ABSTRACT

Storm events in big cities cause serious problems, the more serious the bigger the city is. That reason makes interesting the study of surface flow dynamics in the streets to asses which are the water levels and maximum velocities the water can have. Water volume distributions have to be known in order to do the mentioned study so as the events that happen in a cross street.

The main objective of this study is to characterize the hydraulic behaviour in a street crossing with different widths and supercritical regime in the incoming street by an experimental campaign, continuing the study done by Leonardo S.Nanía who did the study for street crossings with the same width street. In the present case, the study is done for width ratios of ½ and 2/3,.

The results obtained for the street ratios studied (1/2, 2/3) show a change of the regime from supercritical to subcritical by the appearance of hydraulic jumps.

The experimental campaign has shown the existence of the same flow patterns appeared in the previous study: pattern I when both hydraulic jumps are set in the approximation streets, pattern IIx when one of the hydraulic jump , the one in the x-direction, is set in the cross street and the other one, in the y-direction, is set in the approximation street, and IIy when the hydraulic jump in the y-direction is set in the cross street and the one in the x-direction is set in the approximation street.

From the results analysis it's concluded that flow behaviour can be characterized by the variable power ratio in the street that it's being analysed, over the total power that arrives to the street crooing. There is an overlapping zone in which a priori it's not possible to forecast which pattern is going to appear, but it can be known by calculating the variable flow ratio that arrives to that street over the total flow in the street crossing. If the value of this last variable is inside the intervals proposed in this study, the flow pattern in the street crossing will be pattern I because it's has been proved that in these intervals all the flow combinations show that pattern. The join analysis of all the experimental data sets for different widths ratios (1/1, 2/3, ½) show a similar hydraulic behaviour, so in all them the same patterns have appeared.

Another interesting conclusion is that this approaching in terms of power also allows to know the flow ratio that will branch off in each street, so as the angle the hydraulic jump will show in the street crossing. It also can be known the flow distribution in the outgoing streets, which is different depending on the street ratio.

The results obtained in this study can be applied to other street crossings if they have the same characteristics of the cross street here studied due to all the dimensions used are dimensionalless. Nevertheless, those who want to do it have to take into account the existence of a pair of restrictions which are the aspect ratio (channel depth over width street) and the Froude number. These factors have to be in the analysed intervals of the experimental campaign.