

Comparison of stepped and smooth spillway effects on stream reaeration

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Abstract

The oxygen transfer at a hydraulic structure happens by self-aeration through the spillway and by flow aeration in the hydraulic jump downstream of the hydraulic structure. Spillways with their water-air controlling mechanisms are important not only for their structural properties but also for their effects on stream ecology. Spillway types also affect the efficiency of aeration. Decisions on the types of spillway should be made by taking the environmental conditions and flow rates into consideration.

This paper compares the aeration efficiency of stepped and smooth spillways. Empirical correlations predicting length of the non-aerated flow region and aeration efficiency are developed. Smooth and stepped spillways cause increased dissolved oxygen (DO) concentrations at the downstream part of the channel. DO concentration changes are shown to depend on the flow types, discharge rates, tail-water depth and travelling times.

Keywords: dissolved oxygen, spillway, stream, re-aeration, aeration efficiency