CHAPTER 7 - WEIRS

12. Cipoletti Weir

A standard Cipoletti weir is trapezoidal in shape. The crest and sides of the weir plate are placed far enough from the bottom and sides of the approach channel to produce full contraction. The sides incline outwardly at a slope of 1 horizontal to 4 vertical. A Cipoletti weir is shown on figures 7-1 and 7-9.

Figure 7-9 -- Cipoletti weir with a well-type head-measuring station.

(a) Equation for Cipoletti Weirs

The Cipoletti weir is a contracted weir. However, its discharge calibration resembles that of a suppressed weir because the effects of side contractions are intentionally compensated for by sloping the sides of the weir plate outward. Thus, discharge calibrations are nearly equivalent to suppressed weirs of the same crest lengths.

The Cipoletti equation, neglecting velocity of approach, is:

$$Q = 3.367\ L\ h_1^{3/2} \quad (7\text{-}7)$$

where:

L = length of weir crest in ft
h_1 = head on weir crest in ft

The accuracy of measurements obtained by use of Cipoletti weirs and the above equation is considerably less than that obtainable with suppressed rectangular or V-notch weirs (Shen, 1959). The accuracy of the discharge coefficient is ±5 percent.

(b) Discharge of Cipoletti Weirs

Table A7-5 contains discharges in cubic feet per second for standard Cipoletti weirs neglecting velocity of approach, for heads and lengths of weirs generally used in measuring small quantities of irrigation water. For the 0.5-ft, 1ft, 2-ft, and 3-ft weirs, and heads greater than one-third the crest length, the discharges have been taken from experiments performed at the Boise Project. All other discharges were computed from the Cipoletti equation. The data in the table may be considered accurate to ±5 percent for weirs of the above listed lengths. The same accuracy applies to weirs of other lengths which are listed on the table with heads not over one-third the crest length.

(c) Limits of Cipoletti Weirs

All conditions for accuracy stated for the standard contracted rectangular weir apply to the Cipoletti weir. The height of the weir crest above the bottom of the approach channel should be at least twice the maximum head over the crest, and the distances from the sides of the notch to the sides of the channel should also be at least twice the maximum head. This weir should not be used for heads less than about 0.2 ft or for heads greater than one-third the crest length unless calibrations exist beyond this range for specific size weirs. The head is measured at least a distance of four measuring heads upstream from the crest.

All the requirements in section 5 apply. All the approach flow conditions in chapter 2 apply.