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Editorial

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This year, *Bridge Structures* enters its 20th year of publication. Spanning two decades, *Bridge Structures* has been a host to a myriad of innovations and breakthroughs in bridge engineering. *Bridge Structures* has published research that has changed how we look at bridge modeling, strength of materials or paved the way for advancement in construction techniques, and we have shined a spotlight on matters affecting transportation around the world, with a focus on public safety.

To celebrate this milestone, *Bridge Structures* will feature in 2025 several articles by noted bridge engineering professionals. The QR code below connects to a timeline, tracing *Bridge Structures*' path from its very first issue to its 20th year, with the opportunity to read some of the important papers published by *Bridge Structures* over the last 20 years.

Post-tensioned concrete bridges with grouted tendons are a common solution for large-span bridges. The primary advantage of using post-tensioned concrete is to minimize deflection and cracking of the concrete structure in comparison to a reinforced concrete cross-section. A compression force due to prestressing allows for a higher alteration of stress due to external loads before cracking of concrete. The tendon geometry also provides load balancing to compensate the deflection due to external loads. Prestressing tendons are made of high strength steel, which is vulnerable to stress-corrosion cracking and hydrogen embrittlement [1]. Since the 1960 s and 1970 s, the high strength prestressing steel used on post-tensioned concrete bridges has been known to be susceptible to stress-corrosion cracking. This can result in brittle rupture of the prestressing steel. In their paper, Asp and Laaksonen apply reliability analysis to evaluate "Redundancy and reliability levels of post-tensioned and grouted concrete cross-section in case of tendon failure". The authors report that analysis for assessing the safety of post-tensioned concrete cross-sections with tendon cross-section loss, it was found that the design of the structure is more influenced by the serviceability limit state (SLS) than the ultimate limit state (ULS). Proper strength testing in-situ is important for the quality of in-situ concrete, not only relying on the potential lab strength, revealing effects of in-situ of changed mixes, transportation, pumping, casting, consolidation, and curing. Among the test systems for evaluating in-situ strength is pullout testing with LOK-TEST/CAPO TEST [2]. With the LOK-TEST system testing of the pre-installed inserts takes 4–5 minutes each, easily and with only one small suitcase brought along. The CAPO-TEST, originally designed to supplement the LOK-TEST, takes 15–20 minutes for each test to be performed anywhere on a structure without pre-installed inserts. No large holes are left in the structure from coring and thinner elements may be tested without weakening them structurally. In "LOK-TEST and CAPO-TEST pullout for in-situ concrete strength, Petersen presents the application of the concept on several case studies in Europe and Canada. Web shear buckling of bridge steel plate girders limits their load-carrying capacity in bending. Several analytical models have been suggested in the literature to estimate the shear capacity of plate girders. In "Comparison of analytical models for shear strength of steel plate girders", Rafi and Bhutto present a critical evaluation of several analytical models using the data of experimentally tested plate girders available in the literature. The authors conclude that these analytical models make a conservative estimation of critical buckling strength for plate girders with larger slenderness and/or aspect ratios. Although the predicted ultimate shear strength varied across the different analytical models, the authors conclude that there is no particular trend that the aspect and/or slenderness ratios influenced the shear strength. A parametrically conducted analysis indicated that the threshold slenderness ratio (to cause buckling in the web panel) decreases with increasing yield strength and aspect ratio. The paper proposes simplified shear buckling guidelines for the preliminary sizing of steel plate girders, with the aim of satisfying design requirements for both flexure and shear. The failure of concrete connections is a significant vulnerability of reinforced concrete frames. Over the past decades, reinforced concrete and steel jacketing have been used to strengthen the joint area in reinforced concrete structures. However, the implementation of these methods is a difficult and costly. The application of Fiber Reinforced Polymer (FRP) materials in strengthening concrete structures has been rising due to their several advantages, including lightweight, high tensile strength, ease of installation, and corrosion resistance [3]. There are several methods for strengthening reinforced concrete joints. Due to the unique properties of FRP, the use of FRP laminates is one of the most used techniques. The high cost of preparing concrete surfaces and attaching FRP laminates is a restricting factor for its application in reinforced concrete joint retrofit. Therefore, determining proper configurations that reduce the needed FRP material, as well as the surface preparation required for attaching FRP is an important factor in decreasing the strengthening cost. The proper arrangements of FRP strips can improve their performance in the rehabilitation and retrofit of reinforced concrete joints. To determine the proper configuration of FRP strips, Shokrzadeh et al use finite element modeling for "Evaluation of various FRP strengthening configurations for RC beam-column joints". The authors report on results of the study, with details of different behavioral and performance indices such as shear strength, ductility ratio, connection secant stiffness, and plastic strain.

References

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