Abstract

Abstract :Bridges are one of the most important and costly structures in a country's road network and transportation.Devastation of one or more bridges by earthquake has many negative impacts on the economy of a country and can seriously damage the functioning of its transport network. Most of the bridges in the world are generally designed and built according to the old criteria and regulations,Obviously, these bridges do not meet the seismic requirements of the new regulations. These bridges should be subjected to seismic improvement studies and strengthen with appropriate method if needed. The seismic performance of bridges depends on factors such as geometrical properties, bridge materials as well as earthquake record characteristics. One of the practical methods for the performance of a structure under different levels of seismic hazard is the fragility models, which are presented as fragility curves. Fragility curves are a major component in structural damage analysis studies in earthquakes and establish the relationship between two components of earthquake risk and structural features. Fragility curves are a major component in structural damage analysis studies in earthquakes and establish the relationship between two components of earthquake risk and structural features. The fragility curve expresses the conditional probability of reaching or exceeding a limit state as a function of ground motion parameters and the probabilistic method is also used to consider the different states and uncertainties that affect structures and earthquakes.

Boxed cross-section arch bridges have good mechanism for bearing vertical loads due to stability and proper distribution of gravity loads. The lack of traction at the arch causes it to have larger openings than the slab bridges. LRB seismic isolation systems are used to improve the seismic performance of the bridge. Fragility functions are used as a criterion for deciding on the appropriate parameters of LRB seismic isolators in arc bridges to achieve the best seismic performance at different operational risk levels. This study investigates the seismic behavior of the Nanin Bridge Arc Case in Switzerland, which has a cross-section overpass deck with an elastomeric isolator system with a lead core (LRB) Then, by evaluating the structural response states and the capacity of the members, the predictions are made to determine the impact levels of different earthquake impact bridges. In order to dynamically analyze the bridge time history, a set of more than 100 pairs of real mapping accelerations was performed, which required detailed analysis of the bridge components, which was accomplished by developing three-dimensional models using CSI Bridge and SAP2000 software and the results of the response of the elements were extracted. Examination of the results of the seismic response of this structure as well as the probability functions of the frailty curve in different situations showed that the use of this system resulted in a significant reduction in the amount of earthquake damage at all levels of failure in foundation. With the use of Rubber lead seismic isolator, displacement of the structural base, the likelihood of base failure and base shear has been greatly reduced and due to the use of maximum member capacity and reduced member dimensions as well as asignificant reduction in the amount of financial damage the system has also benefited .

Keywords: Arc Bridges, Seismic Isolator, Box Deck, Seismic Performance, Rubber Lead Isolator

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