Aashto Guide Specifications For Lrfd Seismic Bridge Design

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Contribution of Steel Casing to Single Shaft Foundation Structural Resistance - Michel Bruneau 2018

AASHTO Guide Specifications for LRFD Seismic Bridge Design - 2010
AASHTO has issued proposed interim revisions to the AASHTO Guide Specifications for

LFRD 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.

Correlation of Shear Design Between AASHTO LRFD Bridge Design Specifications and AASHTO Guide Specifications for the LRFD Seismic Bridge Design - David H. Sanders 2017

"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 LRFD 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 LRFD seismic bridge design permits the designer to use the AASHTO LRFD bridge design specifications or equations within the AASHTO guide specifications for the LRFD 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 LRFD seismic bridge design to predict shear strength in order to analyze the direct effects of the parameters on the shear strength predictions."--Abstract

Bridge Engineering Handbook, Five Volume Set - Wai-Fah Chen

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 provides detailed information on bridge engineering, and thoroughly explains the concepts and practical applications surrounding the subject, and also highlights bridges from around the world.Published
Proposed AASHTO Guidelines for Performance-based Seismic Bridge Design - Thomas P. Murphy (Engineer) 2020
Performance-based seismic design (PBSD) for infrastructure in the United States is a developing field, with new research, design, and repair technologies; definitions; and methodologies being advanced every year. The TRB National Cooperative Highway Research Program's NCHRP Research Report 949: Proposed AASHTO Guidelines for Performance-Based Seismic Bridge Design presents a methodology to analyze and determine the seismic capacity requirements of bridge elements expressed in terms of service and damage levels of bridges under a seismic hazard. The methodology is presented as proposed AASHTO guidelines for performance-based seismic bridge design with ground motion maps and detailed design examples illustrating the application of the proposed guidelines and maps. Supplemental materials to the report include an Appendix A - SDOF Column Investigation Sample Calculations and Results and Appendix B - Hazard Comparison.
Seismic Evaluation of Bridge Columns with

Energy Dissipating Mechanisms: Research overview - Mehdi Saiidi 2017
TRB's National Cooperative Highway Research Program (NCHRP) Research Report 864: Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms, Volume 1: Research Overview and Volume 2: Guidelines describes the evaluation of new materials and techniques for design and construction of novel bridge columns meant to improve seismic performance. These techniques include shape memory alloy (SMA), engineered cementitious composite (ECC), fiber-reinforced polymer (FRP), and rocking mechanisms. The guidelines contained in Volume 2 explore a quantitative evaluation method to rate novel columns as well as design and construction methods for SMA-reinforced ECC columns, SMA-reinforced FRP-confined concrete/columns, and FRP-confined hybrid rocking columns. The project explores the behavior of the selected columns and develops proposed design guidelines according to the AASHTO LRFD Bridge Design Specifications and the AASHTO Guide Specifications for LRFD Seismic Bridge Design. Appendices A-I are available online.
AASHTO LRFD Bridge Design Specifications, Customary U.S. Units - 2012

Bridge System Safety and Redundancy - Michel Ghosn 2014
"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 approached specified in the AASHTO Guide Specifications for LRFD 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.

Seismic Design Aids for Nonlinear Pushover Analysis of Reinforced Concrete and Steel Bridges - Jeffrey Ger 2016-04-19

Nonlinear static monotonic (pushover) analysis has become a common practice in performance-based bridge seismic design. The popularity of pushover analysis is due to its ability to identify the failure modes and the design limit states of bridge piers and to provide the progressive collapse sequence of damaged bridges when subjected to major earthquakes. Seismic Design Aids for Nonlinear Pushover Analysis of Reinforced Concrete and Steel Bridges fills the need for a complete reference on pushover analysis for practicing engineers. This technical reference covers the pushover analysis of reinforced concrete and steel bridges with confined and unconfined concrete column members of either

circular or rectangular cross sections as well as steel members of standard shapes. It provides step-by-step procedures for pushover analysis with various nonlinear member stiffness formulations, including: Finite segment–finite string (FSFS) Finite segment–moment curvature (FSMC) Axial load–moment interaction (PM) Constant moment ratio (CMR) Plastic hinge length (PHL) Ranging from the simplest to the most sophisticated, the methods are suitable for engineers with varying levels of experience in nonlinear structural analysis. The authors also provide a downloadable computer program, INSTRUCT (INelastic STRUCTural Analysis of Reinforced-Concrete and Steel Structures), that allows readers to perform their own pushover analyses. Numerous real-world examples demonstrate the accuracy of analytical prediction by comparing numerical results with full- or large-scale test results. A useful reference for researchers and engineers working in structural engineering, this book also offers an organized collection of nonlinear pushover analysis applications for students.

