# **Bridge Design Calculations**

#### 1. Dead Load Calculation

Concrete Deck:

The concrete deck is assumed to be 0.6m thick, and the density of concrete is 2.4 tons/m<sup>3</sup>. We calculate the weight of the deck:

- Volume of concrete deck:
- $V_{\text{concrete}} = 60 \text{ m} \times 18 \text{ m} \times 0.6 \text{ m} = 648 \text{ m}^3$
- Weight of concrete deck:

 $W_{concrete} = 648 \text{ m}^3 \times 2.4 \text{ tons/m}^3 = 1,555.2 \text{ tons}$ 

Thus, the total dead load due to the concrete deck is 1,555.2 tons.

Steel Girders:

For multi-girder construction, assume that the steel girder weight per 30m span is around 100 tons.

For 60 meters, with girders spaced at 3m intervals, the number of girders is:

- Number of girders = 60 / 3 = 20 girders
- Total weight of steel girders = 20 × 100 tons = 2,000 tons

Thus, the total dead load from the steel girders is 2,000 tons.

# 2. Live Load Calculation (AASHTO LRFD or Eurocode)

The HL-93 live load is used in AASHTO design, where the combination of truck loads and lane loads is considered:

- Lane load: 640 pounds per linear foot (equivalent to 2.84 kN/m per lane).
- Width of bridge = 18m; assuming 2 lanes:

Live load per lane = 2.84 kN/m × 18 m × 2 = 102.24 kN

Additionally, an impact factor (usually 1.25) is applied for dynamic loading:

Live load with impact =  $102.24 \text{ kN} \times 1.25 = 127.8 \text{ kN}$ 

Thus, the live load is 127.8 kN per lane.

#### 3. Shear Force Calculation at Support

The shear force at the support for a simply supported beam under a uniform load is given by:

# **Bridge Design Calculations**

**David Young Hill** 

# **Bridge Design Calculations:**

LRFD Bridge Design Tim Huff, 2022-02-23 This book examines and explains material from the 9th edition of the AASHTO LRFD Bridge Design Specifications including deck and parapet design load calculations limit states and load combinations concrete and steel I girder design bearing design and more With increased focus on earthquake resiliency two separate chapters one on conventional seismic design and the other on seismic isolation applied to bridges will fully address this vital topic The primary focus is on steel and concrete I girder bridges with regard to both superstructure and substructure design Features Includes several worked examples for a project bridge as well as actual bridges designed by the author Examines seismic design concepts and design details for bridges Presents the latest material based on the 9th edition of the LRFD Bridge Design Specifications Covers fatigue strength service and extreme event limit states Includes numerous solved problems and exercises at the end of each chapter to illustrate the concepts presented LRFD Bridge Design Fundamentals and Applications will serve as a useful text for graduate and upper level undergraduate civil engineering students as well as practicing structural engineers **Bridge Calculation and Design** David Young Hill,1962 **Innovative Bridge Design** Handbook Alessio Pipinato, 2021-09-08 Innovative Bridge Design Handbook Construction Rehabilitation and Maintenance Second Edition brings together the essentials of bridge engineering across design assessment research and construction Written by an international group of experts each chapter is divided into two parts the first covers design issues while the second presents current research into the innovative design approaches used across the world This new edition includes new topics such as foot bridges new materials in bridge engineering and soil foundation structure interaction All chapters have been updated to include the latest concepts in design construction and maintenance to reduce project cost increase structural safety and maximize durability Code and standard references have been updated Completely revised and updated with the latest in bridge engineering and design Provides detailed design procedures for specific bridges with solved examples Presents structural analysis including numerical methods FEM dynamics risk and reliability and innovative structural typologies Current and Future Trends in Bridge Design, Construction and Maintenance Parag C. Das, Dan M. Frangopol, Andrzej S. Nowak, Institution of Civil Engineers (Great Britain), 1999 The major expansion of transport networks in the twentieth century has been accompanied by extensive bridge construction At the end of the century the field of bridge engineering continues to grow and develop Recent years have seen the construction of revolutionary new bridges advances in materials and construction techniques and the development of international codes and standards aimed at producing more durable and reliable structures Application of LRFD Bridge Design Specifications to High-strength Structural Concrete Neil Middleton Hawkins, Daniel Alexander Kuchma, National Cooperative Highway Research Program, 2007 At head of title National Cooperative Highway Research Program The Design of Highway Bridges and the Calculation of Stresses in Bridges Trusses Milo Smith Ketchum, 1908 AASHTO LRFD Bridge Design Guide Specifications

for GFRP-reinforced Concrete Bridge Decks and Traffic Railings ,2009 Glass fiber reinforced polymer GFRP materials have emerged as an alternative material for producing reinforcing bars for concrete structures GFRP reinforcing bars offer advantages over steel reinforcement due to their noncorrosive nature and nonconductive behavior Due to other differences in the physical and mechanical behavior of GFRP materials as opposed to steel unique guidance on the engineering and construction of concrete bridge decks reinforced with GFRP bars is needed These guide specifications offer a description of the unique material properties of GFRP composite materials as well as provisions for the design and construction of concrete bridge decks and railings reinforced with GFRP reinforcing bars

Bridge Engineering Handbook Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts 14 countries and 89 chapters are represented in the second edition of the Bridge Engineering Handbook This extensive collection highlights bridge engineering specimens from around the world contains detailed information on bridge engineering and thoroughly explains the concepts and practical applications surrounding the

**Full-depth Precast Concrete Bridge Deck Panel Systems** Sameh S. Badie, Maher K. Tadros, National Cooperative Highway Research Program, 2008 AASHTO Load and Resistance Factor Design Movable Highway Bridge Design Specifications American Association of State Highway and Transportation Officials. Subcommittee on Bridges and Structures, 2007

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