JGRPD

ISSN : 3032-131X

https://doi.org/10.61796/jgrpd.v1i4.394

Calculation Of Total Wash Under The Bridge Based On Guideline Flow Velocities

Rakhimov S Herzod Shavkatovich
Doctor of Philosophy (PhD) University of Geological Sciences

Botirov is the son of Shokhbos Soibjon
Assistant of Termiz Institute of Engineering Technology

Shodiyev is the son of Ramshid Mukhtar
2nd year student of Termiz Institute of Engineering Technology

Received: Feb 22, 2024; Accepted: March 29, 2024; Published: Apr 18, 2024;

Abstract: Many years of study, modeling, and theoretical studies of the working conditions of bridge crossings have made it possible to significantly improve the methods of determining the size of clear spans under large and medium-sized bridges. Prof. The further development of the method, founded by NA Belelyubsky, consisted in calculating the flow rate at which the under-bridge washout stops. The need for velocity calculation arose after observations of the phenomenon of bridge span washes often stopping at average flow velocities rather than domestic velocities.

Keywords: Bridge Passage, Modeling, Theoretical Studies, Average Bridges, Scour, Flow Rate, Velocity.

Introduction

The flow rate at which washing stops is known as the dynamic equilibrium rate. It corresponds to the constant movement of sediments in the riverbed during floods. According to the results of statistical processing of the data on the flow velocity in the river bed during the flood in more than 250 rivers of different depths and bottoms in Russia, LL Lishtvan concluded that the characteristics of the soils, the river depth and the fact that the water level does not exceed the level during the flood depend on the dynamic equilibrium velocity. proposed the following expression of the relationship:

$$V_{\text{din}} = 1.10\sqrt{g \cdot \bar{h}_{yu.\kappa.}}^{\,0.3} \cdot d^{0.2} \cdot \beta \,,$$

h yu k – average depth after washing, m;

d - the average diameter of non-sticky soil particles that make up the river bed, m;

b is a parameter depending on the probability of overspending.

P, %...............2 1 0.33

B....................0.97 1 1.07

(1) – multiple verification of the expression shows that it is very close to natural indicators. This was the basis for recommending the given formula for practical calculations.

The average depth under the bridge after washing is found from the following formula:

$$\bar{h}_{ю.к.} = Q / L_0 \cdot V_{din} , \quad (2)$$

where Q is calculated consumption, m3/sec; L0 – net span under the bridge.

Results and Discussion

The clear span under the bridge in light is L 0, which is the distance between the front surfaces of the piers of the bridge (or the slopes of the cones of piers surrounded by soil). This distance is determined at the height of the calculated water level, and the total width of the intermediate supports is subtracted from it. Submerged bridge abutments deflect the water flow at their sides, creating stagnant (no-transit) zones that reduce the actual width of the flow under the bridge. If the span of the supports is more than 15 meters, and if they are located perpendicular to the flow of the bridge, the flow direction (overflow) is not taken into account. If the navigation route crosses the river in a sloping direction, the working net span of the bridge is taken as L0, that is, the net span size is equal to the cosine of the crossing slope angle. If we solve the resulting equation by putting the value of the dynamic equilibrium speed in formula (1) into equation (2)

$$\bar{h}_{yu.к.} = 0.93\left[Q / L_0 \sqrt{g \cdot d^{0.2} \cdot \beta} \right]^{0.77} \text{bo‘ladi.}$$

Thus, by placing the net span under the bridge L0 (Fig. 1) in the live section of the river, taking into account the cross section in the part of the net span under the bridge, the surface of the live section under the bridge before washing is ω yu . we determine , then the average depth under the bridge after washing according to the formula (3).

h yu k is calculated, and the live cross-sectional area after washing and the washing coefficient are found according to the following formulas:

