

ACTIVE FAULTING AT THE GOTVAND DAM SITE BASED ON SEISMIC AND GEOTECHNICAL DATA

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ABSTRACT

Active faulting and subsequent movements in dam foundations can cause structural distortions. Regarding to dam safety issues, faults with surface breaking and potential block movements are the main point of interest and accordingly should carefully be studied, especially on the field. The Upper Gotvand dam is the highest rock fill dam with clay core in Iran which was constructed over Karun River in the southwest of Khuzestan Province. Its location in the Zagros active belt as the most active seismotectonic zone of the country had some problematic effects on it including stability of the abutments and seepage potential through the foundation and abutments. The dam is underlain by the conglomeratic Bakhtiari Formation overlying the sandstones of Agha-Jari Formation. The right abutment of the dam is composed of a highly fractured and displaced mass which is a suitable situation for seepage. This fractured zone is the result of Pir-Ahmad thrust fault which rid Gachsaran Formation of Miocene Age over Bakhtiari Conglomerate of Pleistocene Age. The fault is described as a branch or the continuation of famous Lahbari active fault with nearly 70 km length and is the main reason for such failure. Geotechnical section along the dam axis indicates four along strike faults near the right bank and sharp changes in dip of bedding along the dam axis. The Agha-Jari layers are very tight beneath the dam axis with a 30° inter-limb angle indicating a shevron fold. Also a fault trace was recognized beneath the river bed passing through these layers. The whole region is affected by a N-S basement tectonic lineament named here as Lali-Ahvaz trend. Regarding to the available research articles, the Pir-Ahmad fault was not considered in the stability analysis of the abutment, so a revision of dam stability seems crucial for future seismic events.

INTRODUCTION

Geological conditions especially geologic structure play key role in prediction of future behavior of dams and possible seepage and stability problems beneath their foundation or within their reservoirs. The geological structure of an area could play a key role in the stability of a given site particularly a dam site. The Upper Gotvand dam as the highest rock fill dam with clay core in Iran, is located in Khuzestan Province of southwest Iran. It was planned to produce electrical energy, flood control, water regulation and tourist attraction. Its location in the most seismotectonically active zone of the country had some problematic effects on it including stability of the abutments and seepage potential through the foundation and abutments. This is the main concern of this study to investigate the role of geological structure on geotechnical properties of the Upper Gotvand dam site and relevant instability issues.

Khuzestan Province is located in and the Simply Folded Belt (Falcon, 1974) of the Zagros Fold-Thrust Belt. It is comprised of parallel, long anticlines and synclines; the former shows topographic crest lines, while the latter coincides with trough lines. The studied area is located where the Karun River enters into Khuzestan plain at the end of the above zone (Figure 1). The existence of plastic to semi-plastic lithologies among the stratigraphic sequence is also important due to their great role on the formation of local or regional structures (Barjasteh, 2012a).