

## Aashto Guide Specifications For Lrfd Seismic Bridge Design

**This edition is based on the work of NCHRP project 20-7, task 262 and updates the 2nd (1999) edition -- P. ix.**

**TRB's National Cooperative Highway Research Program (NCHRP) Synthesis 532: Seismic Design of Non-Conventional Bridges documents seismic design approaches and criteria used for "non-conventional" bridges, such as long-span cable-supported bridges, bridges with truss tower substructures, and arch bridges. Design of conventional bridges for seismic demands in the United States is based on one of two American Association of State Highway Transportation Officials (AASHTO) documents; the AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications (AASHTO BDS) (1) or the AASHTO Guide Specifications for LRF Seismic Bridge Design (Guide Spec) (2). The stated scope of these documents for seismic design is limited to conventional bridges. Non-conventional bridges outside the scope of these two AASHTO documents, such as cable-supported bridges and long-span arch bridges, are typically high value investments designed with special project criteria. There is no current AASHTO standard seismic design criteria document specific to these non-conventional bridges. Seismic design criteria for these non-conventional bridges are typically part of a broader project-specific criteria document that addresses the special character of the bridge type.**

**AASHTO Guide Specifications for LRF Seismic Bridge DesignAASHTO**

**LRFD Guide Specifications for the Design of Pedestrian Bridges**

**Bridge Engineering Handbook, Second Edition**

**Theory, Design, and Construction to AASHTO LRFD Specifications**

**Reference Manual**

**Design of Highway Bridges**

Covers seismic design for typical bridge types and applies to non-critical and non-essential bridges. Approved as an alternate to the seismic provisions in the AASHTO LRFD Bridge Design Specifications. Differs from the current procedures in the LRFD Specifications in the use of displacement-based design procedures, instead of the traditional force-based R-Factor method. Includes detailed guidance and commentary on earthquake-resisting elements and systems, global design strategies, demand modeling, capacity calculation, and liquefaction effects. Capacity design procedures underpin the Guide Specifications' methodology; includes prescriptive detailing for plastic hinging regions and design requirements for capacity protection of those elements that should not experience damage.

Design of Highway Bridges provides a complete introduction to this important area of engineering, with comprehensive coverage of the theory, specifications, and procedures for the design of short- and medium-span bridges. Beginning with an overview of bridge engineering history, the book examines key bridge types, selection principles, and aesthetic considerations. Design issues are then discussed in detail, from limit states and loads to resistance factors and substructure design.

These guide specifications are an introductory supplement to the AASHTO LRFD Bridge Design Specifications that addresses the design of bridges subjected to light rail transit (LRT) loadings, or both LRT and conventional highway traffic loadings. This document is largely dedicated to LRT load cases and load effects, and analysis of bridges subjected to LRT loadings.

AASHTO LRFD Bridge Design and Guide Specifications: Recent, Ongoing, and Future Refinements

Guide Specifications for Highway Construction [Electronic Resource]

AASHTO LRFD Bridge Design Specifications, Customary U.S. Units: Section 7-Index

AASHTO Guide Specifications for LRF Seismic Bridge Design

Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges, 2nd Edition, with 2010 Interim Revisions

Developed to comply with the fifth edition of the AASHTO LRFD Bridge Design Specifications [2010]—Simplified LRFD Bridge Design is "How To" use the Specifications book. Most engineering books utilize traditional deductive practices, beginning with in-depth theories and progressing to the application of theories. The inductive method in the book uses alternative approaches, literally teaching backwards. The book introduces topics by presenting specific design examples. Theories can be understood by students because they appear in the text only after specific design examples are presented, establishing the need to know theories. The emphasis of the book is on step-by-step design procedures of highway bridges by the LRFD method, and "How to Use" the AASHTO Specifications to

solve design problems. Some of the design examples and practice problems covered include: Load combinations and load factors Strength limit states for superstructure design Design Live Load HL-93 Unfactored and Factored Design Loads Fatigue Limit State and Fatigue Life; Service Limit State Number of design lanes Multiple presence factor of live load Dynamic load allowance Distribution of Live Loads per Lane Wind Loads Earthquake Loads Plastic moment capacity of composite steel-concrete beam LRF Load Rating Simplified LRFD Bridge Design is a study guide for engineers preparing for the PE examination as well as a classroom text for civil engineering students and a reference for practicing engineers. Eight design examples and three practice problems describe and introduce the use of articles, tables, and figures from the AASHTO LRFD Bridge Design Specifications. Whenever articles, tables, and figures in examples appear throughout the text, AASHTO LRFD specification numbers are also cited, so that users can cross-reference the material.

