



## Computational Simulation of Flow and Energy Dissipation in Stepped Spillways

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## Abstract

The analysis of energy dissipation plays a major role in the problem of stepped spillways. In this study has been investigated flow over the stepped spillway using a physical model, in Hydraulics Laboratory, Department of Civil Engineering, University of Tabriz-Iran and has been obtained water profile by an image processing system in MATLAB software. Then for investigation of energy dissipation in stepped spillways, flow simulated using Flow-3D software. In order to this investigation to be more elucidated, 3 models 4, 8, 10 steps with adverse slopes and two discharge is used to determine their influences on amount of energy dissipation. Results showed that amount of energy dissipation decreases with increasing of discharge. Also number of steps and adverse slope on each step affects on energy dissipation, as by increasing number of steps and adverse slope, increases. Finally comparison of the numerical and physical model results showed a relatively good agreement.

## Keywords: Stepped spillway, physical model, Image processing system, Energy Dissipation, Flow-3D software.

## 1. INTRODUCTION

In the last two decades, there has been an increasing interest in the stepped spillways in various laboratories around the world. This is partly because of technical advances in the construction of Roller Compacted Concrete (RCC) dams and considerable amount of energy dissipation along the chute leading to reduction in the size of the stilling basin [1].

Discharge rate in the stepped spillways leads to three different flow regimes. Nappe flow that is observed in the low-rate flows, transition flow can be represented when the discharge rate increases and skimming flow that is caused by high rates of discharge. Figure 1. shown nappe, transition and skimming flow regime.



Figure 1- Flow regim on the stepped spillway [2]

Step geometry are either horizontal, inclined, or pooled, figure 2.