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EDITORIAL

This issue of *Bridge Structures* leads off with a paper by Sih *et al.* on the 'Effect of crack shape and size on estimating the fracture strength and crack growth fatigue life of bridge cable steel wires'. Following a brief account of the current approach for determining the fracture strength of high strength steel bridge cable wire, the paper presents fatigue crack growth estimates for steel wires in tension and bending. The authors employ a linear elastic fracture mechanics approach based on a recently developed fracture strength model for cracked bridge wire.

A recently constructed four-span composite steel I-girder bridge with skewed supports located in the state of Delaware, USA, is used by Liu and Chajes for a 'Lateral–torsional buckling study of a continuous, skewed, steel bridge during deck placement'. Numerical models of the bridge were developed and buckling analyses were performed. Based on the analyses, it was determined that the originally designed bracing system was not adequate to satisfy the stability requirements during the concrete deck pour. Subsequent studies identified three possible ways to correct the problem without changing the original design, a solution that was ultimately implemented. The first possible solution would be to utilise the beneficial effects of the formation of composite action during the pour sequence. The second possible solution would be to modify the pour sequence to minimise instability effects. The third possible solution would be to adjust the orientation of the deck pour (which originally was specified to be parallel to the skew). The study results show that adjusting the pour sequence and increasing the time between pour intervals to increase the effects of composite action would be potential solutions, while changing the orientation of the deck pour relative to the skew would lead to only slight increases in safety.

The use of punched holes in steel bridge load-carrying members is not allowed unless the holes are sub-punched to a smaller diameter and then reamed to full size. Some bridge owners allowed full size punched holes in cross frames and lateral bracing systems since these members were not designed to carry a calculated load. In their paper, 'The use of punched holes in bridge structures', Frank *et al.* evaluate the impact of punched holes upon the tensile capacity, bearing strength, block shear strength, and fatigue strength of members with punched holes. The paper includes the effect of plate thickness, hole size, punch clearance, and yield strength upon the strength and ductility of the plates. The authors recommend design values that account for the lower strength exhibited by members with punched holes. In addition, due to the lower ductility of members with punched holes, the authors do not recommend their use in main load-carrying members.

Bridge planning and management require precise and continuous information on how the age and condition of various types of bridges evolve. A main objective for a bridge manager is to keep the bridge stock in a good and safe condition. A research question is how many new bridges need to be constructed and old bridges demolished per year to maintain the average age and condition of the bridge stock. In 'Bridge demolition and construction rates: inspection data-based indicators', Mattsson *et al.* propose indicators to give guidance on the replacement ratio from real data. The paper calculates the construction and demolition rates required to maintain the average age for a population of 1800 bridges in a Swedish region. The authors address the annual investment and demolition rates, reasons for bridge demolition, and resulting actual service life. The paper also assesses the costs associated with construction, maintenance and repair and the Swedish Road Administration's (SRA's) condition quantifier, Lack of Capital Value (LCV).

On the same topic of bridge condition assessment and bridge management, various techniques are currently used during the inspection of a bridge to assess the conditions of bridge elements. Data collected through inspection is used to make important decisions regarding needs assessment and budget allocation. However, inspection data is at best subjective and associated with uncertainty. This tends to create problems in the decision-making process. Abu Dabous *et al.* present 'A probabilistic methodology for bridge deck condition assessment' to minimise the effect of

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such problems in the assessment of bridge deck condition. The paper develops a bridge deck condition index based on the remaining value of deteriorated quantities. The proposed methodology uses the fuzzy number concept and the Monte Carlo simulation technique to rate the deck condition taking into account the subjectivity and the uncertainty issues in the inspection process. The methodology benefits from the bridge deck inspection current practice and produces a probabilistic rating that is consistent with the Markovian approach to model deterioration.

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