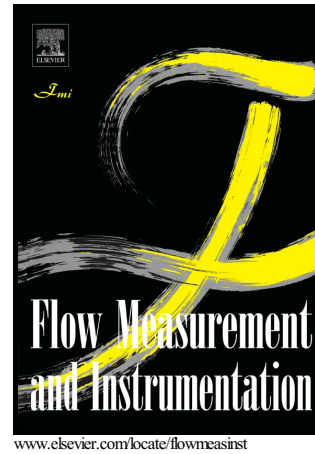


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# Free Over-fall in Exponential Channel Cross-sections Based on Free Vortex Theory in Super Critical Flow Regimes

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## Abstract

Free over-fall can be used as a flow metering hydraulic structure by a single measurement of an end depth. Many theoretical and experimental researches carried out on free over-fall with various approaches for different cross-sectional shapes. This paper presents a theoretical method to compute the end depth ratio (EDR) and the end depth discharge (EDD) relationships in steep sloping channel for the exponential cross-section. The exponential cross-section is a general section which can reduce to rectangular, wide rectangular, parabolic, semi-parabolic, triangular, and semi-triangular channels. Applying the momentum equation based on the free vortex theory, a theoretical approach is presented to obtain the EDR for the exponential channel cross-section in super critical flow regime. Experimental and theoretical studies are then utilized to verify the proposed EDR and EDD relationships. The computed results are in acceptable agreement with the relevant experimental and theoretical studies. Direct

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