

ABSTRACT

In the present work a study of backwater in semicircular arch bridges is reported. In this kind of bridges the large obstructions at flow are characteristics. These bridges are characterized for presenting high areas of obstruction that cause the difficulty of the flow to pass under the bridge. This difficulty reflects themselves in important backwater of the sheet of water that can cause floods where, without the presence of these bridges, perhaps themselves they had not been produced. On the other hand, the piles of these bridges are very strong and extensive, for which cause important local erosions in the granular beds rivers. To this local erosion adds it him the effect of the erosion by the contraction produced by the bridge. This erosion by contraction, besides, affects to the backwater.

In the first place an analysis of the different more important methods for the calculation of backwater is done indicating its way of use as well as possible limitations of the methods. Similarly an explanatory analysis of the modifications by obliquety and erosion of the bed that the diverse equations utilized can suffer is carried out.

The basic parameter of the study of backwater is the value of obstruction m . It will be necessary therefore, to quantify of very exact way this value for each bridge studied. This fact the search is carries out by means of bibliography and plans of numerous historic bridges of Spain and Europe. Subsequently these bridges in function of its geometry, of their importance and of the quality of the plans are selected. Has tried to have an extensive fan of geometries to have general one more vision of the hydraulic operation of this type of bridges.

Once known and they determined the value of the obstruction for each bridge is carried out the comparative study of the backwater utilizing diverse methodologies of calculation. To real lack of values of the conditions of contour in the different bridges, the need to carry out is presented the study for various values of slopes and of coefficients of Manning. Only in the Bridge of Alcántara real data of depth of flow and the discharge have managed, for which has not been necessary to carry out any hypothesis of the previous values. The backwater given by diverse experimental equations carried out in laboratory have been compared with the values of backwater of the free sheet calculated by means of the program Hec-Ras.

Finally, with the values of backwater obtained, is decided to carry out a small study of the factors of security that offers each same old method taking like valid reference the backwaters calculated by Hec-Ras, applying the different possible equations (Teorema of the Quantity of Movement, Teorema of Bernoulli and equation of Yarnell).

This comparison of the diverse methods serves us to understand a little more the operation of the backwater of the sheet of water, and as can vary this in function of the different geometries of the bridges.