EFFECTS OF MASS OF FOUNDATION ON SEISMIC RESPONSE OF GRAVITY DAMS UNDEAR NEAR-FAULT GROUND MOTION EXCITATION

Amir Hoshang AKHAVEISSY
Assistant Professor, Razi University, Kermanshah, Iran
ahakhaveissy@razi.ac.ir
Nazanin AMIRI
M.Sc. Student, Razi University, Kermanshah, Iran
Nazanin.amiri23@gmail.com

Keywords: Near-Fault Ground Motion, Concrete Gravity Dams, Dam-Water-Foundation Interaction, Seismic Response, Dynamic Analysis

In recent decades, researchers pay more attention to the issue of the safety of concrete dams against earthquake. There are several factors affecting the dynamic response of concrete gravity dams to earthquake ground motions. Some of them are the interaction of dam-foundation and water in reservoir. This study focuses on seismic response of a concrete gravity dam subjected to near-field ground motions including dam-water-foundation interaction. The records in near field having special characteristics records suggest that a near-fault ground motion is characterized by a large high-energy pulse and a distinctive pulse shape for the velocity time history. The aim of present study was investigated the effect of mass and geometric damping of foundation on seismic response of dam subjected to near-fault ground motion excitations.

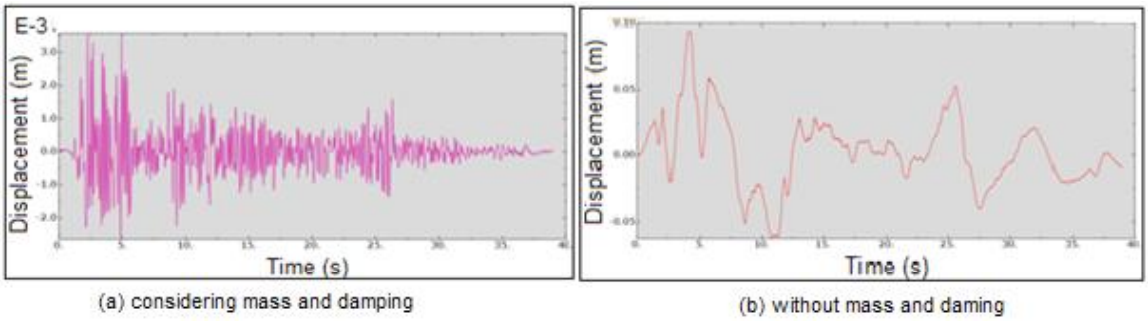
As it is noted, in this research, the numerical approach has been selected for investigating the effect of mass and geometric damping of foundation on seismic response of dam subjected to near-fault ground motion excitations. For this perpose, the non-overflow section of the Hirvi gravity dam has been chosen and assessed using finite element technique.

For this purpose two near-fault ground motions are selected from PEER Ground Motion Database.The fundamental properties of these ground motion records are listed in Table 1.

Table 1. The characteristics of Ground motions selected for dynamic analysis of dam

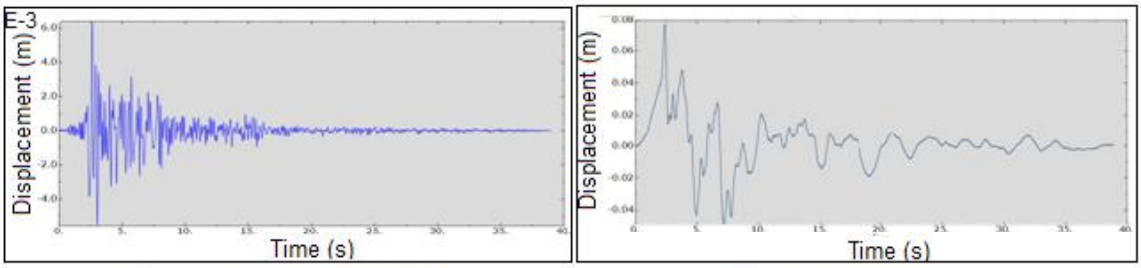
No.	Name	Date	Time (GMT)	Longitude	Magnitude
1	Imperial Valley	1940/05/19	04:37	40	7
2	Loma Prieta	1989/10/18	00:05	40	6.9

The time-histories of displacements at the dam crest for Imperial Valley and Loma Prieta are presented in Figure 1 and Figure 2. It is shown from these Figures that by Considering mass and damping of foundation, the crest displacement values will be decreased.



(a) considering mass and damping (b) without mass and daming

Figure 1. The time-history crest displacement for Imperial Valley record



(a) considering mass and damping (b) without mass and daming

Figure 2. The time-history crest displacement for Loma Prieta record

This study investigates the effect of mass and geometric damping of foundation on seismic response of dam subjected to near-fault ground motion excitations. Based on the results obtained from this investigation, the following conclusion can be drawn:

1) Considering mass and damping of foundations in analysis leads to decrease nodal displacement time history of the dam.
2) Tensions on the heel of the dam due to foundation flexibility increase less than the tensions on the crest of dam.

REFERENCES

Akkose M and Simsek E (2010) Non-linear seismic response of concrete gravity dams to near-fault ground motions including dam-water-sediment-foundation interaction, *Journal of Applied Mathematical Modelling*, 34:3685-3700

Davoodi M et al (2013) Seismic response of embankment dams under near-fault and far-field ground motion excitation, *Journal of Engineering Geology*, 10:66-67

Jin-Ting Wang et al. (2013) Earthquake damage analysis of arch dams considering dam-water-foundation interaction, *Journal of Soil Dynamics and Earthquake Engineering*, 46:64-74