AASHTO Guide Specifications for LRFD Seismic Bridge Design - 2009

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.

Performance-based Seismic Bridge Design - M. Lee Marsh 2013

"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.

Seismic Design Considerations - Anil Kumar Agrawal 2012

LRFD Seismic Analysis and Design of Bridges - M. Lee Marsh 2014

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 LRFD 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.

AASHTO LRFD Bridge Design Specifications, Customary U.S. Units: Section 7-Index - 2012

Development of a Precast Bent Cap System for Seismic Regions - José Ignacio Restrepo 2011

The report explores the development and validation of precast concrete bent cap systems for use

throughout the nation's seismic regions. The report also includes a series of recommended updates to the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Guide Specification for LRFD Seismic Bridge Design, and AASHTO LRFD Bridge Construction Specifications that will provide safe and reliable seismic resistance in a cost-effective, durable, and constructible manner. A number of deliverables are provided as attachments to NCHRP Report 681, including design flow charts, design examples, example connection details, specimen drawings, specimen test reports, and an implementation plan from the research agency's final report. These attachments are only available online at http://www.trb.org/Publications/Blurbs/Development_of_a_Precast_Bent_Cap_System_for_Seism_164866.aspx.TRB's National Cooperative Highway Research Program (NCHRP) Report 681: Development of a Precast Bent Cap System for Seismic Regions explores the development and validation of precast concrete bent cap systems for use throughout the nation's seismic regions. The report also includes a series of recommended updates to the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Guide Specification for LRFD Seismic Bridge Design, and AASHTO LRFD Bridge Construction Specifications that will

provide safe and reliable seismic resistance in a cost-effective, durable, and constructible manner. A number of deliverables are provided as attachments to NCHRP Report 681, including design flow charts, design examples, example connection details, specimen drawings, specimen test reports, and an implementation plan from the research agency's final report. These attachments, which are only available online.

Postearthquake Reconnaissance Report on Transportation Infrastructure Impact of the February 27, 2010 Offshore Maule Earthquake in Chile - 2011

Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms: Guidelines - Mehdi Saiidi 2017

TRB's National Cooperative Highway Research Program (NCHRP) Research Report 864: Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms, Volume 1: Research Overview and Volume 2: Guidelines describes the evaluation of new materials and techniques for design and construction of novel bridge columns meant to improve seismic performance. These techniques include shape memory alloy (SMA), engineered cementitious composite (ECC), fiber-reinforced polymer (FRP), and rocking mechanisms. The guidelines contained in Volume 2 explore a quantitative evaluation method to rate novel columns as well as design and construction methods for SMA-reinforced ECC columns, SMA-reinforced FRP-confined

concrete/columns, and FRP-confined hybrid rocking columns. The project explores the behavior of the selected columns and develops proposed design guidelines according to the AASHTO LRFD Bridge Design Specifications and the AASHTO Guide Specifications for LRFD Seismic Bridge Design. Appendices A-I are available online.

AASHTO Guide Specifications for LRFD Seismic Bridge Design - 2012

AASHTO has issued interim revisions to AASHTO Guide Specifications for LRFD 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.

Bridge Engineering Handbook, Second Edition - Wai-Fah Chen 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 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.

A Pre-tensioned, Rocking Bridge System for Accelerated Construction and Enhanced Seismic Performance - Travis E. Thonstad 2016

A new bridge bent system has been developed to reduce on-site construction time, minimize residual displacements even after a large earthquake, and reduce seismic damage in comparison with conventional cast-in-place construction. Precast connections used in the system have been tested successfully under quasi-static conditions and found to perform exceptionally well, re-centering with essentially no concrete damage or residual drift after being loaded cyclically to drift ratios of up to 10%. The seismic performance of the new system was evaluated with shaking table tests of a quarter-scale, two-span bridge. The maximum displacements of the bents were similar to those expected for a conventional bridge through the Design Level event (PGA=0.75g). Damage to the column concrete was negligible; the columns would not need any repair after being subjected to the Design Level motion. Residual drift ratios never exceeded 0.2% up to the 221% Design Level motion (PGA = 1.66g). The only structural damage to the bridge was the eventual fracture of the column's longitudinal reinforcement and bulging of the column's confining tubes placed at the ends of the

columns, both of which occurred at drift ratios of approximately 6%. Results from the subassembly and shaking table tests were used to develop a design methodology for the new system that aligns with the displacement-based procedure outlined in the AASHTO Guide Specifications for LRFD Seismic Bridge Design (2015). The modifications to this procedure necessary to align with the objectives of the new system are straightforward and could be implemented within current design practice. A modeling strategy for the pre-tensioned bent system is also proposed and specific aspects of this approach are validated against the subassembly and shaking table test results.

