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EDITORIAL

The shocking collapse of the I-35W Bridge over the Mississippi River in Minneapolis, Minnesota, USA, on August 1, 2007, served another wakeup call to the bridge engineering community. The collapse took place during rush hour plunging dozens of cars and their occupants into the river. Each bridge failure, since the Tacoma Narrows Bridge disaster in 1940, has prompted radical changes in the standards of design and construction. However, a paradigm shift is necessary in the inspection, monitoring and preventive maintenance practices to restore the public's confidence in the safety of bridges. Issues of bridge safety and reliability are shared by bridge engineers from different countries. This special issue of *Bridge Structures* presents a number of selected papers that were presented at the Fifth New York City Bridge Conference, held on August 17–18, 2009. These papers provide invaluable contributions to the state-of-the-art in bridge engineering.

The issue leads off with off with a paper by Hopwood *et al*. "Addressing SCC-susceptible ASTM A514 steel on the I-275 twin bridges over the Ohio River". Failure analyses of cracked splice plates made from ASTM A514 quenched and tempered steel revealed that the steel was inadequately tempered resulting in excessively hardened, brittle defective steel. Consequently, this steel was also susceptible to stress corrosion cracking/hydrogen stress cracking. The I-275 twin bridges contained large quantities of A514 steel that needed testing to identify any remaining defective steel. A test plan was developed that incorporated hardness testing to discriminate between acceptable and the defective A514 steels. The plan incorporated the use of the ultrasonic contact impedance and impact hardness test methods. Field hardness testing was conducted over a 10-week period beginning in October 2008. During the testing, two additional cracked splice plates were discovered that contained defective A514 steel. The paper presents details of the testing plan to identify defective A514 steel plates on the two bridges.

The structural response of a steel orthotropic bridge deck is characterized by the complex interaction between its components. In the case of ribs passing continuously through cutouts in the floor beam web, the floor beam exhibits a Vierendeel type truss behavior. In "Parametric study of floorbeam cutouts for orthotropic bridge decks to determine shape factors", De Corte presents the results of a parametric study for 10 trapezoidal rib geometries in conjunction with eight types of floorbeam cutouts to determine shape factors. Five rib depths of 200, 250, 300, 350 and 400 mm in conjunction with three angles of inclination 10/3, 20/9 and $\sqrt{3}$ (corresponding to h/h' values of 10/10.44, 10/10.97 and 10/11.55 as defined by AASHTO LFRD Code) are studied. Shape factors were determined as a design aid to engineers. In addition, the results are compared to measured values derived from a full scale orthotropic plated test specimen, especially intended for this purpose.

Cable-supported bridges are notable for their aesthetic appeal and ability to link long spans. Their dynamic and seismic performance presents a significant issue of concern in seismically active zones. In "Dynamic performance evaluation of straight and curved cable-stayed bridges", Bhagwat *et al.* present a study of the free vibration response for cable stayed bridges with spans of 120–240 m. The paper numerically investigates A-shaped and H-shaped pylons, using FEM software ANSYS. Further response of straight bridges under El Centro earthquake loading is presented using dynamic time history analysis and the results are studied for different geometries. The paper demonstrates that effect of induced curvature in the deck introduces coupling of different modes even at their initial phases, whereas the modes are quite distinct in straight bridges. Under El Centro load time history, bending stress and shear stress distributions in the deck are studied for different geometries of straight bridges which gives the typical behavior pattern of load sharing among the components of the cable stayed bridge.

The Pelješac Bridge, a new 2.4-km long bridge, crossing the sea strait between the Croatian Mainland and the Pelješac Peninsula is being constructed to provide a fixed road link between different parts of Croatia. The bridge is located in a highly seismic zone, on extremely poor soil, with a design ground acceleration of 0.41 g. The four-lane road bridge consists of two approach bridges and a main cable stayed bridge with continuous steel trapezoidal box superstructure.

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In "Seismic analysis of Pelješac Bridge", Savor *et al.* present the seismic design based on superposition of Ritz vectors, but with coupled modal equations. Real earthquake accelerograms for earthquakes in the vicinity (Bar, Ulcinj, Ston) and also El Centro earthquake, as well as 72 artificial accelerograms, determined by seismic study for the specific bridge location, were analyzed. The analysis was carried out, taking into account the proposed construction sequence of the bridge.

The Akashi Kaikyo Bridge, in Japan, is the world's longest suspension bridge and was completed in 1998. In the original seismic design, an inland near-field earthquake with large magnitude was not considered for the seismic design force. Although the bridge encountered the Hyogo-ken Nanbu Earthquake in 1995, during its construction, it did not sustain serious damage. Therefore, seismic performance retrofit study against large-scale earthquakes was undertaken. In "Seismic design and seismic performance retrofit study for the Akashi Kaikyo Bridge", Okuda *et al.* study site-specific large-scale earthquakes including inland near-field earthquakes that were defined based on the latest seismological information. The paper concludes that target seismic performance was ensured by taking some minor countermeasures.

The Forth Road Suspension Bridge, in Scotland, features a main span of 1006 m and side spans of some 408 m. Approach viaducts to the north and south bring the total length of the structure to about 2500 m. The bridge was opened to traffic in 1964 and is used by over 24 million vehicles each year. All of the maintenance work on the bridge that requires lane or carriageway closures is carried out overnight or limited weekend carriageway or lane closures to minimize delays to users on this important strategic and commuter route. During the first internal inspection of the main cables carried out in 2004 (40 years after opening), significant corrosion was found leading to the installation of acoustic monitoring, to report wire breaks, and a system of dehumidification on the main cables. In addition, a second internal inspection was carried out in 2008 to try to establish the rate of corrosion found in the cables. In their "Feasibility study into the replacement or augmentation of the main cables of a long-span suspension bridge", Colford and Clark aim to determine if the main cables on Forth Road Bridge could be either replaced or augmented in the event that corrosion continued following the retrofitting of the dehumidification system.

In "Upgrading of ductility and shear capacity of reinforced concrete beams of highway bridge bents", Zatar and Mutsuyoshi examine two different upgrading techniques. Two techniques to upgrade the ductility and the shear capacity of reinforced concrete beams of existing highway bridge bents were examined. An experimental program that consisted of three scaled models was conducted. The specimens were tested using statically reversed cyclic loading. The first specimen was a control specimen. The beams of the other two specimens were upgraded. External steel plates were bonded to the beam in the first upgrading technique and external steel rods were employed in the second upgrading technique. The characteristic behavior of each specimen was experimentally clarified in terms of hysteretic behavior, displacement response ratio, maximum displacement, damage propagation, energy dissipation, equivalent damping factor, and final failure mode. The study concludes that the two upgrading techniques could result in enhancement of the overall behavior of the bridge bents. Upgrading the beams utilizing external steel rods, however, was shown to be more effective in resisting future earthquakes.

Each of these papers adds to the body of knowledge in bridge engineering. The editor expresses a note of gratitude to the authors and reviewers and acknowledges with appreciation their contribution.

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