# THESIS

## MODELLING SEEPAGE OF MANGLA DAM BY USING SEEP/W COMPUTER MODEL



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## ABSTRACT

Dams are very important for the development of our country. Mangla Dam and Tarbela Dam are the backbone of Pakistan's Economy. More than thirty years have gone when these two dams were constructed. Performance of these two dams shows that the dams are in excellent condition. Engineers can learn a lot from these great engineering structures, to raise the technical skills. Seepage analysis is an important aspect of Dam Engineering, which ensures the conservation of the reservoir storage.

Mangla Dam is located on river Jhelum about 15 miles North East of Dina town, which exists on Grand Trunk road near Jhelum city. Prime objective of this project is to conserve water and control floodwater of the river Jhelum and supply water for irrigation. Mangla powerhouse generates 1000 MW hydel power as byproduct.

The main components of the project include Main Dam, Intake Embankment, Sukian Dyke, Jari Dam, Main and Emergency Spillway, Powerhouse and New Bog Escape. The dam is an Earth fill type and is of 454 ft maximum height above the foundation. Main dam has a length of about 8000 ft. and crest width of 40 ft. With the help of available data, SEEP/W model of Mangla dam has been prepared. Minimum Conservation level of Mangla dam is 1040.0 ft above mean sea level and Maximum conservation level is 1202.0 ft. SEEP/W model has been prepared to cover the range between minimum and maximum conservation levels. Model seepage flows have been plotted against the corresponding reservoir levels in order to ensure the calibration of the model. The historic seepage data has been plotted against the corresponding reservoir levels to review the response of the seepage against variation in the

reservoir levels. The model seepage has also been verified by the seepage computed by the flow net method. The comparison between the two indicates that both are nearly equal. Observed seepage flows have been plotted against the historic reservoir levels.

Plot between the model (computed) seepage flows and the observed seepage flows shows that the observed flows are lesser than the model seepage flows. This verifies the safe selection of the permeability parameters considered during the original design. Satisfactory performance of the dam is due to safe engineering parameters selected at the time of original design. Seepage model for the raised Mangla has also been prepared which yields that about 20% increase in the seepage through the dam is expected. The additional seepage can safely be catered by the existing drainage system. Only filter under the raised shoulder will be required to join with existing drainage system. For Sukian dyke sandstone beds in the foundation, SEEP/W model has been prepared. Various sandstone beds daylighting in the nullah beds at various intersecting points show some seepages emerging out of these beds. Some sand boils have also appeared in the beds and vicinity of these nullahs. SEEP model results yield that an upstream blanket placed along the toe can reduce the seepage quantities as much as 40%. The performance of the upstream impervious blanket has also been verified by comparing the pre-construction and post construction seepage data. It is recommended that the impervious blanket be placed for all the sandstone beds of Sukian dyke prone to excessive seepages.