

## Analysis of the Occurrence of Hydraulic Fracture Phenomena in Roudbar Lorestan Dam

**Authors :** Masoud Ghaemi, MohammadJafar Hedayati, Faezeh Yousefzadeh, Hoseinali Heydarzadeh

**Abstract :** According to the statistics of the International Committee on Large Dams, internal erosion and piping (scour) are major causes of the destruction of earth-fill dams. If such dams are constructed in narrow valleys, the valley walls will increase the arching of the dam body due to the transfer of vertical and horizontal stresses, so the occurrence of hydraulic fracturing in these embankments is more likely. Roudbar Dam in Lorestan is a clay-core pebble earth-fill dam constructed in a relatively narrow valley in western Iran. Three years after the onset of impoundment, there has been a fall in dam behavior. Evaluation of the dam behavior based on the data recorded on the instruments installed inside the dam body and foundation confirms the occurrence of internal erosion in the lower and adjacent parts of the core on the left support (abutment). The phenomenon of hydraulic fracturing is one of the main causes of the onset of internal erosion in this dam. Accordingly, the main objective of this paper is to evaluate the validity of this hypothesis. To evaluate the validity of this hypothesis, the dam behavior during construction and impoundment has been first simulated with a three-dimensional numerical model. Then, using validated empirical equations, the safety factor of the occurrence of hydraulic fracturing phenomenon upstream of the dam score was calculated. Then, using the artificial neural network, the failure time of the given section was predicted based on the maximum stress trend created. The study results show that steep slopes of valley walls, sudden changes in coefficient, and differences in compressibility properties of dam body materials have caused considerable stress transfer from core to adjacent valley walls, especially at its lower levels. This has resulted in the coefficient of confidence of the occurrence of hydraulic fracturing in each of these areas being close to one in each of the empirical equations used.

**Keywords :** arching, artificial neural network, FLAC3D, hydraulic fracturing, internal erosion, pore water pressure

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