These guide specifications establish minimum requirements for wind loads on bridges during construction before a deck is placed. All other aspects of the design shall be performed in accordance to the AASHTO LRFD Bridge Design Specifications or as specified by the bridge owner, as appropriate. The wind loads determined using these specifications are to be used for checking bridge girders, temporary and permanent bracing, and the permanent substructure during the erection of the girders and up to the time of placement of the deck.

TRB's National Cooperative Highway Research Program (NCHRP) Report 655: Recommended Guide Specification for the Design of Externally Bonded FRP Systems for Repair and Strengthening of Concrete Bridge Elements examines a recommended guide specification for the design of externally bonded Fiber-Reinforced Polymer (FRP) systems for the repair and strengthening of concrete bridge elements. The report addresses the design requirements for members subjected to different loading conditions including flexure, shear and torsion, and combined axial force and flexure. The recommended guide specification is supplemented by design examples to illustrate its use for different FRP strengthening applications.

LRFD Bridge Design Specifications

Construction Handbook for Bridge Temporary Works

AASHTO LRFD Bridge Design Guide Specifications for GFRP-reinforced Concrete Bridge Decks and Traffic Railings

Seismic Design of Non-conventional Bridges

AASHTO LRFD Bridge Design Specifications: Section 6-Index

**Many state DOTs and the Federal Highway Administration are actively promoting accelerated bridge construction (ABC) to reduce traffic impacts, onsite construction time, environmental impacts, and life cycle costs; and to improve work zone safety, site constructability, material quality, and product durability, while replacing the nation's transportation infrastructure. With ABC, prefabricated elements reduce or eliminate the onsite construction time that is needed to build a similar structural component using conventional construction methods. These guide specifications compile the growing body of recommended design and construction specifications for prefabricated bridge elements and systems for ABC with a focus on constructability and durability. -- AASHTO website**

**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.**

**Up-to-date coverage of bridge design and analysis—revised to reflect the fifth edition of the AASHTO LRFD Specifications Design of Highway Bridges, Third Edition offers detailed coverage of engineering basics for the design of short- and medium-span bridges. Revised to conform with the latest fifth edition of the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, it is an excellent engineering resource for both professionals and students. This updated edition has been reorganized throughout, spreading the material into twenty shorter, more focused chapters that make information even easier to find and navigate. It also features: Expanded coverage of computer modeling, calibration of servicelimit states, rigid method system analysis, and concrete shear information on key bridge types, selection principles, and aesthetic issues Dozens of worked problems that allow techniques to be appliedto real-world problems and design specifications A new color insert of bridge photographs, including examples of historical and aesthetic significance New coverage of the "green" aspects of recycled steel Selected references for further study From gaining a quick familiarity with the AASHTO LRFD Specifications to seeking broader guidance on highway bridgedesign—Design of Highway Bridges is the one-stop, ready reference that puts information at your fingertips, while also serving as an excellent study guide and reference for the U.S. Professional Engineering Examination.**

**Performance-Based Seismic Bridge Design**

**Standard Specifications for Highway Bridges**

**LRFD Seismic Analysis and Design of Bridges**

**Simplified LRFD Bridge Design**

Covers seismic design for typical bridge types and applies to non-critical and non-essential bridges. Approved as an alternate to the seismic provisions in the AASHTO LRFD Bridge Design Specifications. Differs from the current procedures in the LRFD Specifications in the use of displacement-based design procedures, instead of the traditional force-based "R-Factor" method. Includes detailed guidance and commentary on earthquake-resisting elements and systems, global design strategies, demand modeling, capacity calculation, and liquefaction effects. Capacity design procedures underpin the Guide Specifications' methodology; includes prescriptive detailing for plastic hinging regions and design requirements for capacity protection of those elements that should not experience damage.