Bridge Engineering Handbook - Wai-Fah Chen 2019-09-11

First Published in 1999: The Bridge Engineering Handbook is a unique, comprehensive, and state-of-the-art reference work and resource book covering the major areas of bridge engineering with the theme "bridge to the 21st century."

Comparison and Evaluation of Displacement-based Methods and Modeling Assumptions for Design of Ordinary Bridges in High Seismic Regions Using Various Computer Software - Ali Hajihashemi 2013

The main objective of this research is to evaluate the effectiveness of three different displacement-based methods for seismic design of ordinary standard bridges. Two bridges previously designed by the Tennessee Department of Transportation (TDOT)

engineers following the American Association of State Highway and Transportation Officials (AASHTO) Guide Specifications for LRFD Seismic Bridge Design are selected and investigated in this study. Two different support conditions are considered, one employing seat-type abutments with rigid bent foundations; and the second employing stub wall abutment with flexible bent foundations (Nonlinear Spring Support Configuration). In addition to the AASHTO Specifications, the analysis methods include the capacity-demand-diagram method, as an inelastic demand Capacity Demand Method (CSM), and Federal Emergency Management Agency (FEMA) 440 Procedure C as an equivalent linearization CSM. Pushover analysis methods are used to construct the capacity diagram of the system. Furthermore, the usability of the three most widely used software programs (SAP2000, ADINA, and OpenSees) for performing the displacement-based seismic analysis is studied.This research will provide TDOT engineers with the necessary information on which procedure is the best approach to use for design of highway bridges. Also, it provides information on how well previously designed bridges response when analyzed with the new displacement-based procedures. And finally, it will provide the TDOT engineers with information on capabilities and limitations of various software packages.

Proposed AASHTO Seismic Specifications for ABC

Column Connections - 2020
Accelerated bridge construction (ABC) utilizes rigorous planning, new technologies, and improved methods to expedite construction. Prefabricated columns and their connections to adjoining bridge members (cap beams, footings, pile caps, and pile shafts) are the most critical components of ABC in moderate- and high-seismic regions. The TRB National Cooperative Highway Research Program's NCHRP Research Report 935: Proposed AASHTO Seismic Specifications for ABC Column Connections develops AASHTO specifications for three types of precast column connections to facilitate ABC implementation in moderate- and high-seismic regions.

Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms - Mehdi Saiidi 2017
TRB's National Cooperative Highway Research Program (NCHRP) Research Report 864: Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms, Volume 1: Research Overview and Volume 2: Guidelines describes the evaluation of new materials and techniques for design and construction of novel bridge columns meant to improve seismic performance. These techniques include shape memory alloy (SMA), engineered cementitious composite (ECC), fiber-reinforced polymer (FRP), and rocking mechanisms. The guidelines contained in Volume 2 explore a quantitative evaluation method to rate novel columns as well as design and construction

methods for SMA-reinforced ECC columns, SMA-reinforced FRP-confined concrete/columns, and FRP-confined hybrid rocking columns. The project explores the behavior of the selected columns and develops proposed design guidelines according to the AASHTO LRFD Bridge Design Specifications and the AASHTO Guide Specifications for LRFD Seismic Bridge Design. Appendices A-I are available online.

AASHTO Guide Specifications for LRFD Seismic Bridge Design - 2011

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.

