M.Sc. Thesis

PHYSICAL MODEL STUDY OF EFFECTIVENESS OF SPUR UNDER VARIOUS FLOW CONDITIONS

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ABSTRACT

The number of river training structures are used for stabilization of any river. To stabilize the river any one or the combination of these structures are used. Spurs also called groynes or spur dikes or transverse dikes are very important river training works which are used for the protection of river banks and stable the river morphology. Spurs are also used to change the course of the flow at desired pattern.

In this study physical model of spur was built at different angles, spacing and different geometry to check the effectiveness of the spur. Total 24 experiments were carried out at three different discharges that were 0.75 cusec, 1 cusec and 1.5 cusec respectively. A channel was constructed in the physical model testing laboratory at Center of Excellence in Water Resources Engineering, UET Lahore Pakistan. In this study three different cases were discussed. Firstly three orientations of spur which is used at 90 degree (deflecting spur), 60 degree (repelling spur) and 120 degree (attracting spur) were constructed. Secondly, different cases of spacing between the spurs were discussed. In first case three spurs in series was constructed and in second case two spurs in series were constructed in straight channel and analyzed the more effective spacing for river banks protection. Thirdly, different spur geometry like T-Spur, J-spur and Hockey spur was constructed. In all experiments scouring pattern, deposition and erosion was analyzed near all the spurs with the help of the surfer software. Direction of velocity currents and velocity distribution was also observed with the help of digital current meter near all the orientations, spacing and geometries of spur at different discharges.

This physical modeling of spur showed that when discharge was gradually increased the erosion or deposition and bed morphology changed rapidly near all orientations, geometries and near the first spur when series of spur was used in spacing. According to velocity currents the most appropriate angle is 90 degree in straight channels and for creation of water pockets for banks protection at upstream side the 60 degree angle is most suitable which repel the velocity currents as well. Similarly for creation of water pockets for bank protection on downstream, 120 degree angle is the most suitable.

In case of spacing, results showed that in 1st case of spacing when three spur spacing was used in series, discharge increase gradually then erosion also increased near first spur and deposition occur near 2nd and 3rd spur and between them. In 2nd case of spacing when two spur spacing was used in series by removing the middle spur then same behavior was observed as in three spur spacing. The results shows that middle spur are not much effective for banks protection in straight channel.

This study shows that geometry of the spur is used for specific functions according to the site morphology conditions. According to the results T-spur is used where bank protection needed for shorter length at both side of the structure by creating the water pockets both side of the T-spur, J-spur and hockey spur are used to divert the flow of water at specific direction and also used for banks protection for shorter length at downstream of the structure by accumulation of sediment.