"The NCHRP Report 776 provides proposed revisions to Section 1.3—Design Philosophy of the AASHTO LRFD Bridge Design Specifications with detailed examples of the application of the proposed revisions. The proposed revisions include system factors that can be used during the design and safety assessment of bridges subjected to distributed lateral load being evaluated using the displacement-based approach specified in the AASHTO Guide Specifications for LRF Seismic Bridge Design or the traditional force-based approach. Also, the report presents system factors calibrated for application with bridge systems subjected to vertical vehicular loads. The material in this report will be of immediate interest to highway design engineers."--Project information.

These Guide Specifications address major changes in the way seismic hazard is now defined in the United States, as well as changes in the state of the art of seismic isolation design for highway bridges. It also reflects changes in the definition of the seismic hazard as now defined in the AASHTO LRFD Bridge Design Specifications and the Guide Specifications for LRF Seismic Bridge Design, industry trends in the design and construction of isolators, and provisions in the design specifications that impact the design and testing of isolation bearings. This new edition has been revised and greatly expanded with the addition of Appendix B, which contains 14 design examples: two benchmark bridges and six design variations of each one.

Roadside Design Guide

AASHTO LRFD Bridge Design Specifications, Customary U.S. Units

Based on AASHTO LRFD, Bridge Design Specifications

Final Report

Guide Specifications for Bridges Vulnerable to Coastal Storms

This work offers guidance on bridge design for extreme events induced by human beings. This document provides the designer with information on the response of concrete bridge columns subjected to blast loads as well as blast-resistant design and detailing guidelines and analytical models of blast load distribution.

The content of this guideline should be considered in situations where resisting blast loads is deemed warranted by the owner or designer.

This manual is intended to provide a technical resource for bridge engineers responsible for seismic analysis and design. It serves as a reference manual for use with the 5-day National Highway Institute (NHI) 130093 course "LRFD Seismic Analysis and Design of Bridges", and the 3-day 130093A course "Displacement-Based LRFD Seismic Analysis and Design of Bridges". The manual covers fundamental topics such as engineering seismology; seismic and geotechnical hazards; structural dynamics (Single-Degree-of-Freedom (SDOF) and Multiple-Degree-of-Freedom (MDOF)); and methods for modeling and analyzing bridges subject to earthquake ground motions. It also presents the principles of capacity design: applications of capacity design to piers, foundations, superstructures and connections; and discusses the requirements and recommendations of the seismic provision in each of the AASHTO LRFD Bridge Design Specifications and AASHTO Guide Specifications for LRF Seismic Bridge Design, and their common features. Lastly, the manual addresses seismic isolation design in accordance with AASHTO Guide Specifications for Seismic Isolation Design, and retrofitting strategies in accordance with the 2006 Federal Highway Administration (FHWA) Seismic Retrofitting Manual for Highway Structures.

"TRB's National Cooperative Highway Research Program (NCHRP) Synthesis 440, Performance-Based Seismic Bridge Design (PBSD) summarizes the current state of knowledge and practice for PBSD. PBSD is the process that links decision making for facility design with seismic input, facility response, and potential facility damage. The goal of PBSD is to provide decision makers and stakeholders with data that will enable them to allocate resources for construction based on levels of desired seismic performance"--Publisher's description.

AASHTO LRFD Bridge Design Guide Specifications for GFRP-reinforced Concrete

Seismic Design Considerations

Recommended Guide Specification for the Design of Externally Bonded FRP Systems for Repair and Strengthening of Concrete Bridge Elements

Cost-effective Practices for Off-system and Local Interest Bridges

Guide Specifications for Bridges Carrying Light Rail Transit Loads

**AASHTO has issued interim revisions to AASHTO Guide Specifications for LRF Seismic Bridge Design, Second Edition (2011). This packet contains the revised pages. They are not designed to replace the corresponding pages in the book but rather to be kept with the book for quick reference.**