$$\omega_{yu.k.} = \bar{h}_{yu.k.} \cdot L_0 ,$$

$$p = \omega_{yu.k.} / \omega_{yu.o.} .$$

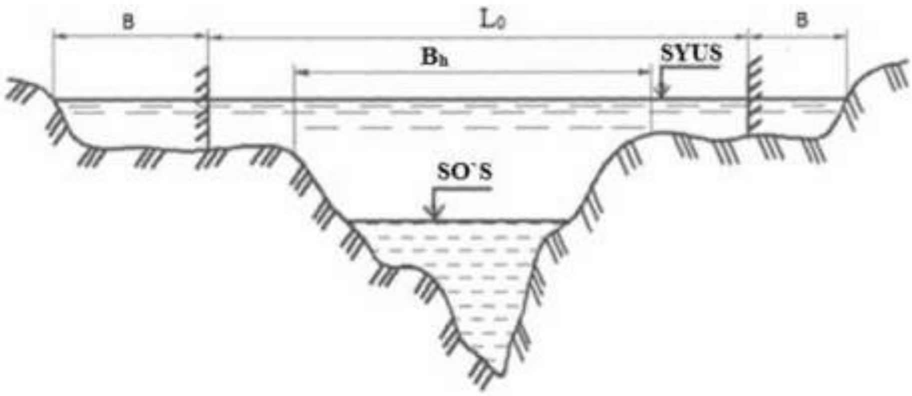

Fig. 1 Schematic of the total washout calculation under the bridge

By solving this problem at least three times, the P(L0) curve is constructed (Fig. 2) and the minimum and maximum values of the net span under the bridge are determined according to it. Thus, in order to find the most alternative solution, the limit dimensions of the net span under the bridge are determined. The method of calculating the total washout of the under-bridge basins based on the allowable flow velocities gives a result that corresponds to long-term floods. In short-term flood conditions, the calculation of the dynamic equilibrium rate of washout gives exaggerated results. Therefore, it is necessary to develop methods for calculating the total wash, which take into account the flood hydrograph, that is, the graph of the change of water consumption over time.

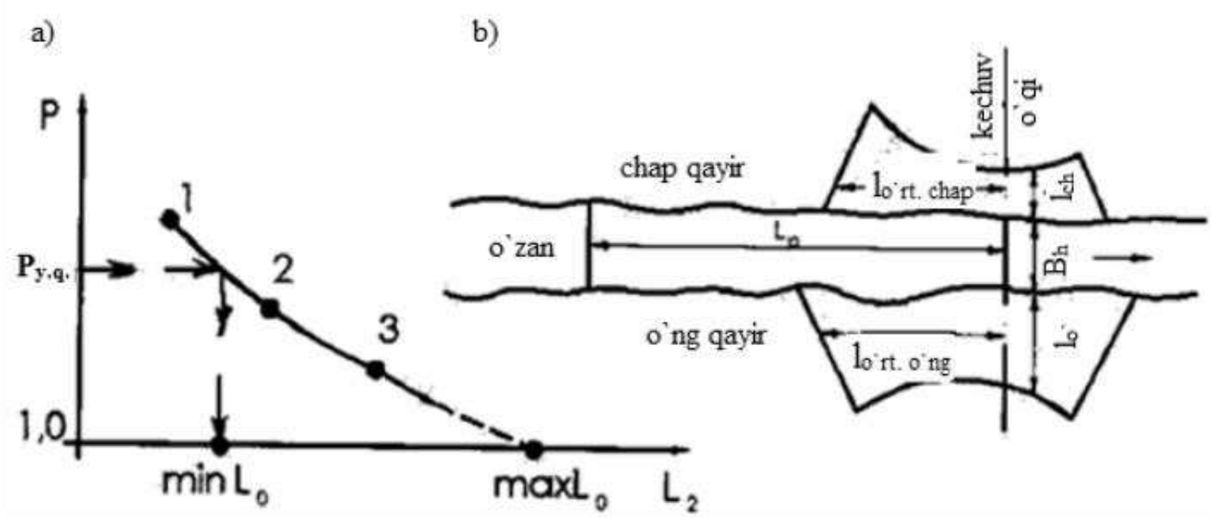

Figure 2. Dependence of washing coefficient

Conclusion

Calculation programs have been developed at EHM to determine the total washout from the flood hydrograph. In order to compare the results of calculating the total wash under the bridge by the allowable velocities method on the estimated flood hydrograph, multiple comparison calculations were performed for both methods. In the relatively small dimensions of the washing place, if the washing area does not exceed 20,000 m2, the period of water flooding is equal to 60 days, if it is more than that, there will be no difference in the results obtained by the comparable methods. Even when the flood lasts for 30 days, the results of the calculations of both methods do not differ much: in the 2nd degree of flow compression, their difference does not exceed 5%. In order to increase the reliability of the results of calculation of more total washes by the method of permissible velocities, it is recommended to add the coefficient η =0.8-0.9 to the formula (3.6). This coefficient is adopted according to the duration of the flood, the level of flow compression by the bridge crossing and the area of the washout area.

References

[1] Design of bridge crossings on railways MI Voronin, NN Kantor, VA Kopylenko and others - M.: Transport, 1990.-287 p. (Bible Code 624.2/8, P791).
[2] Rothenburg IS, Volnov VS, Polyakov MP Bridge transitions. -M.: Higher School, 1977.-328p.
[3] Rotenburg IS, Volnov VS Examples of pavement design transitions. -M.: Higher School, 1969.- 284 p.
[4] Babkov VF, Andreev OV Highway design part 2. M: Transport, 1979.-407 p.
[5] Technical and economic bases of designing highways and bridge crossings (reference) / EV Boldakov, GA Fedotov, BF Perevoznikov and others - M.: Transport, 1981.-207p.