

Analytical Solution for End Depth Ratio in Rectangular Channels

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Abstract : Free over-fall is an instrument for measuring discharge in open channels by measuring end depth. A comprehensive researchers investigated theoretically and experimentally brink phenomenon with various approaches for different cross-sectional shapes. Anderson's method, based on Boussinq's approximation and energy approach was used to derive a pressure distribution factor at end depth. Applying the one-dimensional momentum equation and the principles of limit slope analysis, a relevant analytical solution may be derived for brink depth ratio (EDR) in prismatic rectangular channel. Also relationships between end depth ratio and slope ratio for a given non-dimensional normal or critical depth with upstream supercritical flow regime are presented. Simple indirect procedure is used to estimate the end depth discharge ratio (EDD) for subcritical and supercritical flow using measured end depth. The comparison of this analysis with all previous theoretical and experimental studies showed an excellent agreement.

Keywords : analytical solution, brink depth, end depth, flow measurement, free over fall, hydraulics, rectangular channel

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