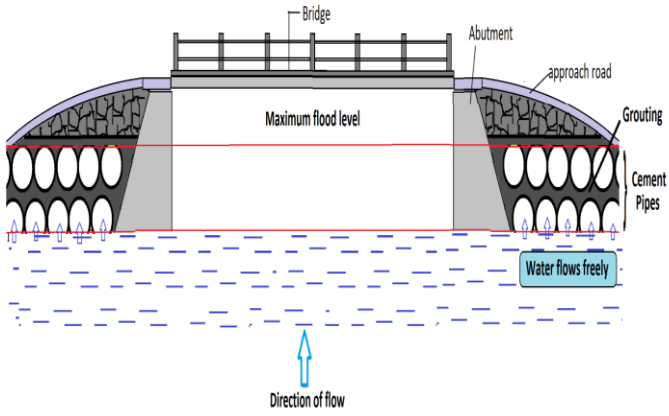

Fig. 1.4 Installed high resistant cement pipes

7. METHODOLOGY

7.1 SURVEYING

Fig. 1.5 Slope failures due to hammering of flood water

Fig 1.6 slope failure at side of road

Fig.1.7 This image is of the Krushnna Bridge of village Rethare BK, Tal.Karad, Dist. Satara, and Maharashtra, India. The affect of flood water is seen on the side pitching of the road.

Fig 1.7 Erosion of side slope of road

Fig 1.8 Shows the prevented area from failure of slope which is provided by RCC structure on other sides of road. The image also represent that as soon as the RCC work stopped from that point sliding of slope is started because of incomplete work.

Fig. 1.8 Side slope failure of road belongs to Krushnna Bridge

7.2 TRAFFIC EFFECT DUE TO SLOPE FAILURE

As the slope failure process is unintentional it may creates the chances of accident especially at the night time. The continue road get immediately cut off and the traveler doesn't have any idea about it. Collapse road is dangers for transportation. The described road of village Rethare BK is main link between other side villages and civil hospital, krushnna sugar factory, Railway station. Whose side slope was failure and now a day creates traffic problems.

7.3 CALCULATION FOR SLOPE STABILITY

Culmann's Method for safe height of finite slope is as:

Safe height (H).

$$H = \frac{4Cm \sin i \cos \Phi m}{\gamma [1-\cos (i - \Phi m)]}$$

Where,

H= Safe height of slope,

Cm = Mobilized Cohesion,

i= Angle of slope,

Ɣ= Submerged density,

Φm= Angle of mobilized,

Taylor's Stability method for submerged slope,

$$\Phi w = \frac{\gamma'}{\gamma sat} \Phi m = \frac{\gamma'}{\gamma sat} \left[\frac{\Phi}{(F.S.)\,\Phi} \right]$$

Where,

Φw= Weighted frictional angle

Ɣ'= Submerged density

Ɣsat = Saturated density

Φm = Slope angle

F.S= Factor of safty

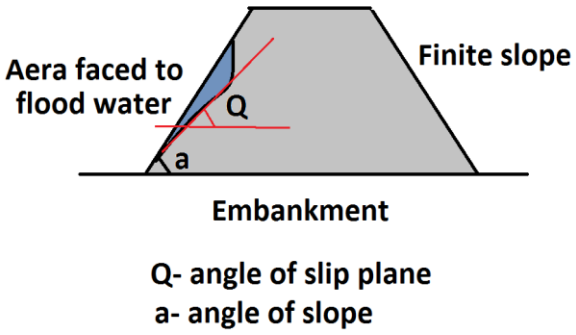

Fig 1.9 Block diagram of embankment

8. SUGGESTION FOR DESIGN:

As per above explained remedy the design is made as shown in the Figure 1.4 .Which indicate that the high strength cement pipes are installed transversely along the road.

Pipe reduces the area of cross section of the slope, the intermediate space between pipes are packed by RCC grout. This acts as water proof material and adherers the penetration of flood water. The pipe allows the water to flow within it smoothly. Such designing changes makes slope more stable in flood condition.

9. PROBLEM STATEMENT

1. Problem regarding given development is cost of construction. The initial cost of product is high but it reduces the future maintenance. Overall the cost is getting reduced. The fund for the work is taken from road development authorities.

2. Skilled labor is required. The well experienced labor is necessary for installation of pipe and water proofing technique.

3. During the time of construction traffic problem comes. Which can be reduced by providing alternate temporary road.

10. SCOPE OF WORK

1. The slope stability will improve.

2. The traffic problem associated with the slope failure will be solved.

3. Helps in continue communication during flood condition also

4. Bridge structure life is increased.

11. CONCLUSION

Severe problem of slope failure and disrupted transportation get solved. There are no chances of accident due to slope failure in this area. The process of erosion of side slope by hammering of flood water is prevented due to application o f pipes inside the structure.

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