CENTRAL WATER AND POWER RESEARCH STATION

GEOTECHNICAL STUDIES FOR SUGGESTING SEEPAGE MITIGATION AND STABILITY MEASURES FOR NIVE EARTHEN DAM, DIST. RATNAGIRI, MAHARASHTRA

STUDY OVERVIEW

To meet the drinking water demands and local irrigation requirement, Minor Irrigation (MI) tanks have been built by Govt. of Maharashtra in Ratnagiri District. Many of these dams including Nive dam have developed leakages, resulting in depleted water storage and raising safety concerns. Considering the acute storage of water and safety of the structures, it is proposed to carry out detailed studies of Nive dam for recommending appropriate remedial measures to arrest leakages and improve stability.

APPROACH

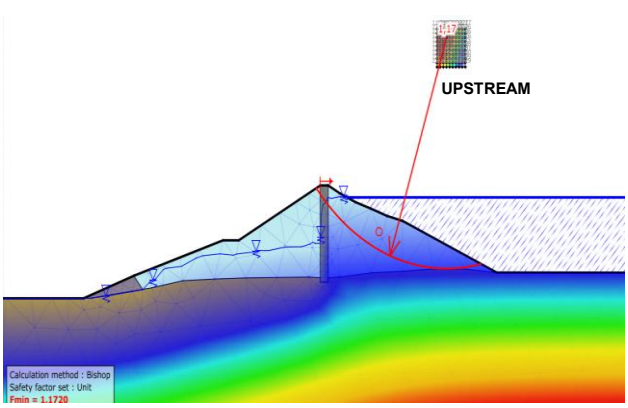
Seepage analysis was carried out to obtain phreatic line, seepage flow path, quantity of seepage discharge, pore pressures and hydraulic heads in dam body and foundation. Followed by Slope stability analysis of downstream and upstream slopes by Bishop's limit equilibrium method of slip circle analysis (method of slices) for conditions of steady seepage and sudden drawdown respectively.

SIGNIFICANCE

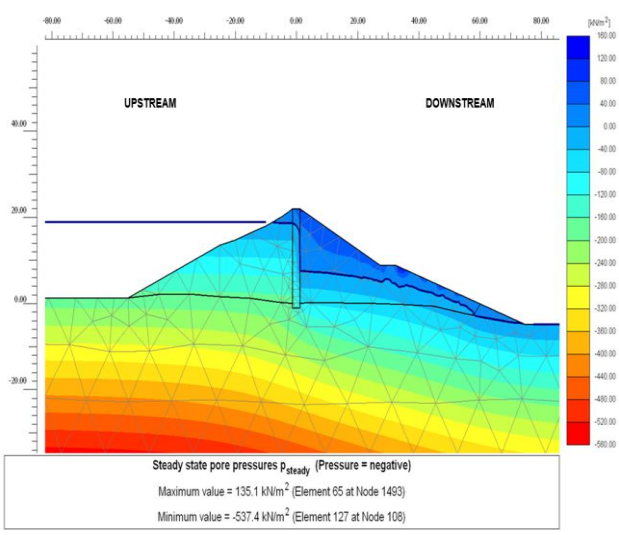
The stability analysis of dam provided a comprehensive overview of existing dam conditions. Based on these conditions, remedial measures were suggested. To minimize seepage, grouting was suggested along with flattening of downstream slope to stabilize the dam for various conditions such as steady seepage and sudden drawdown.

KEY FINDINGS

- Seepage studies indicated that the phreatic line drops and intercepts the downstream slope, which is often the result of absence of impervious hearting zone.
- During drawdown condition also, the phreatic line is also intercepting the upstream slope in drawdown condition, creating high hydraulic head and consequently high pore pressures.
- It is inferred that rehabilitation measures for seepage mitigation as well as stability improvement are required to be implemented for the dam.
- Following rehabilitation measures are recommended based on studies:
  (i) Grouting through dam body
  (ii) Flattening of slopes
  (iii) Provision of berm on both Upstream & Downstream slopes
  (iv) Repairs to RCC conduit by grouting
- The upstream and downstream slopes should be protected against wave action by rip-rap/ pitching.
- Regular maintenance of the dam as per CWC guidelines is recommended.



Critical Slip Circle – Modified section upstream slope for pseudo static (FS = 1.17)



Steady State pore pressure by Seepage analysis of Modified section