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Effects of Near Fault and Far Fault Ground Motions on Nonlinear Dynamic Response and Seismic Improvement of Bridges

Mohammad Hajali [a], Abdolrahim Jalali [b*], Ahmad Maleki [c]

[a] *Department of Civil Engineering, Maraghe Branch, Islamic Azad University Maraghe, Iran.*

[b] *Department of Engineering, Tabriz University, Tabriz, Iran.*

[c] *Department of Engineering, Maraghe Islamic Azad University, Maraghe, Iran.*

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Abstract

In this study, the dynamic response of bridges to earthquakes near and far from the fault has been investigated. With respect to available data and showing the effects of key factors and variables, we have examined the bridge's performance. Modeling a two-span concrete bridge in CSI Bridge software and ability of this bridge under strong ground motion to near and far from fault has been investigated. Nonlinear dynamic analysis of time history includes seven records of past earthquakes on models and it was observed that the amount of displacement in the near faults is much greater than the distances far from faults. Bridges designed by seismic separators provide an acceptable response to a far from fault. This means that in bridges using seismic separators, compared to bridges without seismic separators, Acceleration rate on deck, base shearing and the relative displacement of the deck are decrease. This issue is not seen in the response of the bridges to the near faults. By investigating earthquakes near faults, it was observed that near-fault earthquakes exhibit more displacements than faults that are far from faults. These conditions can make seismic separators critical, so to prevent this conditions FDGM should be used to correct the response of these bridges. Based on these results, it can be said that the displacement near faults with forward directivity ground motion is greater than far from faults. So that by reducing the distance from the faults, the maximum value of the shearing and displacement of the deck will be greater.

Keywords: Nonlinear Dynamic Response of Bridge; Seismic Improvement of Bridges; the Near and Far Fault; Forward Directivity Ground Motions.

1. Introduction

Today, destructive effects of earthquakes near fault are well known. In the earthquakes near the fault, the destruction of structures has been well observed. In recent years, the destruction of bridges in near fault has shown that the impact of these earthquakes should be considered in the design of bridges. One of the most important features of this type of earthquake is forward directivity. In the records of acceleration in the near fault, in the records of PGV in near the fault, the meaning of PGV is that created from the PGA [1]. An image of these effects is creating large displacements and is seen in PGD records. The presence of these large values in the parameters of ground motion near the fault is a hallmark of earthquake records, such as the Northridge earthquake, Kobe earthquake, Chichi earthquake in Taiwan, and for near-fault earthquakes, or in other words, earthquakes with a low distance from faults. The purpose of this study is to use the value of recent ground motion data in order to improve the understanding of conventional reinforced concrete and to improve the understanding of the response of the precast concrete bridges to the ground movements. Increasing clarity about FDGM and structural response to this type Land movement leads to direct benefits to near fault, and as a result,

* Corresponding author: jalali@tabrizu.ac.ir

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