Analysis and Design of Bridges - C. Yilmaz 2012-12-06

The Proceedings of the NATO Advanced Study Institute on Analysis

and Design of Bridges held at ~e§me, lzmir, Turkey from 28 June 1982 to 9 July 1982 are contained in the present volume. The Advanced Study Institute was attended by 37 lecturers and participants from 10 different countries. The Organizing Committee consisted of Professors P. Gtilkan, A. C. Scordelis, S. T. Wasti and 9. Yl. lmaz. The guidelines set by NATO for the Advanced Study Institute require it to serve not only as an efficient forum for the dissemination of available advanced knowledge to a selected group of qualified people but also as a platform for the exploration of future research possibilities in the scientific or engineering areas concerned. The main topics covered by the present Advanced Study Institute were the mathematical modelling of bridges for better analysis and the scientific assessment of bridge behaviour for the introduction of improved design procedures. It has been our observation that as a result of the range and depth of the lectures presented and the many informal discussions that took place, ideas became fissile, the stimulus never flagged and many gaps in the engineering knowledge of the participants were "bridged". Here we particularly wish to mention that valuable informal presenta tions of research work were made during the course of the Institute by Drs. Friedrich, Karaesmen, Lamas and Parker.

Seismic Design of Non-conventional Bridges - David Goodyear 2019

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 LRFD 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.

LRFD Guide Specifications for the Design of Pedestrian Bridges - American Association of State Highway and Transportation Officials 2009

Simplified LRFD Bridge Design - Jai B. Kim

2013-04-08
Developed to comply with the fifth edition of the AASHTO LFRD 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 Un-factored 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 LRFR 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 LFRD 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.

AASHTO Guide Specifications for LRFD Seismic Bridge Design - 2011

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.

AASHTO Guide Specifications for LRFD Seismic Bridge Design (2nd Edition) with 2012, 2014 and 2015 Interim Revisions - American Association of State Highway and Transportation Officials 2011

Bridge Engineering Handbook, Second Edition - Wai-Fah Chen 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 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.

AASHTO LRFD Bridge Design Specifications: Section 6-Index - 2010

Preliminary Seismic Analysis and Design of Reinforced Concrete Bridge Columns for Curved Bridge Experiments - Nathan W. Harrison 2011

As part of a Federal Highway Administration (FHWA) sponsored research project to study highway system resilience, a 40 percent scale curved steel plate girder bridge is to be constructed and subjected to earthquake simulation at the Large Scale Structures Laboratory on the University of Nevada, Reno (UNR) campus. The 145 foot long bridge model is to have three-spans, supported on two single-column bents with hammer-head pier caps, and have a subtended angle of 104°. The purpose of the shake table testing is to study the seismic system behavior of the bridge as well as additional

bridge components including; conventional columns, isolation, ductile-cross frames, abutment behavior, and the seismic behavior of bridges including the effects of live load. Ultimately design recommendations will be developed from this research. The research presented in this document is the results of preliminary analysis and design of conventional reinforced concrete bridge columns and substructure elements as part of the larger project to examine global seismic behavior of the scaled bridge model. In order to prepare for seismic testing of the scaled bridge model, extensive pre-experimental numerical analysis was performed. Finite element models were developed using SAP2000 and non-linear time-history analysis was performed to investigate the seismic response of the bridge model. Analytical bridge models were analyzed using both 16-inch and 20-inch column diameters and various abutment support conditions. The models were subjected to two levels of horizontal bidirectional earthquake excitation representing a design level earthquake and a large amplitude earthquake intended to cause column failure. Using the results from the analysis, preliminary construction plans were prepared for one set of columns and the adjacent substructure components using the provisions from the AASHTO Guide Specifications for LRFD Seismic Bridge Design. In addition to the investigation into column performance, a parametric study was performed to determine axial response of the

bearings at both the abutments and piers when subjected to seismic loading. The numerical analysis showed that system effects due to superstructure-substructure interaction can cause column flexural response that is typically not observed with stand-alone column tests. The effects of bridge horizontal curvature was shown to have a significant impact on the axial performance of the bearings in which the response was not uniform for all bearing at one support location. As a component of the analysis and design, two strut-and-tie models were developed to provide adequate joint detailing in order to ensure capacity protection of the column-to-bentcap connection under multiple cycles of seismic loading.

