Continuous Monitoring of Isolated Bridges: Parametric Analysis of the Effects of Damper Characteristics

Chiara Casarotti, Gianmario Benzoni
UCSD Dept. Structural Engineering, La Jolla, CA.

ABSTRACT
The main objective of the project currently in progress is the definition of an effective health monitoring approach for bridges protected with the most common seismic response modification devices. The research aims at advancing existing health monitoring techniques to the level of accuracy needed to detect variations of performance of the isolation devices and, at the level of overall structural response, to define the state of integrity for the bridge. The general research plan involves the study of the ranges of performance variation of the devices due to use and damage, followed by the identification of the elements affected by such variations and the development of experimentally validated models of their performance at pre-damage and post-damage stage. The selection of existing Damage Detection Algorithms and Health Monitoring Techniques and the design of in-field monitoring system for isolated bridges will complete the project.
In this paper the first case study is presented, which consists of the cable-suspension Vincent Thomas Bridge. A preliminary validation of the numerical model of the bridge, aimed at ensuring the reliability of the FE model, has been carried out by comparing the numerical response with recorded signals. As preparatory phase to the application of health monitoring approaches, a study of the sensitivity of the bridge seismic response to the variation of the dissipator characteristics has been completed. The parametric study has been conducted to evaluate the effects of the damper characteristics on the structural performance but also the range of forces and displacements associated with the devices when installed on the real structure.

Keywords: Bridge, Monitoring, Dampers, Vincent Thomas Bridge