

PRINCIPLES AND APPLICATIONS IN ENGINEERING SERIES

# BRIDGE ENGINEERING

## Seismic Design

EDITED BY  
**Wai-Fah Chen**  
**Lian Duan**

 **CRC Press**  
Taylor & Francis Group

# Bridge Engineering Seismic Design

**M. Lee Marsh, Stuart Judson Stringer**



## **Bridge Engineering Seismic Design:**

**Bridge Engineering** W.F. Chen, Lian Duan, 2003-02-27 Mitigating the effects of earthquakes is crucial to bridge design. With chapters culled from the best selling Bridge Engineering Handbook this volume sets forth the principles and applications of seismic design from the necessary geotechnical and dynamic analysis background to seismic isolation and energy dissipation active control and retrofit.

**Bridge Engineering Handbook, Second Edition** Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts from 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 Rewrite 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.

**Bridge Engineering Handbook** Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts from 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

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**Seismic Design of Buildings and Bridges** Alan Williams,1995 **Civil & Structural Engineering** Alan Williams,2005 Containing everything civil and structural engineers need to prepare for the seismic design topics of the Structural Engineering I and II exams this guide emphasizes methods that lead to the quickest and simplest solution to any problem In addition to exam preparation this book is an outstanding reference manual for practicing engineers and upper level engineering students Book jacket

**Seismic Design and Assessment of Bridges** Andreas J. Kappos,M. Saiid Saiidi,M. Nuray Aydinoglu,Tatjana Isaković,2012-04-18 The book focuses on the use of inelastic analysis methods for the seismic assessment and design of bridges for which the work carried out so far albeit interesting and useful is nevertheless clearly less than that for buildings Although some valuable literature on the subject is currently available the most advanced inelastic analysis methods that emerged during the last decade are currently found only in the specialised research oriented literature such as technical journals and conference proceedings Hence the key objective of this book is two fold first to present all important methods belonging to the aforementioned category in a uniform and sufficient for their understanding and implementation length and to provide also a critical perspective on them by including selected case studies wherein more than one methods are applied to a specific bridge and by offering some critical comments on the limitations of the individual methods and on their relative efficiency The book should be a valuable tool for both researchers and practicing engineers dealing with seismic design and assessment of bridges by both making the methods and the analytical tools available for their implementation and by assisting them to select the method that best suits the individual bridge projects that each engineer and or researcher faces

*Bridge Engineering Handbook, Second Edition* 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 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 second book Superstructure Design contains 19 chapters and covers information on how to design all types of bridges What s New in the Second Edition Includes two new chapters Extradosed Bridges and Stress Ribbon Pedestrian Bridges Updates the Prestressed Concrete Girder Bridges chapter and rewrites it as two chapters Precast Pretensioned Concrete Girder Bridges and Cast In Place Post Tensioned Prestressed Concrete Girder Bridges Expands the chapter on Bridge Decks and Approach Slabs and divides it into two chapters Concrete Decks and Approach Slabs Rewrites seven chapters Segmental Concrete Bridges Composite Steel I Girder Bridges Composite Steel Box Girder Bridges Arch Bridges Cable Stayed Bridges Orthotropic Steel Decks and Railings 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

**Performance-based Seismic Bridge Design** M. Lee Marsh, Stuart Judson Stringer, 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 Bridge Design and Retrofit -- Structural Solutions** fib Fédération internationale du béton. Task Group: Seismic design and assessment procedures for bridges, 2007 Bridge structures can give the impression that they are rather simple structural systems whose seismic responses can be easily predicted On the contrary however many bridges did not perform well in recent earthquakes showing a need for increased research to understand various potential problems and collapse mechanisms Indeed progress has been made lately in design and assessment procedures around the world and consequently many practices have changed In this context the objective of fib Bulletin 39 is to present discuss and critically compare structural solutions for bridge seismic design and retrofit that have been developed and are now used all over the world ten years after the publication of the last comprehensive manual on the subject It is the result of the work of an international team of experts that collaborated intensively for over three years The

first four chapters of the Bulletin present a regional review of design choices compare and discuss international design practices and indicate their relative merits and potential problems Current developments are treated in the next three chapters with particular emphasis on design for enhanced damage control for spatial variation of ground motion and for fault crossing The last part presents a summary of current issues related to existing bridges Extensive technical developments have been taking place in the last two decades with the goal of making bridges an important transportation infrastructure with limited damage during earthquakes Realising this goal depends on regional seismicity transportation systems seismic performance goals local cultures and a wide range of design and construction practices which are presented and discussed in this Bulletin

**Bridge Engineering Handbook** Wai-Fah Chen,Lian Duan,2023-01-27 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 This second volume includes sections covering substructure design and seismic design

