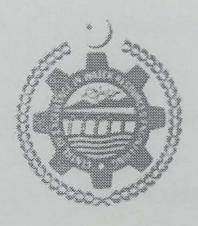THESIS

EVALUATION OF STABILITY FOR IMPERVIOUS FLOOR BY ANALYZING UPLIFT PRESSURE: A CASE STUDY OF KHANKI WEIR

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ABSTRACT

Life is not possible without water and civilization is not possible without proper drainage. Uncontrolled groundwater and seepage may cause serious economic and human loses.

In Pakistan all the hydraulic structures on alluvial plains of Indus and its tributaries have been constructed on permeable foundations. Such structures have the problems of uplift pressure and piping due to seepage flow underneath, energy dissipation and scour due to surface flow.

The scope and purpose of this study is to analyze the stability of impervious floor of Khanki Weir by considering the aspect of uplift pressure. The growth of knowledge on the subject and development of theories for the design of hydraulic structures up to 1936 is on record and most of the structures in the sub-continent were designed on the basis of Khosla's theory. The recent contribution is of Mr. Chugaev who has proposed simpler methods of computing uplift pressure, exit gradients and seepage flow rate for structures on shallow depths of permeable foundations. Khanki weir constructed during 1889 faced the problem of undermining just after its construction. The history of construction of Khanki weir is actually a history of evaluation of science, designing and construction of hydraulic structures on the alluvial sandy bed of rivers. Historic Khosla's theory for determination of uplift pressure and exit gradient was derived from the analysis of data collected from pressure pipes installed at Khanki weir After repeated failures, ultimately

the weir was reconstructed with an aim to provide safety to structure against uplift pressure.

The author has collected the field data of pressure pipes installed throughout the barrage and calculated the uplift pressure at different points by using Khosla's method (i.e. direct method for calculating uplift pressure from the observed field data).

The results are also compared with the uplift pressures calculated by using Chugaev method which is not so far been used in design calculations of uplift pressure on permeable foundations in Pakistan.

A detailed visual inspection of the barrage has also been carried out to assess the structural soundness of various components of the weir. These findings may be useful for the professional Engineers, involved in work on hydraulic structures for solving the uplift problems.