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Editorial

During earthquake events, long-span bridges receive different ground motions at different supports. Seismic wave propagation and local site conditions cause spatial variation of ground motion. This may result in pounding or even collapse of adjacent bridge decks owing to the out of phase response. In addition, dynamic Soil-Structure Interaction (SSI) resulting from the interaction of the bridge with the surrounding soil also affects the dynamic bridge response. In most bridges, pile groups are used as foundation system, and designed to support not only vertical loads, but also lateral loads due to earthquake, wind and vehicle impact loads. Therefore, soil-pile interaction is added in dynamic behavior of long-span bridges. Hoseini et al present “A new approach to soil-pile-structure modeling of long-span bridges subjected to spatially varying earthquake ground motion”. The authors simulate ground motion time histories, based on the Northridge earthquake of January 17, 1994. Since the 1960 s, continuity of concrete bridges has been achieved using cast-in-situ concrete slab and diaphragms. The main advantage of continuous precast prestressed-concrete girder bridges is the elimination of deck joints, thus reducing long-term maintenance costs. In “Stress on simply supported bridge girders made continuous by full Post-tensioning under static load”, Taha and Jia present a method to provide continuity by casting a continuity diaphragm over supports and then post-tensioning the top end of the girders. The standard approach for vibration monitoring and system identification of suspension bridges is to install sensors on key components of the bridge (e.g., pylons, deck, and the cables), and analyse the records to identify the modal characteristics (e.g., modal frequencies, damping ratios, and mode shapes) of the vibrations. Calibrated analytical models of the bridge are developed by matching the identified modal properties. Due to their large size, geometric nonlinearities, non-proportional damping, and moving traffic loads, most suspension bridges do not meet the requirements and assumptions of classical modal analysis. Also, since there are an infinite number of modes, it is not possible to identify all of them and to develop a single model that match the recorded data. In “Monitoring and system identification of suspension bridges: An alternative approach”, Şafak presents an alternative approach for monitoring and system identification of suspension bridges. The objective is to identify the physical parameters of the response, such as the axial forces in the main suspension cables, axial forces in the hangers, forces and moments in the pylons, and the flexibility of the bridge deck. A new metro bridge was constructed across the Golden Horn, Istanbul. The bridge consists of 2 approach viaducts, a cable-stayed bridge with a main span of 180 meters and a swing bridge. A metro station is situated in the centre of the main bridge. The deck of the cable-stayed bridge and the swing bridge are designed as steel structures. The bridge is equipped with a structural health monitoring system. In “SHM of Golden Horn Metro Crossing Bridge in Istanbul – Initial assessment, permanent monitoring and data analysis”, Furtner et al describe details of the health monitoring solution. During the past few decades, several studies have addressed non-destructive damage evaluation via changes in the dynamic modal responses of a structure. In “Damage detection of a truss bridge via vibration data”, Al-Qayyim and Çağlayan present a technique, in which the damage detection is based on vibration. The authors propose reducing the structural system to two degrees of freedom system. The technique is applied to the experimental data of a steel truss bridge model structure after inducing the damage by removing an element from the model.

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