Bridges Seismic Isolation Using CNT Reinforced Polymer Bearings

Authors : Mohamed Attia, Vissarion Papadopoulos

Abstract : There is no doubt that there is a continuous deterioration of structures as a result of multiple hazards which can be divided into natural hazards (e.g., earthquakes, floods, winds) and other hazards due to human behavior (e.g., ship collisions, excessive traffic, terrorist attacks). There have been numerous attempts to address the catastrophic consequences of these hazards and traditional solutions through structural design and safety factors within the design codes, but there has not been much research addressing solutions through the use of new materials that have high performance and can be more effective than usual materials such as reinforced concrete and steel. To illustrate the effect of one of the new high-performance materials, carbon nanotube-reinforced polymer (CNT/polymer) bearings with different weight fractions were simulated as structural components of seismic isolation using ABAQUS in the connection between a bridge superstructure and the substructure. The results of the analyzes showed a significant increase in the time period of the bridge and a clear decrease in the bending moment at the base of the bridge piers at each time step of the time-history analysis in the case of using CNT/polymer bearings compared to the case of direct contact between the superstructure of the bridge and the substructure.

Keywords : seismic isolation, bridges damage, earthquake hazard, earthquake resistant structures
Conference Title : ICSSDSA 2022 : International Conference on Structural Seismic Design and Seismic Assessment
Conference Location : Istanbul, Türkiye
Conference Dates : June 27-28, 2022