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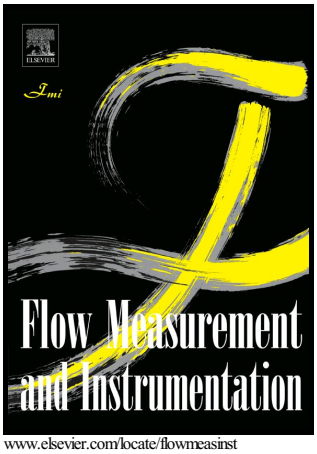

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Unified discharge coefficient formula for free and submerged triangular labyrinth weirs

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Abstract

The flow through a triangular plan labyrinth weir is studied for both free and submerged flow conditions experimentally and theoretically. The free flow condition is studied using a new experimental data set collected in this study. For the submerged flow condition, the threshold between free and submerged flow regimes is studied experimentally. Then Buckingham analysis is employed to determine the submerged head-discharge formula of the triangular plan labyrinth weir. Finally, a step by step calibration method is proposed to find the unified discharge coefficient. The proposed discharge coefficient can be used for both free and submerged flow conditions continuously and within the transition zone.

Keywords: labyrinth weir; free flow; submerged flow; linear weir; discharge coefficient; head-discharge relationship.

Introduction

A labyrinth weir is used to increase the discharge capacity compared to a linear weir installed in a specific channel width. Different shape configurations such as triangular, trapezoidal, and rectangular have been used to fold the weir in plan-view thereby a longer crest length than a linear weir is obtained. The performance of a labyrinth weir in connection with some influencing factors including crest length, plan shape, and number of cycles, has been studied widely and design guide lines were proposed (e.g. [1–4]). However, some disagreements regarding the accuracy of the proposed methods among researchers were published so far,