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Editorial

This issue of *Bridge Structures* leads off with a paper, by Reza Rahai and Shokoohfar on "Shear capacity of continuous pre-stressed concrete bridge girders with different static systems through vertical prestressing". Several models of prestressed concrete beams are selected and analyzed using the finite-element method. The validity of modeling is evaluated based on some test performed on an existing bridge girder in Switzerland. In the second part of the study several beam specimens are built and tested and their load-deformation curve and cracking pattern are studied. Using all numerical and experimental studies, the slope of shear cracks and shear reinforcement ratio are investigated and the effect of horizontal and vertical pre-stressing on the noted parameters is evaluated. Masonry arch bridges represent one of the oldest forms of bridge construction in the world. In "Condition assessment of multi span masonry arch bridges," Karunananda et al. present a reliability-based condition assessment procedure of multi span masonry arch bridges. Considering axle load as assessment criterion, safety margins (limit state functions) are introduced for each arch of the bridge. The introduced safety margins consist of two variables: Provisional axle load (PAL), which is estimated using MEXE methods and actual axle load (AAL), which is estimated using weigh-in-motion measurements of the bridge. Both variables are assumed to follow log-normal distribution. Then, failure probabilities of each arch which were estimated from statistical parameters of variables are combined to get the failure probability of the bridge using reliability bounds. The reliability index of the bridge is estimated from the failure probability. Bridge condition is predicted by comparing the reliability index with its acceptable reliability index. The introduced assessment procedure is illustrated by a four span brick masonry arch bridge in Sri Lanka. Weigh-in-motion plays instrumental role in structural health monitoring and bridge condition assessment. On short and medium span bridges, the largest live load effects are generally caused by heavy trucks. Accurate knowledge of the axle configurations and weights, as well as determination of axle position on the bridge at any point in time are important ingredients for bridge condition assessment. In addition, a history of loading may be required to properly conduct fatigue assessment of key components. For engineers who work on code calibration matters, detailed statistical information of vehicles is necessary for reliability modeling. Finally, identifying overloaded vehicles may be important information in studying cumulative damage. A method for the identification of vehicle axle loads on slab-on-girder bridges is presented by Edalatmanesh and Newhook in "Using search based optimization algorithms in bridge Weigh-in-Motion systems". The method is based on the development of a bridge specific static influence line matrix and the use of an optimization method combined with a pattern search algorithm. A 1/3 scale laboratory model of a six girder bridge was used as part of the case studies which demonstrate the development and implementation of the method. A finite element model of the bridge was developed and calibrated against experimental data. Load testing is gaining popularity among bridge owners to take advantage of the actual load capacity that cannot be estimated using conservative analyses. In "Cost, benefit, and value of bridge load testing", Alampalli and Ettouney provide a generalized model for evaluating the value of load testing using costs and benefits of load tests. Both quantitative and qualitative benefits are included. Also explored are the effects of load tests on the life cycle analysis of bridges and quantification of extended life of bridges due to load testing. In October of 2007 the AASHTO LRFD Bridge Design Specification became the mandatory design specifications for highway structures in the United States. This has introduced a number of changes in the design and analysis procedures that engineers have to follow. In "Comparison of AASHTO LRFD and ASD Specifications for structural design of cantilever abutments and retaining walls," Esposito and Najm evaluate the differences between the ASD standard specifications and the LRFD specification and how they apply to the design of earth retaining structures. Several design examples were carried out to examine the effect of the new design standards on structural proportioning and cost. For cantilever abutments and retaining walls 4.57 meter (15 ft) and taller, the author conclude that a difference between the LRFD specifications and the ASD standard specifications was insignificant. For shorter abutments and retaining walls, the paper concludes that using the LRFD specifications can result in an increase in footing length of about 30% and an increase in cost of approximately 10% of the cost of the retaining structures. While these cost impacts to a structure can be significant in some designs, the AASHTO LRFD specifications provides a safe and reliable method of design which is of paramount importance to engineers and the public. The AASHTO LRFD specifications permit the use of a Canadian based deck design procedure termed "empirical deck design". Such a procedure is developed assuming that the reinforced concrete deck slab actually transmits its loading to support elements through a complex membrane type response termed internal arching. This differs from traditional deck design where the reinforced concrete deck slab transmits loading to support components through flexural action. In "Buffalo Creek Bridge: A case study of empirical versus traditional bridge deck design," Shoukry et al. present a case study of the Buffalo Creek Bridge structure under two conditions, one with an empirical sandwich deck referred to as "old deck design" and the other with traditional deck referred to as "new deck design". The focus of the study is to assess the performance of the empirically designed reinforced concrete bridge decks versus those designed using traditional analytical design methods and to check the adequacy of both design methods by correlating the theoretical results with field observations. For this purpose, two 3-D finite element models of the old deck and new deck designs were developed together with the bridge superstructure. Both models were subjected to real life loading configurations of self weight and temperature variations. A comparison of the stresses induced in both models indicates that the stresses developed in the empirically designed concrete deck (old design) at the levels of the reinforcing mats are similar to those developed in the traditionally designed deck. The connections between the steel main girders and the concrete deck are the main constrains for deck expansion and contraction in the transverse direction, hence high tensile stresses were developed over the girders in the transverse direction. Additionally, the sharp edge of the clip angle protruding into the concrete deck as well as the top of the slope of the stay-in-place forms were identified as stress risers that contribute to the longitudinal cracking problem.

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