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Editorial

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The use of Accelerated Bridge Construction (ABC) in the United States has dramatically expanded over the last decade. ABC methods include bridge construction techniques utilizing innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the on-site construction time when building new bridges or replacing or rehabilitating existing bridges. One of the many methods employed in ABC is the use of Prefabricated Bridge Elements and Systems (PBES). PBES are structural components of a bridge fabricated off-site and shipped to the bridge site to be assembled. Barth et al provide “Experimental assessment of link slabs in continuous span applications of press-brake-formed tub girders”. A full-scale link slab transversely joining two PBFTGs was fatigue loaded simulating a 75-year fatigue life in a rural environment. Strain and deflection data was recorded and compared throughout the fatigue life to determine the link slab’s effectiveness. Seismic retrofit is a cost-effective and sustainable solution for improving bridge structures in seismic zones. Fiber Reinforced Polymer (FRP) is commonly used to replace steel components in retrofit projects due to their light weight, high strength, and high corrosion resistance. In “Evaluation of hybrid NSM-CFRP technical bars and FRP sheets for seismic rehabilitation of a concrete bridge pier”, Shokrzadeh and Nateghi-Alahi provide numerical modeling of the experimentally determined response of a hybrid FRP and concrete bridge pier subjected to quasi-static tests. The authors compare results from FEM with the experimental response in terms of load-displacement curve and failure mode. After validating the model, alternative designs (changing the height of the CFRP slab, changing the height and compaction of the CFRP bar, and concrete encasement with and without CFRP slab) were numerically tested to investigate the effects of each model on the load capacity. Many studies have been conducted regarding impact factor on traditional bridges such as beam bridges and arch bridges. However, there are few studies on the impact factor difference of different members and different positions of the same member. In addition, many tests and numerical simulations have proved that the impact factor of the bridge is greatly affected by the roughness of bridge deck, and the impact factor amplifies significantly with increased roughness of bridge deck. Other studies have discussed the influence of vehicle parameters on impact factor. However, there is no universally accepted conclusion on the relationship between vehicle speed and impact factor of bridge. Li et al provide a “Study of impact factor of arch bridge made with continuous composite concrete filled steel tube beams”. The authors consider the vehicle-bridge coupling vibration effect, the spatial beam element model of the bridge and the half vehicle model with the three-axis. The impact factor of different parts of the main beam and different responses affected by the deck surface roughness, the vehicle speed and the number of vehicles. A binary regression formula of impact factor is obtained by taking the vehicle speed and the roughness of bridge deck as independent variables. Finally, the formula is verified by the measured data of two bridges with similar fundamental frequencies. Precast I-girders have been widely used in the design of bridge due to their advantages in constructing longer spans than reinforced concrete girders and reducing construction cost. Standard AASHTO I-girder sections were developed for this purpose in the 1950’s as six types

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having various depths. These sections have been widely adopted and the precast concrete industry is able to supply them in many areas. The design of prestressed concrete members involves balancing the effects of loads and prestressing to eliminate or minimize tension in concrete member. Prestressed concrete beams are designed by AASHTO LRFD for flexure using stress limits at the service limit, which results in the number of strands to be calculated for this limit states then checked at ultimate for flexure and shear using factored loads at the strength limit state. Therefore, the estimation of optimum number of prestressing strands to eliminate or minimize tensile stress in concrete represents a focal effort during the design of these type of girders. In "Design optimization of PCI girders: a parametric study", Jahjouh and Erhan investigate the effect of superstructure configuration on the optimum design of slab on Precast I (PCI) girder bridges. For this purpose, more than 20,000 bridge cases of varying superstructure configurations are considered to investigate the effects of various superstructure parameters such as girder spacing, span length, slab thickness and girder types on the optimum design of slab on PCI girder bridges. PCI girders are designed conforming to the AASHTO LRFD for flexure using stress limits at the service limit state, then checked at ultimate for flexure and shear using factored loads at the strength limit state. The authors employ a modified harmony search optimization algorithm to obtain optimum bridge design parameters using standard AASHTO PCI girders according to the AASHTO LRFD requirements.

Khaled M. Mahmoud, PhD, PE
Editor-in-Chief
BTC
New York, New York, USA