HYDRAULIC CHARACTERISTICS OF SHARP -CRESTED LINEAR WEIRS

Ş. YURDAGÜL KAYATÜRK[1] and MUSTAFA GÖĞÜŞ[2]

[1]Dr. Engineer, Hydraulics Laboratory, State Hydraulic Works
06100 Yücetepe-Ankara, Turkey
(Tel: +90-312-3992796, e-mail: yurdagulkumcu@hotmail.com,)
[2]Professor, Civil Engineering Dept, Hydromechanics Laboratory,
Middle East Technical University, 06531 Eskişehiyolu-Ankara, Turkey
(Tel: +90-312-2105499, e-mail: mgogus@metu.edu.tr)

Sharp-crested weirs are discharge measuring devices placed through the channel section perpendicular to the flow direction. In this study to provide a longer total effective length for a given overall channel width the inclined sharp-crested weirs were tested to increase the discharge capacity for a given water head over the crest. Figure1 shows a typical layout. The total length of the inclined sharp-crested weir is typically 1.2 to 1.6 times greater than the straight overflow weir width. Its capacity varies with head. Spillway capacity can be increased with labyrinth spillways which is brought into view by placing inclined weirs side by side typically and about twice that of standard weir or overflow crest of the same width .

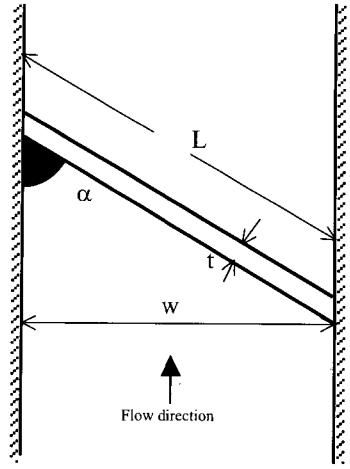
A series of laboratory experiments were performed in order to investigate the hydraulic characteristics of sharp-crested linear weirs. For this reason, eight different sharp-crested linear weir models manufactured from plexiglass were tested in a horizontal laboratory flume. The water head over the crest, was measured in each experiment. The dependence of the discharge coefficient and other dimensionless terms on the model parameters were investigated and presented graphically. For the models, the sidewall angle α takes the values of $38^{\circ}.68$, $45^{\circ}.59$, $56^{\circ}.44$ and 90°. The weir height, P, was 15 cm in models of a- and 10 cm in models of b- series.

It is concluded from this study that, in linear weirs having the same weir height, the discharge capacity increases as the length of the weir is extended for a given water head over the weir crest. 60 % increase in weir length results in 34-48 % increase in discharge in linear weirs of P=15 cm. The corresponding increase in the discharge is 45-58 % for linear weirs of P=10 cm.

The discharge coefficient Cd is function of H/P ratio and attains the maximum value of about 0.75 for $H/P \geq 0.5$ in linear weirs perpendicular to the flow direction. ($\alpha=90^{\circ}$) Yet, under non-aerated flow conditions the value of C_d may exceed 0.75 for smaller H/P values ($H/P \leq 0.50$).

In linear weirs as the length of the weir increases, Cd value decreases for a given H/P ratio. Discharge capacity or discharge coefficient of linear weirs having smaller weir height (P=10 cm) is greater than that having greater weir height (P=15 cm).

Keywords: Sharp-crested weir, Discharge coefficient, Open channel



Plan View

Fig. 1 A typical layout of inclined sharp-crested weir