**"This report presents the analytical study of the shear capacity of reinforced concrete columns using both the AASHTO LRFD bridge design specifications and the AASHTO guide specifications for the LRF seismic bridge design. The study investigates various levels of axial load, transverse reinforcement and longitudinal reinforcement to determine who the two specifications compare. The AASHTO guide specifications for the LRF seismic bridge design permits the designer to use the AASHTO LRFD bridge design specifications or equations within the AASHTO guide specifications for the LRF seismic bridge design with predetermined values. [...] A parametrical study was extended to conventional full-scale columns, using both the AASHTO LRFD bridge design specifications and the AASHTO guide specifications for the LRF seismic bridge design to predict shear strength in order to analyze the direct effects of the parameters on the shear strength predictions."--Abstract**

**Segmental concrete bridges have become one of the main options for major transportation projects world-wide. They offer expedited construction with minimal traffic disruption, lower life cycle costs, appealing aesthetics and adaptability to a curved roadway alignment. The literature is focused on construction, so this fills the need for a design-oriented book for less experienced bridge engineers and for senior university students. It presents comprehensive theory, design and key construction methods, with a simple design example based on the AASHTO LRFD Design Specifications for each of the main bridge types. It outlines design techniques and relationships between analytical methods, specifications, theory, design, construction and practice. It combines mathematics and engineering mechanics with the authors' design and teaching experience.**

**Correlation of Shear Design Between AASHTO LRFD Bridge Design Specifications and AASHTO Guide Specifications for the LRF Seismic Bridge Design**

**Bridge System Safety and Redundancy**

**2012 Interim Revisions**

**An LRFD Approach**

**LRFD Guide Specifications for Accelerated Bridge Construction**

"These guide specifications provide guidance for developing transportation contract specifications and are the national standard for best practices in highway and road construction. This consensus-based guide is used by states and local agencies as a standard requirement for roadway construction contracts and is a basis for those in developing their own construction specifications. This edition focuses on electronic submittals, updated environmental requirements, and revised materials specifications. The guide is designed for use with the AASHTO LRFD Bridge Construction Specifications, 4th Edition, and the AASHTO Partnering Handbook, 2nd Edition.. " -- publisher description.

AASHTO has issued proposed interim revisions to the AASHTO Guide Specifications for LRF Seismic Bridge Design (2009). This packet contains the revised pages. They are not designed to replace the corresponding pages in the book but rather to be kept with the book for fast reference.

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 subject. Published in five books: Fundamentals, Superstructure Design, Substructure Design, Seismic Design, and Construction and Maintenance, this new edition provides numerous worked-out examples that give readers step-by-step design procedures, includes contributions by leading experts from around the world in their respective areas of bridge engineering, contains 26 completely new chapters, and updates most other chapters. It offers design concepts, specifications, and practice, as well as the various types of bridges. The text includes over 2,500 tables, charts, illustrations, and photos. The book covers new, innovative and traditional methods and practices; explores rehabilitation, retrofit, and maintenance; and examines seismic design and building materials. The fourth book, Seismic Design contains 18 chapters, and covers seismic bridge analysis and design. What's New in the Second Edition: Includes seven new chapters: Seismic Random Response Analysis, Displacement-Based Seismic Design of Bridges, Seismic Design of Thin-Walled Steel and CFT Piers, Seismic Design of Cable-Supported Bridges, and three chapters covering Seismic Design Practice in California, China, and Italy Combines Seismic Retrofit Practice and Seismic Retrofit Technology into one chapter called Seismic Retrofit Technology Rewrites Earthquake Damage to Bridges and Seismic Design of Concrete Bridges chapters Rewrites Seismic Design Philosophies and Performance-Based Design Criteria chapter and retitles it as Seismic Bridge Design Specifications for the United States Revamps Seismic Isolation and Supplemental Energy Dissipation chapter and retitles it as Seismic Isolation Design for Bridges This text is an ideal reference for practicing bridge engineers and consultants (design, construction, maintenance), and can also be used as a

reference for students in bridge engineering courses.

Guide Specifications for Wind Loads on Bridges During Construction, 1st Edition

Improved Design Specifications for Horizontally Curved Steel Girder Highway Bridges

Guide Specifications for Seismic Isolation Design

Concrete Segmental Bridges

The Manual for Bridge Evaluation

"Highways Subcommittee on Bridges and Structures"--P. iv.

Seismic Design

AASHTO Guide Specifications for LRF Seismic Bridge Design (2nd Edition) with 2012, 2014 and 2015 Interim Revisions