1. **A Laboratory Study Attempt of Flow and Energy Dissipation in Stepped Spillways**

**ABSTRACT**

A new laboratory study conducted on stepped spillways in order to investigate their efficiency of dissipating flow energy. All previous study on stepped spillway indicated that the flow energy dissipation decreased as increasing in discharge. Increasing in the step numbers and the spillway slope led to energy dissipation decreased. In this study, an experimental attempt to increase energy dissipation at variable discharges was performed on stepped spillway and that lead to decreasing the cost of initiating the stilling basin or may be ignoring it. Five spillways were constructed from concrete and tested to investigate and compare among them. Three were roughed by gravel with different size for each one, one of them was stepped without any addition, and the last one was stepped with cavitation. The height of stepped spillways was 18 cm with unique numbers of steps (*n* = 3), and unique downstream slope of stepped face (*θ* =30⁰) were utilized. The percentage of relative energy dissipation (R.E.D) was increased using rough surface with coarse gravel. When the size of gravel increased, the R.E.D was increased and when using the ratio between heights of gravel to steps of 0.5, the R.E.D was increased to about triple compared with traditional spillways. The R.E.D was decreased when the cavitation on the stepped surface was utilized compared to the stepped spillway without any addition for large discharges and that was inverse for small discharges. Comparing to steps without any addition, the rouged steps with the larger size of gravel were maximized the energy dissipation for both small and large discharges. The relative energy dissipation was 26.73 % compared with traditional spillway and 16.73 % compared with stepped spillway without any addition, since the stepped spillways more effective than traditional spillways by 10 %.In general, the R.E.D was decreased when increasing the discharge.