

## Analytical Formulae for the Approach Velocity Head Coefficient

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**Abstract :** Critical depth meters, such as abroad crested weir, Venture Flume and combined control flume are standard devices for measuring flow in open channels. The discharge relation for these devices cannot be solved directly, but it needs iteration process to account for the approach velocity head. In this paper, analytical solution was developed to calculate the discharge in a combined critical depth-meter namely, a hump combined with lateral contraction in rectangular channel with subcritical approach flow including energy losses. Also analytical formulae were derived for approach velocity head coefficient for different types of critical depth meters. The solution was derived by solving a standard cubic equation considering energy loss on the base of trigonometric identity. The advantage of this technique is to avoid iteration process adopted in measuring flow by these devices. Numerical examples are chosen for demonstration of the proposed solution.

**Keywords :** broad crested weir, combined control meter, control structures, critical flow, discharge measurement, flow control, hydraulic engineering, hydraulic structures, open channel flow

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