

# Experimental study of the temporary evolution of the local erosion in circular batteries of bridge.

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## ABSTRACT

In the present work a study appears on the temporal evolution of the local scour in circular piers of bridge, that is to say, it will not only be the maximum scour depth and the equilibrium time, but that will be tried to evaluate the scour evolution through the time. A morphodynamic model of local scour developed by Allen Bateman based on the data of the experiments presented in RCEM 2005, "Study of the temporal evolution of the local scour at bridge piers for a long term experiments". In this work the model was validated for square piers and it tried itself to adapt the model in circular piers, nevertheless the lack of experimental datas did not allow it.

It is therefore that in the present work we made some experiments of local scour in circular piers of bridge in the Laboratory of Fluvial Morphology of the UPC. All the tests were made in clear conditions of waters and the equilibrium was reached, is therefore that the minimum duration of the tests is of five days.

The model, is based mainly on the idea of the power of the flow and the conservation of the mass of sediment, maintains the theory that the process of local scour is the sum of two subprocesses: the first one, called active, and the other, the passive. The active phenomenon is developed in the low part of the pit, just next to the pier, upstream this one. Here is where the motor of the scour is located, and is where the vortex take place that are those that originates the scour.

The passive phenomenon is the landslides of the wall of the pit when the pit caused by the active phenomenon deepens. The development of the theory gives like result a system of two equations ordinary differentials, which can be solved by means of numerical methods like the one of Runge Kutta. The variables that take part are the scour and the solid volume, based on the time.

In order to calibrate the model it has been left from the experimental datas and the Matlab program has been used, this allowed to fit the parameters of the model to the experimental datas. Nevertheless it was verified that the model did not work well for the circular piers, is therefore that a new morphodynamic model of two equations differentials considered, whose parameters were calibrated. The new model considers the gold relation that takes place in the geometry of the pit and assumes that the scour comes caused by the own flow without considering the vortex, in such a way that the material is leaving by the sidewalls of the pier.

Finally a comparative study has been made of the prediction of the evolution of the scour between the formulation of Franzetti and the model explained in this work.