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## کارگاه های آموزشی مرکز اطلاعات علمی جهاد دانشگاهی



کارگاه آنلاین آشنایی با پایگاه های اطلاعات علمی بین المللی و ترند های جستجو



مباحث پیشرفته یادگیری عمیق؛ شبکه های توجه گرافی (Graph Attention Networks)



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## EXTENDED ABSTRACT

# Numerical Analysis of Dynamic Response of Concrete Gravity Dam under Blast Loading in the Reservoir

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### Keywords:

Blast loading, Gravity dam, Reservoir -structure interaction, Finite element, Displacement, Stress.

## 1. Introduction

Studies about effects of blast in the reservoir on dynamic behavior of concrete dams is accelerated with began of Second World War and the necessity of finding the persevering ways of this structures against of blast loading (Cole, 1948). In the present paper the effect of explosion in the reservoir on dynamic response of concrete gravity dam is study using ABAQUS commercial software. In the present research two different gravity dam model are considered and the effect of geometrical and material properties on dynamic response of gravity dam are studied. In the first model the linear behavior of material and in the second model the linear and nonlinear behavior of material are considered in the analysis (Sprague and Geers, 2006).

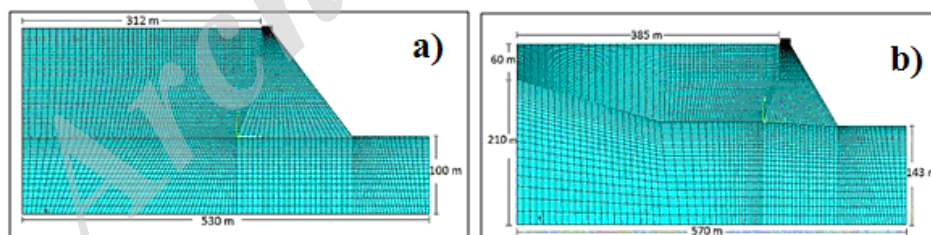


Fig. 1. Concrete gravity dam-reservoir-foundation finite element model, a) Shafaroud Gravity dam, b) assumptive gravity dam

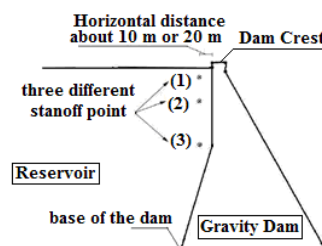


Fig. 2. Configuration of different standoff points in the reservoir

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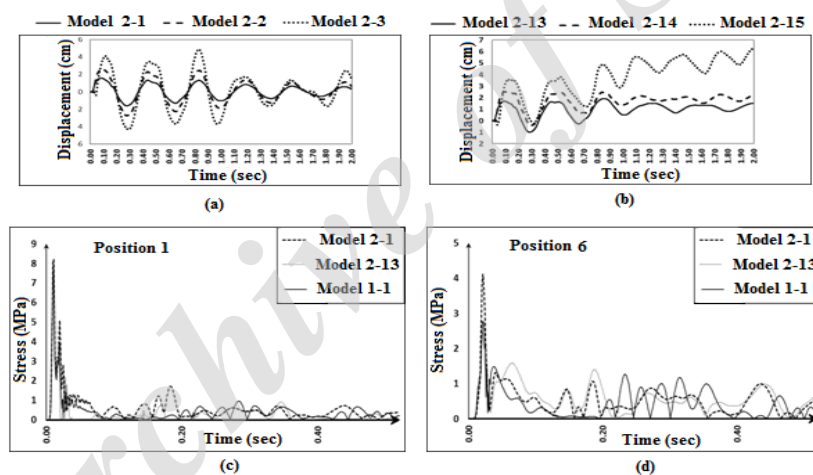
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## 2. Methodology

In this study, the procedure for computing concrete gravity dams response to blast loading in the reservoir is described. This procedure considers the effects of dam body material behavior and standoff point location in determining the crest displacement, stress in dam body and hydrodynamic pressure in the reservoir produced by the blast loading. Based on a two-dimensional model of concrete gravity dam, a dynamic time-history analysis is carried out to using ABAQUS software to study the effect of different aspects on the response. Fig. 1 shows the finite element model of two considered gravity dams. Fig. 2 represents the configuration of different standoff points in the reservoir.

## 3. Results and discussion

Validation of analysis using comparison of obtained result with existing analytical one is done and good agreement between two results shows that accuracy of analysis process. In the following analysis of gravity dam-reservoir-foundation system, different scenarios are considered. Obtained results show that the horizontal displacement of different point of dam body is grater that vertical displacement and considering material nonlinearity causes larger displacement. In addition, comparison between different standoff points of charge show that located of standoff point of charge in the middle part of dam causes larger acceleration. Distribution of induced stress wave in the dam body is begun from the point of dam body facing of standoff point of charge. Stress in the downstream layers of dam is grater that upstream face. With considering of nonlinearity of material not noticeable difference is obtained in the stresses in dam body in the comparison of linear material behavior. Fig. 3 Show sample results that obtained from the present research.



**Fig. 3.** a) comparison of time-history of displacement for charge located at the position (2), b) comparison of time-history of displacement for charge located at the position (1), c) Time history of dam body stress for different models, charge is located near point (1), d) Time history of dam body stress for different models, charge is located near point (2)

## 4. Conclusions

This study considers the response of concrete gravity dam subjected to blast loading. The results of the analysis compared with those obtained from different assumption for material of dam and standoff point. Obtained results show that material nonlinearity has significant effects in the predicting of dam response and change of standoff point location, alter the response of gravity dam but the critical location for standoff point is near the slop change in the dam geometry. With approach of standoff point to the dam body the effect of explosion loading intensified but not linearly proportional to the distance.

## 5. References

- Cole RH, "Underwater Explosions", Princeton University Press, US, 1948.  
 Sprague MA, Geers TL, "A spectral-element/finite-element analysis if a ship-like structure subjected to an underwater explosion", computer Methods in Applied Mechanics and Engineering, 2006, 195, 2149-2167.

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