Experimental and numerical evaluation of discharge capacity of sharp-crested triangular plan form weirs

Bahador Abbaspuor*, Amir Hamzeh Haghiabi, Abbas Maleki and Hassan Torabi Poodeh

Department of Water Engineering, College of Agriculture, Lorestan University, Khorramabad, Iran
Email: b.a1366@yahoo.com
Email: haghiabi@yahoo.com
Email: dr.maleki38@yahoo.com
Email: torabi1976@gmail.com
*Corresponding author

Abstract: Weirs are those structures used extensively for flood passage, flow measurement, flow deviation and controlling the water level in dams, rivers and open channels. In this study, the numerical model was simulated using flow-3D software and the results from experimental and numerical model were compared. Investigations have shown that the results of RNG turbulence model are better compared to k-ε and LES models. Then, to model the turbulence, and to determine the location of free-surface profile, RNG model and VOF method were used respectively. Experimental results show proper coordination with estimated results of numerical model. For similar low values of h/p, the performance of 30 degree sharp crested triangular plan form weir for discharging of overflow was more suitable than other sharp-crested triangular plan form weirs.

Keywords: labyrinth; flow measurement; simulation; numerical model; VOF method; open channels.


Biographical notes: Bahador Abbaspoor is an MS student of Water Structures at Lorestan University, Iran. His research interests are hydraulic structures and flow simulation.

Amir Hamzeh Haghiaabi received his PhD in Water Structures from Shahid Chamran University of Ahvaz, Iran in 2003. His research interests are hydraulic structures, sediment transport and river engineering. He is currently an Associate Professor in Department of Water Engineering, Lorestan University, Iran.

Abbas Maleki received his PhD in Irrigation and Drainage from Shahid Chamran University of Ahvaz, Iran in 2004. His research interests are irrigation networks and drainage. He is currently an Assistant Professor in Department of Water Engineering, Lorestan University, Iran.

Hasan Torabi Poodeh received his PhD in Water Structures from Shahid Chamran University of Ahvaz, Iran in 2007. His research interests are hydraulic structures and optimisation. He is currently an Assistant Professor in Department of Water Engineering, Lorestan University, Iran.

1 Introduction

Weirs are used extensively for flood passage, flow measurement, flow deviation, and controlling the water level in dams, rivers, and open channels (Falvey, 2003). Normal weirs are of different rectangular, triangular, trapezoidal and circular shapes in which the weirs crest is straight in plan form. Different corrective plans such as Duckbill and labyrinth weirs are investigated and operated as well in which the weir crest is not straight in plan form and the length of the crest is increased to increase the discharge capacity of the weir. Another type of these weirs is triangular plan form weir (Bagheri and Heidarpour, 2010). Labyrinth weirs passes large flood at a comparatively low head, they can therefore be widely used to a particular advantage in situations where a weir is required to pass a range of discharge with a limited variation in upstream water levels and also where the width of a channel is...