Discussion of "V-Shaped Multislit Weirs" by A. S. Ramamurthy, J. Kai, and S. S. Han

DOI: 10.1061/(ASCE)IR.1943-4774.0000574

Ali R. Vatankhah[1]; A. Barghi-Khezerloo[2]; and H. Khalili-Shayan[3]

[1]Assistant Professor, Irrigation and Reclamation Engineering Dept., Univ. College of Agriculture and Natural Resources, Univ. of Tehran, P.O. Box 4111, 31587-77871 Karaj, Iran (corresponding author). E-mail: arvatan@ut.ac.ir

[2]Ph.D. Student, Irrigation and Reclamation Engineering Dept., Univ. College of Agriculture and Natural Resources, Univ. of Tehran, P.O. Box 4111, 31587-77871 Karaj, Iran.

[3]Ph.D. Student, Irrigation and Reclamation Engineering Dept., Univ. College of Agriculture and Natural Resources, Univ. of Tehran, P.O. Box 4111, 31587-77871 Karaj, Iran.

A single relation between the weir discharge coefficient and the weir Reynolds number for both the rectangular and V-shaped multislit weir systems are provided with particular attention paid to some key points.

Multislit weirs permit accurate flow measurement in a wide range of discharges. They also allow for better flow control in laboratory flumes by evenly distributing the approach flow. Thus, any effort presenting a simple and explicit discharge coefficient with reasonable accuracy for this flow measurement device would be of practical importance.

The discharge, Q_R, over a rectangular sharp-crested weir of width, b, can be expressed as

$$Q_R = C_d \frac{2}{3}\sqrt{2g} b h^{3/2} \tag{1}$$

where g = gravitational acceleration; h = flow depth above the weir crest, and C_d = effective discharge coefficient. For a rectangular slit weir ($b \ll h$), the Reynolds number R_R is defined as

$$\mathrm{R}_R = \frac{Q_R}{h\nu} \tag{2}$$

in which the kinematic viscosity is present. Substituting Q_R from Eq. (1) into Eq. (2) yields

$$\mathrm{R}_R = \frac{2}{3}\frac{C_d b\sqrt{2gh}}{\nu} \tag{3}$$

Similarly the discharge, Q_T, over a triangular sharp-crested weir with angle θ can be expressed as

$$Q_T = C_d \frac{8}{15}\sqrt{2g}\tan\frac{\theta}{2} h^{5/2} \tag{4}$$

For a triangular slit weir, the Reynolds number R_T is defined as

$$\mathrm{R}_T = \frac{Q_T}{h\nu}\cos\frac{\theta}{2} \tag{5}$$

Substituting Q_T from Eq. (4) into Eq. (5) yields

$$\mathrm{R}_T = \frac{8}{15}\frac{C_d h\sqrt{2gh}}{\nu}\sin\frac{\theta}{2} \tag{6}$$

The common Reynolds number R is used for both multislit units (rectangular and V-shaped multiunit weirs) and it is linked to C_d as

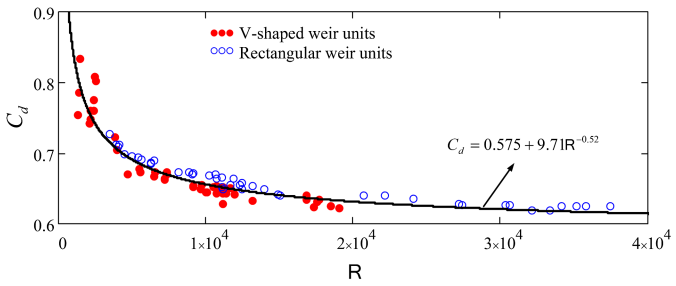

Fig. 1. Discharge coefficient versus Reynolds number for rectangular and V-shaped multislit weirs (an implicit representation)

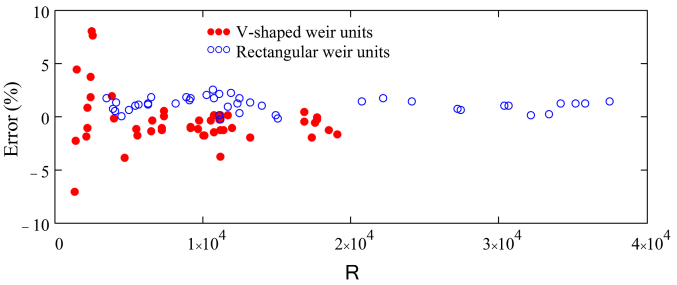

Fig. 2. Percentage error of proposed equation for discharge coefficient by the authors

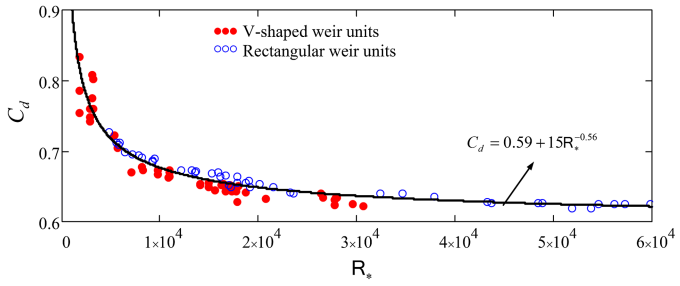

Fig. 3. Discharge coefficient versus new Reynolds number for rectangular and V-shaped multislit weirs (an explicit representation)

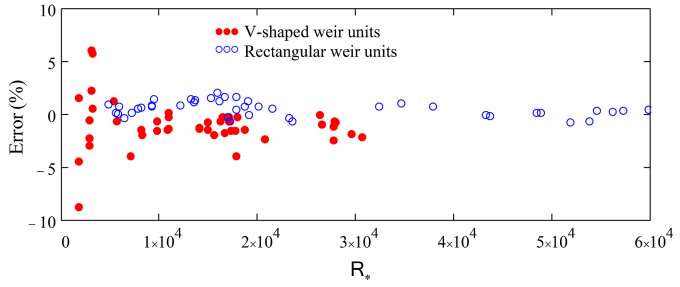

Fig. 4. Percentage error of proposed equation for discharge coefficient in this research