Semi-circular side weir

H. Zahedi Khameneh[1], SR. Khodashenas[2], K. Esmaili[3], A. Beyhaghi Kondori[4]

1 MSc., Water Eng.
[2] Associate. Prof., Water Eng. Dep., Ferdowsi University of Mashhad, Iran
[3] Assistant. Prof., Water Eng. Dep., Ferdowsi University of Mashhad, Iran
4 MSc. Student, Water Eng. Dep., Ferdowsi University of Mashhad, Iran
E-mail: H.Zahedi.Kh@Gmail.com

Abstract

One of the most important discharge control ways is side weir. Semi-circular side weir can be an solution for increasing discharge coefficientC_m. In present research the semi-circular side weir has been studied to find the influence of hydraulic and geometry variables on the C_m value. Furthermore semi-circular side weir has been compared with labyrinth side weir with a beak angle 90°.
105 experimental tests were conducted on the semi-circular and labyrinth side weir. Upstream Froude number and discharge coefficient were calculated. The results showed that semi-circular side weir has higher coefficient value in comparison with rectangular side weir and labyrinth side weir when beak angle is90°. An inverse relationship between C_m Value and Fr_1 was found. Also increase in dimensionless height of weir (w/y_1) was causes the C_m value enhances.

Keywords : semi-circular side weir, labyrinth side weir, water surface profile, effective length, discharge coefficient, experimental model

Introduction

A side weir is a hydraulic control structure used to divert flow from a main channel into a side channel when the water level in the main channel exceeds a specified limit.
Side weirs extensively used in irrigation, water distribution, waste-water engineering, drainage, flood control and other water related projects.
Study about side weirs returned the early twentieth century. De-Marchi investigation (1934) basis on the following researches. He assumed the specific energy along the side weir to be constant and obtained the following equation for a side weir located in a rectangular channel:

$$L = \frac{3}{2}\frac{B}{C_d}(\varphi_2 - \varphi_1) \qquad (1)$$

in which *L*= length of the weir crest; *B*= width of the main channel; *Cm*= local discharge coefficient known as the De Marchi coefficient; $\varphi =$ varied flow function; and subscripts 1 and 2 represent immediate upstream and downstream of the weir, respectively.
The varied flow function can be expressed by the following equation:

$$\varphi(y, E, w) = \frac{2E-3w}{E-w}\sqrt{\frac{E-y}{y-w}} - 3\sin^{-1}\sqrt{\frac{E-y}{E-w}} \qquad (2)$$