

INVESTIGATING THEORETICALLY AND EXPERIMENTALLY THE EFFECT OF A MOVABLE LATERAL SILL ON HYDRAULIC JUMP

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Abstract

There is no doubt that, reducing of the hydraulic jump length and improving its ability to disperse energy is the main outputs of the modification processes of the jump. The idea is to set up a Movable Lateral Sill (MLS) as a hollow gate downstream the main gate. The properties of MSL have been studied experimentally and this paper investigated the effects of different relative positions (x/G), relative heights (H_s/G), relative height of the sill (H_{ob}/G) and contraction coefficient C ($C = [b - bc]/b$). It was found that, the use of MSL improves the characteristics. Moreover, it was found that the sill of $x/G = 2.31$, $H_s/G = 0.7$, $H_{ob}/G = 0.263$ and $C = 0.12$ gives optimum results for the investigated ranges. It reduces the relative depth and length of the jump and increases the relative energy loss by about 35% in comparison with the classical jump. Two theoretical models are developed to predict the relative depth and energy loss of the jump. Moreover, statistical equations for the different jump characteristics were developed using the multiple linear regression. A good agreement was obtained for the theoretical and statistical models. Finally, the results of this study may be recommended in engineering applications.