Seismic Response of Columns in Horizontally Curved Bridges - Michael John Levi 2011

As part of a FHWA sponsored research project to study highway system resilience, a two-fifths scale curved steel plate girder bridge was constructed and subjected to earthquake simulation at the Large Scale Structures Laboratory at the University of Nevada, Reno (UNR). The objective of this simulation was to study the seismic system behavior of the bridge as well as additional components including reinforced concrete columns, effects of live load, isolation systems, ductile-cross frames, and abutment behavior. Ultimately design recommendations will be developed from this research. The research that is presented in this document is the

results of the design, analysis, and experimental results of the conventional bridge columns and substructure elements as part of the research being conducted at UNR. The design of the substructure elements was completed according to the requirements of the AASHTO Guide Specifications for LRFD Seismic Bridge Design. In addition, the column design was based on the typical column sizes used by the local departments of transportation. The Sylmar recording of the 1994 Northridge, California earthquake was used as the input ground motion in the system. Analytical modeling using SAP2000 was performed on the scaled bridge model to estimate the seismic response of the bridge using non-linear time-history analysis. Numerical analysis was used to check the system at the design level earthquake and at a large amplitude motion intended to cause column failure. In addition, the analytical models were subjected to the testing protocol, ten ground motions with increasing amplitudes, to determine the effect of the loading protocol on the system. The response of the columns during experimental testing met all performance requirements at the design level and maximum considered earthquakes. The effects of shear keys in the system were shown to have an impact on the torsional loads in the system. At the end of the last test, longitudinal reinforcement started buckling in the columns, however; columns had not reached the maximum lateral capacity.

Testing was stopped at this point due to shake table limitations.

Design of Highway Bridges - Richard M. Barker 2013-02-04

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 service limit 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 applied to 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 bridge design

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.

Emulative Precast Bent Cap Connections for Seismic Regions - Andrew G. Wilson 2010

A Critical Review of Column Confinement Reinforcement Used in Current Seismic Bridge Design Practice - Aaron Shelman 2014

Guide Specifications for Seismic Isolation Design - 2010

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

Seismic Design and Retrofit of Bridges - M. J. N. Priestley 1996-04-12

Because of their structural simplicity, bridges tend to beparticularly vulnerable to damage and even collapse when subjectedto earthquakes or other forms of seismic activity. Recentearthquakes, such as the ones in Kobe, Japan, and Oakland,California, have led to a heightened awareness of seismic risk andhave revolutionized bridge design and retrofit philosophies. In Seismic Design and Retrofit of Bridges, three of the world's topauthorities on the subject have collaborated to produce the mostexhaustive reference on seismic bridge design currently available.Following a detailed examination of the seismic effects of actualearthquakes on local area bridges, the authors demonstrate designstrategies that

will make these and similar structures optimallyresistant to the damaging effects of future seismicdisturbances. Relying heavily on worldwide research associated with recentquakes, Seismic Design and Retrofit of Bridges begins with anin-depth treatment of seismic design philosophy as it applies tobridges. The authors then describe the various geotechnicalconsideratio ns specific to bridge design, such as soil-structureinteraction and traveling wave effects. Subsequent chapters coverconceptual and actual design of various bridge superstructures, andmodeling and analysis of these structures. As the basis for their design strategies, the authors' focus is onthe widely accepted capacity design approach, in which particularlyvulnerable locations of potentially inelastic flexural deformationare identified and strengthened to accommodate a greater degree ofstress. The text illustrates how accurate application of thecapacity design philosophy to the design of new bridges results instructures that can be expected to survive most earthquakes withonly minor, repairable damage. Because the majority of today's bridges were built before thecapacity design approach was understood, the authors also devoteseveral chapters to the seismic assessment of existing bridges,with the aim of designing and implementing retrofit measures toprotect them against the damaging effects of future earthquakes.These

retrofitting techniques, though not considered appropriate inthe design of new bridges, are given considerable emphasis, sincethey currently offer the best solution for the preservation ofthese vital and often historically valued thoroughfares. Practical and applications-oriented, Seismic Design and Retrofit ofBridges is enhanced with over 300 photos and line drawings toillustrate key concepts and detailed design procedures. As the onlytext currently available on the vital topic of seismic bridgedesign, it provides an indispensable reference for civil,structural, and geotechnical engineers, as well as students inrelated engineering courses. A state-of-the-art text on earthquake-proof design and retrofit ofbridges Seismic Design and Retrofit of Bridges fills the urgent need for acomprehensive and up-to-date text on seismic-ally resistant bridgedesign. The authors, all recognized leaders in the field,systematically cover all aspects of bridge design related toseismic resistance for both new and existing bridges. * A complete overview of current design philosophy for bridges,with related seismic and geotechnical considerations * Coverage of conceptual design constraints and their relationshipto current design alternatives * Modeling and analysis of bridge structures * An exhaustive look at common building materials and theirresponse to seismic activity * A hands-on approach to the capacity

design process * Use of isolation and dissipation devices in bridge design *	Important coverage of seismic assessment and retrofit design ofexisting bridges