

13.2 Critical depth flumes

A free flowing critical depth or standing wave flume is essentially a streamlined constriction built in an open channel where a sufficient fall is available so that critical flow occurs in the throat of the flume. The channel constriction may be formed by side contractions only by a bottom contraction (or hump) only, or by both side and bottom contractions.

The use of a weir is a simple method, but it causes relatively high head loss. The hydraulic behavior of a flume is similar to the flow over broad crested weir.

In this regard the stage-discharge relations of several critical depth flumes in general can be expressed as $Q = C_0 h^n$

where ' C_0 ' is a coefficient depending on the breadth (b) of the throat, on the velocity head $\bar{V}^2 / 2g$ at the head measurement section, and on those factors which influence the discharge coefficient; ' h ' is the piezometric level over the flume crest at a specified point in the converging approach channel and n is a factor usually varies between 1.5 and 2.5 depending on the geometry of the control section.

The empirical relationships are derived from experimental observations for a particular structure. Hence, the dimensions of the new structure should match exactly with that of the structure for which the equation is derived.

Example of critical depth flumes that have such head-discharge relationship are the Venturi flume, Long throated flume, Parshall flume, cut-throat flume, and H-flume.

1. The centre line of the flume matches with that of the canal. The flumes cannot be used in structures like turnouts, controls and regulating device etc.

2. The critical depth flumes are

- (i) Long throated flumes.
- (ii) Throatless flumes with rounded.
- (iii) Throatless flumes with broken phase transition.
- (iv) Parshall flume.
- (v) H flumes
- (vi) Venturi flume with sub critical constriction.