

Editorial

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Accidental damage to prestressed concrete bridge girders may occur due to impact by over-height vehicles on the bottom of the girder, or the top flange of the girder may be damaged during deck removal and replacement operations. Since stress checks at service loads are an important component of design for prestressed concrete beams, serviceability-based stress checks should be considered when assessing the structural condition of damaged girders. In “Stress change calculations in accidentally damaged prestressed bridge girders”, Tabatabai and Nabizadeh present step-by-step theoretical calculations to develop equations for estimating service load stress changes due to physical damage (partial loss of concrete section and strands) based on a differential approach. The effects of lack of symmetry in the damaged cross section is considered in the calculations. The authors develop a spreadsheet-based program to calculate complex section property values for the damaged sections. The accuracy of the developed equations was verified using a finite element model of a prestressed beam under undamaged and damaged conditions. Several studies on the live load distribution factor (LLDF) for moment and shear in Northeast extreme tee (NEXT) precast prestressed concrete beam bridges have been reported, which indicate that using the AASHTO LRFD LLDF for moment in NEXT F beam bridges could provide a sufficient safety margin. However, a 20% increase in the LRFD LLDF for shear was recommended for the safety of shear design. In “Shear design of precast prestressed concrete NEXT beam bridges: A critical assessment”, Huang investigates the required transverse shear reinforcements in NEXT F beam bridges by using a factor of 1.2 for the LRFD LLDF for shear. The author considers various parameters, including

concrete strength, beam section, bridge section, and span length. Results from this study showed that providing the minimum transverse shear reinforcement could offer a sufficient safety margin for the shear design of NEXT F beam bridges, even with an increase of 20% on the LRFD LLDF for shear. The use of integral abutments in bridges goes back many years to the late 1930's in the United States. Over the years, integral bridges became more popular as more and more states built those bridges and more engineers became familiar with their design and construction. These bridges are being built in Europe since the 1980's. An integral abutment bridge act as a frame structure with a continuity connection between the superstructure and the substructure. The substructure is typically an integral cap supported on single row of piles that provides flexibility to accommodate thermal loads and displacements. The main advantage of integral abutment bridges is that they are built without expansion joints which eliminates maintenance costs and reduces construction costs. Because of the interaction between the soil and the integral abutment under the applied loads and the cyclic nature of thermal loads, the analysis and design of integral abutment bridges can be, in some cases, challenging especially when the designs falls outside the geometrical limits set by existing standards. With a focus on field performance data reported in the literature and interpretation of this data, Kustau et al present “An overview of integral abutments: current practices, field monitoring and deck replacement measures.” The paper highlights the needs for more test data during construction and for long term performance under cyclic thermal movements. The authors investigate deck replacement requirements in integral abutments using analytical models

and provide recommendations for deck replacement preparations. Structural Health Monitoring (SHM) systems, in combination with controlled load tests, can provide valuable data for calibrating high fidelity bridge models, which can then be used for evaluating the long-term performance of the bridge, improved load ratings, and permit vehicle evaluation. To capture the influence of concrete variability in the deck and girders, Natalicchio et al present “Model calibration of a long-span concrete cable-stayed bridge based on structural health monitoring data: influence

of concrete variability”. The authors examine the effect of various modeling and calibration assumptions.

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