

THESIS

**EVALUATION OF EFFECTIVENESS OF SEEPAGE CONTROL MEASURES
AT TARBELA DAM**

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Submitted by:

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ABSTRACT

Tarbela Dam, a masterpiece of engineering, is constructed on river Indus involved placement of 153 million cubic meters of “earth and rock fill” and the largest embankment type dam so far constructed in the world. The project comprises of an earth & rock fill main dam; two auxiliary dams on the left bank; service & auxiliary spillways on the left bank; four tunnels & power station on the right bank, and; a tunnel in the left bank.

Tarbela Dam was constructed on a deep alluvium foundation composed of cobbles, gravels and fine sand with extensive association of works, which makes the foundation highly pervious. The forces and pressure of water can pose serious threats to the security of earthfill dam, if not properly controlled, therefore, evaluation of effectiveness of seepage control measures are of considerable importance for the stability of Tarbela Dam.

The aim of this research is to study “**Evaluation of Effectiveness of Seepage Control Measures at Tarbela Dam**” by addressing the seepage problems, control measures, their effectiveness, and the to-date performance of the dam. Evaluation of seepage control measures adopted at the Tarbela Dam was done by investigating the seepage behaviour during different years for all the main components of the dam i.e. upstream impervious blanket, right and left abutments of MED, service & auxiliary spillways, and auxiliary dam-2. The piezometric data for all the above were also analysed. This enormous study would be helpful in predicting the increasing and decreasing effect of seepage from the dam site. It will also pin point the problems at

Tarbela Dam and will be useful to government agencies to adopt appropriate and in time remedial measures.

For this purpose an earnest endeavour has been made to collect and analyze the post operational data on seepage through the foundation, abutments, auxiliary dams, spillways; behaviour of various piezometers in the foundation, abutments, dam fill, main embankment dam downstream toe, auxiliary dams, spillways; dissolution of rock salts in the right abutment, and; sinkhole development on the upstream impervious blanket.

It is concluded from this study that upstream impervious blanket; grouting curtains for auxiliary dam-1 & 2, auxiliary & service spillways, left & right abutments of MED; and core of MED are effective in controlling the seepage. It is further concluded that due to grouting of right abutment and sediment deposition, the removal of salts has been reduced from 60 tons/day in 1975 to 19 tons/day in 1999.

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