

Zeitschrift: IABSE congress report = Rapport du congrès AIPC = IVBH
Kongressbericht

Band: 12 (1984)

Artikel: Distribution of wheel loads on highway bridges

Autor: Sanders, Wallace W.

DOI: <https://doi.org/10.5169/seals-12236>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 22.02.2026

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>



Distribution of Wheel Loads on Highway Bridges

Wallace W. SANDERS, Jr.

Prof. Dr.

Iowa State University

Ames, IA, USA

The current criteria for the distribution of wheel loads in the U.S. bridge specifications have been undergoing change and expansion for over 50 years. The changes have primarily been introduced as modifications for a specific bridge type or condition with variations in the factors considered. As a result, the approach to the criteria has varied and resulted in inconsistencies in the codes. There now is a need for a complete review of load distribution in bridges recognizing a consistent approach to all bridge types and the availability of high speed computation.

There are a number of methods of analysis that can be used to develop load distribution behavior. These methods include: orthotropic plate, finite element or strip, grillage analogy, folded plate, influence surfaces. Using the selected methods, the effects of aspect ratio, bridge stiffness parameter, edge effects, load position, skew, continuity and diaphragms need to be evaluated for the broad types of bridges.

This study is needed and should result in a consistent criteria format based on similar parameters. It should consider all factors which affect behavior. The option should be available and encouraged to use one of the theories for complex structures, while providing a simple format for simple bridges.

DISTRIBUTION OF WHEEL LOADS ON HIGHWAY BRIDGES

Abstract

The current criteria for the distribution of wheel loads in the U.S. bridge specifications have been undergoing change and expansion for over 50 years. The changes have been primarily introduced as modifications for a specific bridge type or condition with variations in the factors considered. As a result, the approach to the criteria has varied and resulted in inconsistencies in the codes. There now is a need for a complete review of load distribution in bridges recognizing a consistent approach to all bridge types and the availability of high speed computation.

Design Criteria

STANDARD SPECIFICATIONS
for
HIGHWAY BRIDGES



The American Association of State Highway
and Transportation Officials

SECTION 1 - DESIGN
1983 DRAFT COPY



Percentage of Live Loads:

One or two lanes	100%
Three lanes	90%
Four lanes or more	75%

Traffic Lanes:
12 ft. wide lanes (with 10 ft. wide trucks), spaced across the entire bridge roadway width. Lanes shall be placed in numbers and position to maximize effect.

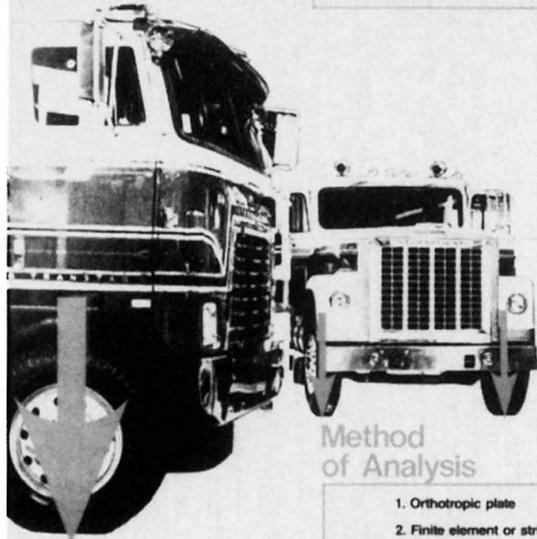
Interior Beams: Wheel Load Fraction (typical)

Kind of Floor	Bridge Designed for One Traffic Lane	Bridge Designed for Two or More Traffic Lanes
Timber: S' Glued Laminated Panels on Glued Lam. Stringers	0.60	0.50
Concrete: Steel I-beam Stringers or P.C. Girders	0.70	0.55
Concrete Box Girders	0.80	0.70

Exterior Beams:
a. Simple beam reaction, or
b. Load fraction = $S/8L$ - 25%
(L = 4 steel stringers; S = 6 - 14)

Special Spread Box Girders: Interior Load Fraction $\frac{2N_c}{N_c + N_s}$

Composite Box Girders: Load Fraction = 0.1 - 1.7R - 0.85 $\frac{N_s}{N_c}$



Method of Analysis

1. Orthotropic plate
2. Finite element or strip
3. Grillage analogy
4. Folded plate
5. Influence surfaces

Factors Affecting Design

1. Aspect ratio
2. Bridge stiffness parameter
3. Edge effects
4. Load position
5. Skew
6. Continuity
7. Diaphragms (type, location)

Specification Problems

1. Criteria format not consistent
2. Basis for criteria varies
3. Critical factors not considered
4. New bridge types require special studies
5. Loading conditions changed
6. Inconsistent safety factors
7. No criteria for rating

Current Design Practice

1. Timber deck timber stringers
2. Concrete deck steel I-beams
3. Concrete deck P.C. girders
4. Steel grid decks any stringer
5. Concrete deck concrete T-beams
6. Segmental box girders
7. Concrete deck spread box beams

Future Criteria

1. Load distribution criteria centralized
2. Simple criteria for "simple" bridges; Complex theories for "complex" bridges encouraged
3. Adaptable to all types of bridges
4. Separate design and rating criteria
5. Complete criteria for moment and shear