

Bridges & Structures

LRFD Steel Girder SuperStructure Design Example Pier Design Example Design Step 8

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Design Step 8.1 - Obtain Design Criteria

This pier design example is based on *AASHTO LRFD Bridge Design Specifications* (through 2002 interims). The design methods presented throughout the example are meant to be the most widely used in general bridge engineering practice.

The first design step is to identify the appropriate design criteria. This includes, but is not limited to, defining material properties, identifying relevant superstructure information, determining the required pier height, and determining the bottom of footing elevation.

Refer to Design Step 1 for introductory information about this design example. Additional information is presented about the design assumptions, methodology, and criteria for the entire bridge, including the pier.

The following units are defined for use in this design example:

$$K = 1000lb \quad Kcf = \frac{K}{ft^3} \quad ksi = \frac{K}{in^2} \quad ksf = \frac{K}{ft^2} \quad klf = \frac{K}{ft}$$

Material Properties:

Concrete density:	$W_c = 0.150kcf$	S Table 3.5.1-1
Concrete 28-day compressive strength:	$f'_c = 4.0ksi$	S5.4.2.1 C Table 5.4.2.1-1
Reinforcement strength:	$f_y = 60.0ksi$	S5.4.3

Concrete 28-day compressive strength - For all components of this pier design example, 4.0 ksi is used for the 28-day compressive strength. However, per the Specifications, 2.4 ksi could be used for the

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Tim Huff



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LRFD Design Example for Steel Girder Superstructure Bridge with Commentary Raymond A. Hartle, Kenneth E. Wilson, William A. Amrhein, Scott D. Zang, Justin W. Bouscher, Laura E. Volle, United States. Federal Highway Administration, 2003

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The Structural Engineer's Professional Training Manual Dave Adams, 2007-10-24 The Business and Problem Solving Skills Needed for Success in Your Engineering Career The Structural Engineer's Professional Training Manual offers a solid foundation in the real world business and problem solving skills needed in the engineering workplace Filled with illustrations and practical punch list summaries this career building guide provides an introduction to the practice and business of structural and civil engineering including lots of detailed advice on developing competence and communicating ideas Comprehensive and easy to understand The Structural Engineer's Professional Training Manual features Recommendations for successfully training engineers who are new to the field Methods for bringing together ideas from a variety of sources to find workable solutions to difficult problems Information on the real world behaviors of building materials Guidance on licensing liability regulations and employment Techniques for responsibly estimating design time and cost Tips on communicating design ideas effectively Strategies for working successfully as part of a team Inside This Skills Building Engineering Resource The Dynamics of Training The World of Professional Engineering The Business of Structural Engineering Building Projects Bridge Projects Building Your Own Competence Communicating Your Designs Engineering Mechanics Soil Mechanics Understanding the Behavior of Concrete Understanding the Behavior of Masonry Construction Understanding the Behavior of Structural Steel Understanding the Behavior of Wood Framing

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methods for steel beams columns tension components roof systems and connections Design examples throughout the book clearly demonstrate how to apply complex code provisions in the field You will get clear explanations of AISC 360 16 the AASHTO Standard Specification for Structural Steel Bridges the AISI Cold Formed Steel Standards ASCE 7 16 and the 2018 IBC Structural Steel Designer s Handbook Sixth Edition covers Properties of structural steels Effects of steelmaking and fabrication Fabrication and erection Connections Building codes loads and fire protection Criteria for building design Design of building members Floor and roof systems Lateral force design Cold formed steel design Highway bridge design criteria Beam girder and truss bridges Arch and cable suspended bridges *Progress Report* National Cooperative Highway Research Program,2002 **Proceedings** ,2002 Transportation Research Record ,2000 **Bridge and Highway Structure Rehabilitation and Repair** Mohiuddin A. Khan,2010-02-08 State of the Art Bridge and Highway Rehabilitation and Repair Methods This authoritative volume offers up to date guidance on the latest design techniques repair methods specialized software materials and advanced maintenance procedures for bridges and highway structures Focusing on both traditional and nontraditional design issues Bridge and Highway Structure Rehabilitation and Repair clarifies the most recent AASHTO bridge design codes and discusses new analytical and design methodologies such as the application of load and resistance factor design LRFD A wealth of concise explanations solved examples and in depth case studies are included in this comprehensive resource COVERAGE INCLUDES Diagnostic design and selective reconstruction Bridge failure studies and safety engineering Analytical approach to fracture and failure Load and resistance factor rating LRFR and redesign Application of LRFD and LRFR methods Inspection and structural health monitoring Bridge widening and replacement strategies Conventional repair methods Advanced repair methods Concrete repair methods Extreme events of flood scour and countermeasures design Guidelines for seismic design and retrofit methods 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 *Design & Construction of Segmental Concrete Bridges* ,1994 **Highway Structures Design**

Handbook, 1992 Bridge Engineering, Third Edition Jim Zhao, Demetrios Tonnias, 2012-03-05 The state of the art in highway bridge engineering Fully updated with the latest codes and standards including load and resistance factor design LRFD Bridge Engineering Third Edition covers highway bridge planning design construction maintenance and rehabilitation This thoroughly revised reference contains cutting edge analytical design and construction practices the most current information on new materials and methods and proven cost effective maintenance and repair techniques Real world case studies and hundreds of helpful photos and illustrations are also included in this practical resource BRIDGE ENGINEERING THIRD EDITION FEATURES COMPLETE COVERAGE OF Highway bridge structures Project inception Project funding Design standards Bridge inspection and site survey Physical testing As built plans and other record data Superstructure types Deck types Wearing surface types Deck joint types Design loads Design methods Internal forces Load distribution Concrete deck slabs Composite steel members Plate girder design Continuous beams Protecting steel superstructures Load rating Prestressed concrete Substructure design Abutments Piers Bearings Managing the design process Contract documents Bridge management systems Bridge Engineering: Design, Rehabilitation, and Maintenance of Modern Highway Bridges, Fourth Edition Jim J. Zhao, Demetrios E. Tonnias, 2017-04-28 Bridge engineering essentials fully updated to reflect the latest standards and regulations This thoroughly revised resource combines the latest LRFD bridge engineering standards with cutting edge maintenance and rehabilitation techniques enabling you to successfully address today s challenging infrastructure projects The book features cutting edge analysis design and construction practices along with proven cost effective maintenance and repair methods Bridge Engineering Design Rehabilitation and Maintenance of Modern Highway Bridges Fourth Edition examines the entire lifecycle of a bridge from inception design and construction to long term maintenance and management Two brand new chapters cover foundations and superstructure rehabilitation Real world case studies and hundreds of helpful photos and illustrations are also included Fully aligns with the 7th Edition of AASHTO s LRFD Bridge Design Specifications All examples and equations are presented in both S I and U S units Written by a pair of experienced civil engineers

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