

Thesis

COMPARATIVE STUDY OF DIFFERENT ALLUVIAL CHANNEL DESIGN  
APPROACHES FOR SELECTED CANAL IN THE INDUS BASIN



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## ABSTRACT

Generally alluvial channels are the man made channels. Ideally the geometry of these channels should remain stable which is practically impossible. The bed and banks of these channels deform with the passage of time as the sediment loaded water flows through these channels, so alluvial channel requires the analysis of channel stability. The study of alluvial channel design is important for Pakistan because agriculture plays a major role in economy of Pakistan. To irrigate agricultural lands Pakistan has an integrated canal system. The canals take water from the rivers. The river water contains the variable contents of sediment, so sediment inflow in canals also varies. Sedimentation and scouring is the common phenomenon in alluvial channels. The major reasons of these issues are the scanty knowledge about the sediment at the time of the design of these channels. So there is need to re-evaluate the design of channels along with sediment studies.

Present research study was under taken to analyze the different analytical methods and regime theories of alluvial channel design in combination with different approaches of sediment load transportation. These theories were analyzed on the basis of observed data of discharge and sediment concentration on head reach of Lower Bari Doab Canal (LBDC) at Balloki Headworks, as the LBDC off takes from left bank of River Ravi at Balloki Headwork.

In order to achieve the objectives of the study, the discharge, sediment size and sediment concentration data were collected. The design of LBDC canal was reassessed by using regime theories and analytical methods. The regime theories used were, Lacey channel design theory, Simon and Albertson channel design theory and Blench theory of channel design. The analytical methods used were, tractive force

method and rational canal design methods. The bed material sediment transport rate was calculated using approaches like Ackers and White, Engelund and Hansen, Brownlie and Yang. The suspended sediment transport rate was calculated using Westrich and Jurashek method and Arora, Raju and Grade method.

To enhance the computational accuracy an excel worksheet was developed for the selected Regime approaches and Tractive force method to compute the design parameters. Design of Regime Canal (DORC) computer software was used for analytical approaches other than tractive force method.

LBDC was originally designed using empirical approach, the Lacey theory. The results of the study therefore revealed that the hydraulic parameters are in close proximity of empirical equation specially the Lacey theory. The use of rational approaches may be more appropriate in new canal system designs.