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Live Load Distribution on Concrete Bridges: Design, Evaluation, Construction, Innovation

Editors:
Nur Yazdani and Benjamin Z. Dymond

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American Concrete Institute
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Live Load Distribution on Concrete Bridges: Design, Evaluation, Construction, Innovation

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Live Load Distribution on Concrete Bridges: Design, Evaluation, Construction, Innovation

In recent years, both researchers and practicing engineers worldwide have been investigating the effect of live load distribution on concrete bridges during design, evaluation, and construction. Papers discussing live load distribution issues and innovation for concrete bridge decks and/or supporting girders were considered for inclusion in this Special Publication. Papers in the following areas of interest were sought: AASHTO methodology, other available codes/specification provisions, simplification of the AASHTO methodology, traffic non-parallel to girders, construction stage issues, partial composit deck-girder systems, long-span girders, slab-span structures, and bridges with missing as-built plans.

To exchange international experiences among a global group of researchers, ACI Committees 343 and 342 organized two sessions entitled “Live Load Distribution on Concrete Bridges: Design, Evaluation, Construction and Innovation” at the Fall 2021 ACI Virtual Convention. This Special Publication contains the technical papers from experts who presented their work at these sessions. The first session was focused on girder bridges and the second session was focused on non-girder bridges. The technical papers in this Special Publication are organized in the order in which they were presented at the ACI Convention.

Overall, in this Special Publication, authors from different backgrounds and geographical locations share their experiences and perspectives on how live load distribution affects concrete bridges during design, evaluation, and construction. Contributions were made from different regions of the world, and the technical papers were authored by experts at universities, government agencies, and private companies.

The co-editors, Dr. Nur Yazdani and Dr. Benjamin Dymond, are grateful for the contributions from the Special Publication authors and sincerely value the time and effort of the authors in preparing the papers in this volume. Furthermore, the Special Publication would not have been possible without the effort expended by the experts who peer reviewed the papers in this volume.

Nur Yazdani and Ben Dymond
Co-Editors

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Live Load Distribution in a Slab-on-Girder Bridge Subjected to Corrosion and Differential Settlement

Jun Wang and Yail J. Kim

Synopsis: This paper presents the structural performance of bridge decks reinforced with steel and glass fiber-reinforced polymer (GFRP) bars subjected to corrosion and differential settlement. The superstructure system of the bridge comprises a deck slab and prestressed concrete girders, which is modeled using a finite element program. In compliance with the American Association of State Highway Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications (BDS), live loads are applied and the implications of various load combinations are examined. Emphasis is placed on determining stress distributions and corresponding live load distribution factors when subjected to the external distress. The calculated load distribution factors are compared against those obtained from AASHTO LRFD BDS. The stress levels and load distributions in the steel- and GFRP-reinforced concrete decks are found to be similar.

Keywords: corrosion; fiber reinforced polymer (FRP); live load distribution factor; settlement