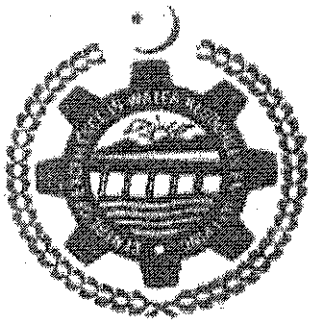
THESIS

"EVALUATION OF EFFECT OF HUMP ON OPEN CHANNEL: A CASE STUDY OF KORU DISTRIBUTARY OF L.C.C (EAST) SYSTEM"



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ABSTRACT

Khanki Weir was constructed across River Chenab about eight miles upstream of head of the old inundation canal and just below the junction of Pulkhu Nullah with the river. The lower Chenab Canal (LCC) System off takes from Khanki Weir and is one of the oldest in Punjab Province. Ever since its inception in 1862 it has undergone a process of extension and improvement many a time. The L.C.C. system had been facing number of major and minor problems. Gradual addition of new areas to CCA over the years put more and more demand for pushing excessive supplies through the canals. This extra demand for water induced lawlessness on the canals because the archaic provisions of the Canal & Drainage Act could not be helpful in controlling the situation. This resulted in serious deterioration of canal banks and berms. Hydraulic structures outlived their natural life on account of being more than century old. Deferred maintenance due to paucity of funds has further aggravated the situation. All this has rendered the conveyance system inefficient resulting in shortage of irrigation supplies particularly in tail reaches.

Keeping in view all above It was the demand of the situation that the capabilities of the irrigation system to convey its design supplies must fully be restored for equitable supply at all points.

Remodeling of L.C.C system was planned in two Phases. First phase of rehabilitation has been completed. Rehabilitation of Lower Gugera Branch Canal and its system is the part of 2nd phase which is under process. The ultimate purpose of rehabilitation is equitable draw off of water from outlets and proportionate distribution of the available water supply from head to tail of the channel.

The main objective of this study was to check the reliability of the solution of

canal water supplies to Koru distributary through Lower Gugera Branch canal and also to ensure the conveyance of enough flows in the distributary in order to meet the envisaged irrigation requirements. This can be accomplished by creating an obstruction in parent channel (either x-regulator or a hump) and heading up the water, thereby feeding the distributary. The other objective of this study includes the performance evaluation of weir/hump when the canal is running full and below F.S.L.

Koru distributary off takes from Lower Gugera Canal at RD. 201+100/L with authorized discharge of 08 Cusecs. As long as the parent channel is running full, there is no problem of feeding the distributary, but when the parent channel runs below F.S.L, the off taking distributary does not take its authorized discharge / working head is not available at low supplies.

The study area was limited to RD 180+100 to RD 210+100 of Lower Gugera Branch Canal. Methodology adopted to achieve the study objectives was collection of data, study of L-sections of parent channel and distributary, study of streamlined obstruction, design of hump in parent channel using fluid mechanics techniques and use of HEC-RAS & FLOW PRO software to evaluate the performance of designed hump.

From the study of L-Section of LGBC and Koru distributary it was observed that F.S.L of Lower Gugera Branch Canal at 100% discharge is 583.74 ft whereas bed level of Koru distributary is 581.39 ft. This means that sufficient head is available to feed Koru distributary. But at 60% discharge in parent channel, observed F.S.L of parent channel becomes 582.14 ft, which means that depth of water in parent channel becomes 4.36 ft (582.14 ft – 577.78 ft), resulting in lesser discharge in off-taking distributary. Minimum depth of water required in parent channel at 60% discharge is 5.10 ft to completely feed Koru distributary (08 cusecs), whereas F.S.D in parent

channel at 100% discharge must remain as 5.96 ft. After provision of 3.05 ft high hump in parent channel, F.S.D upstream of hump at 60% discharge was observed as 5.14 ft (higher than the required depth), so there will be sufficient damming action at 60% discharge. But at the same time F.S.D upstream of hump at 100% discharge was observed as 5.96 ft, which confirms that there is no damming action at 100% discharge after provision of hump.

Water surface profile on the basis of above results was plotted using FLOW PRO software, which confirms back water effect due to hump at 60% discharge and no back water effect at 100% discharge in the presence of 3.05 ft hump.

Water surface profile at 60% discharge and at 100% discharge for given cross sections (with hump and without hump) were plotted using HEC-RAS, which also confirms required rise in water level at 60% discharge with hump and no rise in water at 100% discharge in presence of hump.

The study concludes that the design of hump indicates required damming action at 60% discharge and no damming action at 100% discharge. Moreover damming action at 60% discharge indicates required height of water above the crest for feeding Koru distributary. Study also concludes that provision of hump at 100% discharge will have no effect on u/s and d/s side of parent channel. Study of flow characteristics of hydraulic jump developed due to hump, effect due to sediment deposition and unsteady flow analysis is recommended to be done in future.