

Applying Energy Balance Conditions for Estimating Local Scour Depths at Bridge Piers

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Abstract: The failure of bridges due to local scour at piers has been studied for quite long time (from 1873). However, most of calculation methods are mainly based on measurement data, empirical or semi-empirical formulas with certain conditions. Therefore, there are rather big differences among calculation results of different methods and between calculation results and practical measured values.

Based on recent studies about local scour of bridge piers, analyzing hydraulic mechanism of flow when meeting bridge piers, with supposition that the bridge piers are circular column, located at positions far away enough, they don't affect each other; the bed load at bridge piers is sand; flowing is potential and one direction. This paper proposes a new approach for formulating the depth of local scour at bridge piers by identifying energy of downflow along column of bridge piers that moves material particulates out of scour holes.

In order to use this formula in calculation to design and forecast scour depth at bridge piers, it is necessary to identify the value of elements in the formula and change this formula to explicit form.

This paper also presents methods to identify parameters which affect the depth of local scour holes at bridge piers, empirical coefficients based on current studies on local scour at bridge piers and river flow velocity, and measured data of actual local scour depth.

Explicitly determining the parameters based on a lot of experiments and measurement data make more available to calculate parameters of formula for the scour depth; Authors also propose the use of relation between the depth at upstream of bridge piers and U_{max} correspondent for calculating local scour depth at bridge piers which permit us to avoid big errors when one determines inexactly the U_{max} values, especially complex cross – sections. . .

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