ABSTRACT

The large irrigation system in Pakistan was constructed to protect the region from the threat of famine and to open up new areas of settlement to generate income to the then colonial British Government by the sale of crown waste lands. With the objective of maximizing the production per unit of surface water available. The water was spread thinly over a large an area to achieve maximum social benefits from the distribution of available watercourses. To limit the human interface in the operation of system, regulation points were minimized and watercourses were provided with ungated outlets. In the recent past, research on the performance of these irrigation systems at primary and secondary levels by many researchers showed that the distribution of the canal water is neither proportionate nor equitable. This performance is mainly attributed tot the improper design and maintenance, poor orientation and management and scarcity of surface water. Outlets plays a very important role in the efficient working of an irrigation system. Outlets are designed in such a way that they should draw their due share of water and sediment.

This study was done to analyse the effects on discharge coefficient of different types of outlets under different hydraulic and geometric conditions. As changes in hydraulic and geometry conditions of outlets affects on the discharge of outlets and its not possible to analyse different changes under field conditions, so a physical model of distributary (rectangular in cross section) along with three outlets of different types was constructed in the model tray hall in the centre of excellence in water resources engineering for the accomplishment of the study. The main focus of the study was calibration of irrigation outlets, and to calculate the range of discharge coefficient values for different hydraulic and geometric conditions.

Outlets was calibrated in the model under free and submerge flow conditions, by changing the depth of flow in the distributary and by changing the opening of the outlets. It was observed that C_d varied from 6.07 to 8.20 under free flow and from 0.56 to 0.74 under submerge flow conditions for APM/AOSM. For open flume it was observed between 2.46 to more than 4.31.

The behaviour of tempering over the coefficient of discharge was studied by tempering the outlets. Three scenarios of outlet tempering are discussed in the thesis i.e. tempering half wing wall, tempering full wing wall and lowering the bed level downstream of the outlet. It was observed that under all these scenarios coefficient of discharge was increased, but it varies depending upon the natural and extend of tempering. The percentage increased for outlet A was +10.84 (for half wall tempered), +17.12 (for full wing wall tempered), and +24.25 (for lowering the bed level). Similarly, for outlet B it was observed that these values were +14.49 (for half wing wall tempered), +22.36 (for full wing wall tempered), and +26.30 (for lowering the bed level).

Bilal Sajjad