**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

*Seismic Design and Retrofit of Bridges* M. J. N. Priestley,F. Seible,Gian Michele Calvi,1996-04-12 Because of their structural simplicity bridges tend to be particularly vulnerable to damage and even collapse when subjected to earthquakes or other forms of seismic activity Recent earthquakes such as the ones in Kobe Japan and Oakland California have led to a heightened awareness of seismic risk and have revolutionized bridge design and retrofit philosophies In *Seismic Design and Retrofit of Bridges* three of the world's top authorities on the subject have collaborated to produce the most exhaustive reference on seismic bridge design currently available Following a detailed examination of the seismic effects of actual earthquakes on local area bridges the authors demonstrate design strategies that will make these and similar structures optimally resistant to the damaging effects of future seismic disturbances Relying heavily on worldwide research associated with recent quakes *Seismic Design and Retrofit of Bridges* begins with an in depth treatment of seismic design philosophy as it applies to bridges The authors then

describe the various geotechnical considerations specific to bridge design such as soil structure interaction and traveling wave effects. Subsequent chapters cover conceptual and actual design of various bridge superstructures and modeling and analysis of these structures. As the basis for their design strategies, the authors focus is on the widely accepted capacity design approach in which particularly vulnerable locations of potentially inelastic flexural deformation are identified and strengthened to accommodate a greater degree of stress. The text illustrates how accurate application of the capacity design philosophy to the design of new bridges results in structures that can be expected to survive most earthquakes with only minor repairable damage. Because the majority of today's bridges were built before the capacity design approach was understood, the authors also devote several chapters to the seismic assessment of existing bridges with the aim of designing and implementing retrofit measures to protect them against the damaging effects of future earthquakes. These retrofitting techniques, though not considered appropriate in the design of new bridges, are given considerable emphasis since they currently offer the best solution for the preservation of these vital and often historically valued thoroughfares. Practical and applications oriented *Seismic Design and Retrofit of Bridges* is enhanced with over 300 photos and line drawings to illustrate key concepts and detailed design procedures. As the only text currently available on the vital topic of seismic bridge design, it provides an indispensable reference for civil structural and geotechnical engineers as well as students in related engineering courses. A state of the art text on earthquake proof design and retrofit of bridges, *Seismic Design and Retrofit of Bridges* fills the urgent need for a comprehensive and up to date text on seismic ally resistant bridge design. The authors, all recognized leaders in the field, systematically cover all aspects of bridge design related to seismic 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 relationship to current design alternatives. Modeling and analysis of bridge structures. An exhaustive look at common building materials and their response 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 of existing bridges.

**Bridge Engineering Handbook** Wai-Fah Chen, Lian Duan, 2023-01-27. 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. This second volume includes sections covering substructure design and seismic design.

[Bridge Engineering Handbook, Second Edition](#) Wai-Fah Chen, Lian Duan, 2014-01-24. Over 140 experts from 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

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**Bridge Engineering Handbook, Five Volume Set** 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 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 This second edition of the bestselling Bridge Engineering Handbook covers virtually all the information an engineer would need to know about any type of bridge from planning to construction to maintenance It contains more than 2 500 tables charts and illustrations in a practical ready to use format An abundance of worked out examples gives readers numerous practical step by step design procedures Special attention is given to rehabilitation retrofit and maintenance Coverage also includes seismic design and building materials Thoroughly revised and updated this second edition contains 26 new chapters

**Earthquake-Resistant Structures** Abbas Moustafa,2012-02-29 This book deals with earthquake resistant structures such as buildings bridges and liquid storage tanks It contains twenty chapters covering several interesting research topics written by researchers and

experts in the field of earthquake engineering The book covers seismic resistance design of masonry and reinforced concrete structures to be constructed as well as safety assessment strengthening and rehabilitation of existing structures against earthquake loads It also includes three chapters on electromagnetic sensing techniques for health assessment of structures post earthquake assessment of steel buildings in fire environment and response of underground pipes to blast loads The book provides the state of the art on recent progress in earthquake resistant structures It should be useful to graduate students researchers and practicing structural engineers *Recent Developments In Bridge Engineering* K.M. Mahmoud,2003-01-01 This book contains a selected number of papers that were presented at the Second New York City Bridge Conference organized by the Bridge Engineering Association It represents the state of the art papers from different countries on a wide spectrum of topics in bridge engineering *Seismic Design of Buildings and Bridges for Civil and Structural Engineers* Alan Williams,2004-05 Everything you need to prepare for the seismic design topics of the National Structural Engineering I Contains an 8 page summary of useful equations Reflects current publications of SEAOC and FEMA Conforms to the 1997 edition of the UBC Updated based on the latest AISC and ACI standards Provides comprehensive clarification of applicable Building Codes and Standard Specifications Uses provisions of the 1999 SEAOC bluebook 1999 FEMA Advisory No 2 2000 FEMA 350 Design of Steel Moment Frame Buildings and 1997 AISC Seismic Provisions Cites extensive references that reflect current design procedures **Bridge Engineering** Demetrios E. Tonia s,1995 Design rehabilitate and maintain modern highway bridges From steel and reinforced concrete design to highway layout and basic geometrics to geotechnical engineering and hydraulics Demetrios E Tonia s Bridge Engineering Design Rehabilitation and Maintenance of Modern Highway Bridges fully integrates the resources you need to master the entire bridge design process Written with unusual clarity and packed with timely design examples and case studies plus eye opening sidebars and graphics it shows you how to understand bridge structures functions types and applications design superstructures and substructures for maximum maintainability design highway components approach pavements and slabs structure geometrics and elevations roadway alignments and more kick off the project from funding to site surveying and coring manage the design process contract documents reports plans client interactions and more manage the bridge itself from creating a structure inventory to extending GIS and CADD functionality

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