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LATERAL SEISMIC FRAGILITY ASSESSMENT OF A CABLE – STAYED BRIDGE USING A POINT ESTIMATE METHOD

David Flores V.

DFloresV@iingen.unam.mx

Instituto de ingeniería UNAM, Coordinación de estructuras y geotecnia
Ciudad de México, México

Roberto Gómez

RGomezM@iingen.unam.mx

Instituto de ingeniería UNAM, Coordinación de estructuras y geotecnia
Ciudad de México, México

Dante Tolentino

dantetl@azc.uam.mx

Departamento de Materiales, Universidad Autónoma Metropolitana-Azcapotzalco
Ciudad de México, México

E. Sánchez Nájera

efra-7@hotmail.com

Sección de estudios de posgrado de investigación, Instituto Politécnico Nacional
Ciudad de México, México

ABSTRACT

Cable-stayed bridges are a constant topic of study, they are pleasing to the eye and have a good seismic performance. Some important cable-stayed bridges in Mexico are ageing and there is a need to review their structural response. As built drawings are necessary to carry out a thoroughly review, however, ageing bridges blue prints are incomplete or lack important information, such is the case of cable pre-stressing forces, concrete mechanical properties and damping ratio. These are common source of uncertainty.

In the analytical fragility assessment of bridges, several uncertainties are inherent in the estimation of seismic damage. Several techniques have been widely used, such as Monte Carlo simulations, simplified fragility estimation, Bayesian methodologies, among others. However, there is not much research about point estimate methodologies that are just as precise as other techniques and demand much lower computation time.

In this regard, in this paper a probabilistic approach for the lateral seismic fragility of cable stayed bridges is presented. Point estimates simulations are used. We study a cable-stayed bridge whose configuration is widely used in Mexico. A numerical model is developed considering the nonlinear response of the components and its uncertainties. A collection of real ground motion records is used as applied load, from which the fragility curves are then obtained by analysing the structure using Non-linear Time History Analysis (NTHA). Then, the fragility curves of piers and pylon are presented.

Keywords: Seismic fragility, cable-stayed, point estimates