

# Bridge Design Calculations

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## 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:

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

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 =  $20 \times 100 \text{ tons} = 2,000 \text{ tons}$

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:

$$\text{Live load per lane} = 2.84 \text{ kN/m} \times 18 \text{ m} \times 2 = 102.24 \text{ kN}$$

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

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

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

**Wai-Fah Chen, Lian Duan**



## **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

**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

**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

Full-depth Precast Concrete Bridge Deck Panel Systems Sameh S. Badie, Maher K. Tadros, National Cooperative Highway Research Program, 2008

**Finite Element Design of Concrete Structures** Guenter Axel Rombach, 2004 In Finite Element Design of Concrete Structures practical problems and their solutions the author addresses this blind belief in computer results by offering a useful critique that important details are overlooked due to the flood of information from the output of computer calculations Indeed errors in the numerical model may lead in extreme cases to structural failures as the collapse of the so called Sleipner platform has demonstrated

*Bridge Design, Assessment and Monitoring* Airong Chen, Dan M. Frangopol, Xin Ruan, 2018-12-07 Bridges play important role in modern infrastructural system This book provides an up to date overview of the field of bridge engineering as well as the recent significant contributions to the process of making rational decisions in bridge design assessment and monitoring and resources optimization deployment for the purpose of enhancing the welfare of society Tang specifies the purposes and requirements of the conceptual bridge design considering bridge types basic elements structural systems and load conditions Cremona and Poulin propose an assessment procedure for existing bridges Kallias et al develop a framework for the performance assessment of metallic bridges under atmospheric exposure by integrating coating deterioration and corrosion modelling Soriano et al employ a simplified approach to estimate the maximum traffic load effect on a highway bridge and compare the results with other approaches based on on site weigh in motion data Akiyama et al propose a method for reliability based durability design and service life assessment of reinforced concrete deck slab of jetty structures Chen et al propose a meso scale model to simulate the uniform and pitting corrosion of rebar in concrete and to obtain the crack patterns of the concrete with different rebar arrangements Ruan et al present a traffic load model for long span multi pylon cable stayed bridges Khuc and Catbas implement a non target vision based method for the measurement of both static and dynamic displacements time histories Finally Cruz presents the career of the outstanding bridge engineer Edgar Cardoso in the fields of bridge design and experimental analysis The book serves as a valuable reference to all concerned with bridge structure and infrastructure systems including students researchers engineers consultants and contractors from all areas sections of bridge engineering The chapters originally published as a special issue in Structure and Infrastructure Engineering

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web may 12 2022 if there is no voltage at pin socket 85 there is an open in the wire between pin socket 85 and pn 19 of pcm connector c3 see diagram if there is no voltage at pin socket 86 there is an open in the wire between fuse 11 in the jb and pin socket 86

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web dec 4 2018 it looks like the fuel pump has a red and black wire and the fuel gauge has a green and black wire however the plug has 2 black wires a red wire and an orange wire my question is two fold

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web sep 20 2010 it s the fuel pump module connector fuel pump module 4 way pin 1 circuit a141 18dg wt fuel pump relay output pin 2 circuit k226 20db lg fuel level sensor signal pin 3 circuit k4 20bk lb sensor ground pin 4 circuit z1 18bk ground where 18 20 gauge dg dark green wt white

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web apr 27 2014 fuel pump wiring diagram 1993 1995 4 0l jeep grand cherokee applies to this fuel pump relay circuit wiring diagram applies to the following vehicles 1993 1994 1995 4 0l jeep grand cherokee the fuel pump relay gets power from fuse 6 15 amp of the power distribution center pdc

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web mar 10 2020 the 12v wire for the fuel pump is the dark green coming into the connector and the orange as in the pic

out of the connector and to the pump found another issue while under that needs a quick fix fuel return line has a bit of wetness near the filter how much pressure on that line