



# **Stability analysis of divergence tunnel of storage dam by finite and boundary element method**

## **Case study: Ardak dam (Mashhad)**

**SH. Taheri<sup>1</sup>, H. Saghi<sup>2</sup>**

1- Ms.c Rock mechanic engineering and academic member of azad university of Mashhad

2-PhD Student of Hydraulics, Department of Civil Engineering, Ferdowsi University, Mashhad, Iran and  
designer of TOOSAB consulting engineering company  
Shahab.Taheri@gmail.com

### **Abstract**

The purpose of this research is study of stability of water diversion tunnel of Ardak dam of Mashhad and analyzing it through the experimental and numerical methods and finally providing different methods and controlling stability of tunnel housing based on regional strategic situation. For this purpose, at first the condition of regional geology determined thorough ground experiments and cross-drilled bore tunnels and exploration, and then suitable options identified to determine location and depth of the tunnel. Then specific parameters for designing tunnel were determined and designing the covert tunnel is accomplished by using various soft wares (including software and UNWEDGE and PHASE2) which are based on Finite element methods, and wedge method. Finally, the achieved results were validated through experimental analysis (RMR and Q methods) and providing the amount required for increasing the stability of tunnel maintenance has been proposed through natural sustainability of land.

**Keywords:** Ardak dam, Finite element, Boundary element, stability of tunnel

### **1.Introduction**

Considering that the most important issue of all countries, especially in arid and semi-arid areas is water shortage crisis in the near future, so lack of water and appearing gradually the real and vital value of water makes people and the countries to take maximum utilization of available water in the lodge. In mean while one of the methods of exploitation of groundwater is the implementation of dams. In making the body of dam and to keep the environment dry, diversion condition of river flow should be examined and during this review diversion tunnel is one of the appropriate options e. In this article, stability of water diversion tunnel of Ardak has been reviewed and different stages of design will be provided as follows:

- Plan Introduction
- Geological studies of diversion tunnel
- Diversion tunnel stability analysis through the experimental method
- Diversion tunnel stability analysis through numerical methods
- Diversion tunnel stability analysis through wedge method
- Conclusions and providing suggestions and related solutions