

## Seismic Design Of Reinforced Concrete Buildings

Design of Wind and Earthquake Resistant Reinforced Concrete Buildings explains wind and seismic design issues of RCC buildings in brief and provides design examples based on recommendations of latest IS codes essential for industrial design. Intricate issues of RCC design are discussed which are supplemented by real-life examples. Guidelines are presented for evaluating the acceptability of wind-induced motions of tall buildings. Design methodologies for structures to deform well beyond their elastic limits, which is essential under seismic excitation, have been discussed in detail. Comparative discussion including typical design examples using recent British, Euro and American codes is also included. Features: Explains wind and earthquake resistant design issues, balancing theoretical aspects and design implications, in detail Discusses issues for designing the wind and earthquake resistant RCC structures Provides comprehensive understanding, analysis, design and detailing of the structures Includes a detailed discussion on IS code related to wind and earthquake resistant design and its comparison with Euro, British and American codes Contains architectural drawings and structural drawings The book is aimed at researchers, professionals, graduate students in wind and earthquake engineering, design of RCC structures, modelling and analysis of structures, civil/infrastructure engineering.

Reinforced concrete (R/C) is one of the main building materials used worldwide, and an understanding of its structural performance under gravity and seismic loads, albeit complex, is crucial for the design of cost effective and safe buildings. Concrete Buildings in Seismic Regions comprehensively covers of all the analysis and design issues related to the design of reinforced concrete buildings under seismic action. It is suitable as a reference to the structural engineer dealing with specific problems during the design process and also for undergraduate and graduate structural, concrete and earthquake engineering courses. This revised edition provides new and significantly developed coverage of seismic isolation and passive devices, and coverage of recent code modifications as well as notes on future developments of standards. It retains an overview of structural dynamics, the analysis and design of new R/C buildings in seismic regions, post-earthquake damage evaluation, pre-earthquake assessment of buildings and retrofitting procedures, and several numerical examples. The book outlines appropriate structural systems for many types of buildings, explores recent developments, and covers the last two decades of analysis, design, and earthquake engineering. It specifically addresses seismic demand issues and the basic issues of structural dynamics, considers the "capacity" of structural systems to withstand seismic effects in terms of strength and deformation, and highlights the assessment of existing R/C buildings under seismic action. All of the material has been developed to fit a modern seismic code and offers in-depth knowledge of the background upon which the code rules are based. It complies with European Codes of Practice for R/C buildings in seismic regions, and includes references to current American Standards for seismic design.

With its accessible approach and streamlined coverage of theory, engineers will quickly learn how to apply the concepts in the eighth edition. The contents have been updated to conform to the 2008 building code of the American Concrete Institute (ACI 318-08). New spreadsheets are included that arm the reader with tools to analyze and design reinforced concrete elements and quickly compare alternative solutions. A new chapter on seismic design explores the issues related to the design of reinforced concrete structures to resist earthquakes. The new materials section also provides engineers with details and examples on how to design shear walls for combined axial load and bending moment.

Countless lives have been saved as a result of recent strides in earthquake engineering and related sciences. This trend has been furthered by the work of the Canadian national Committee on Earthquake Engineering which has, over the past twenty years, provided

specialists with a forum for exploring new approaches to the problem. Engineers, scientists, researchers, geologists, seismologists, and other professionals have shared research and experience at the committee's conferences. The sixth of these, held in June 1991, is documented in this volume. Three keynote papers provide the overall focuses for the volume. Each deals with one of the three major areas in the field: structures, in a paper on design developments in high-rise design and construction in Japan; geotechnical engineering, in a discussion of the effects of site conditions on ground motions; and seismology, in an account of the development of phased strong-motion time-histories for structures with multiple supports. Shorter papers fall into three broad areas: response analysis and design of structural components; the interaction of seismicity, mitigation, soil response, and social structure; and seismic codes and structures. This conference, along with other similar events throughout the world, has contributed significantly towards understanding various phenomena needed for building safe, reliable, and economical structures that can meet the challenges presented by the forces of nature.

A brief summary of the history of seismic design as given in chapter 1, indicates that initially design was purely based on strength or force considerations. When the importance of displacement, however, became better appreciated, it was attempted to modify the existing force-based approach in order to include considerations of displacement, rather than to totally reconsider the procedure on a more rational basis. In the last decade, then, several researchers started pointing out this inconsistency, proposing displacement-based approaches for earthquake engineering evaluation and design, with the aim of providing improved reliability in the engineering process by more directly relating computed response and expected structural performance. The main objective of this report is to summarize, critically review and compare the displacement - based approaches proposed in the literature, thus favouring code implementation and practical use of rational and reliable methods. Chapter 2 Seismic performance and design objectives of this report introduces concepts of performance levels, seismic hazard representation, and the coupling of performance and hazard to define performance objectives. In fact, for displacement analysis to be relevant in the context of performance-based design, the structural engineer must select appropriate performance levels and seismic loadings. A critical review of some engineering limit states appropriate to the different performance levels is therefore proposed. In chapter 3 Conceptual basis for displacement-based earthquake resistant design, the fundamental principles associated with displacement of the ground during an earthquake and the effects, in terms of displacement, in the structure, are reviewed. The historical development guides the presentation with a review of general linear and nonlinear structural dynamics principles, general approaches to estimate displacement, for both ground and structure, and finally a general presentation of the means to measure and judge the appropriateness of the displacements of the structure in section. Chapter 4 Approaches and procedures for displacement-based design can be somehow considered the fundamental part of the report, since a critical summary of the displacement - based approaches proposed by different researchers is presented there. Displacement - based design may require specific characterization of the input ground motion, a topic addressed in Chapter 5 Seismic input. In general, various pertinent definitions of input motion for non-code format analysis are included, while peak ground parameters necessary for code base shear equations are only addressed as needed for the definition of motion for analysis. Chapter 6 Displacement capacity of members and systems addresses the fundamental problem of evaluating the inelastic displacement capacity of reinforced concrete members and realistic values of their effective cracked stiffness at yielding, including effects of shear and inclined cracking, anchorage slip, bar buckling and of load cycling. In Chapter 7 Application and evaluation of displacement-based approaches, some of the many different displacement based design procedures briefly introduced in Chapter 4 are applied to various case studies,

identifying and discussing the difficulties a designer may encounter when trying to use displacement based design. Results for five different case studies designed in accordance with eight different displacement based design methods are presented. Although in general case studies are considered a useful but marginal part of a state of the art document, in this case it has to be noted that chapter 7 is possibly the most innovative and fundamental part of the whole report. The conclusions of chapter 7 are the fundamental and essential conclusions of the document and allow foreseeing a bright future for displacement - based design approaches. The state-of-art report has been elaborated over a period of 4 years by Task Group 7.2 Displacement-based design and assessment of fib Commission 7 Seismic design, a truly international team of experts, representing the expertise and experience of all the important seismic regions of the world. In October 2002 the final draft of the Bulletin was presented to the public during the 1st fib Congress in Osaka. It was also there that it was approved by fib Commission 7 Seismic Design.

Throughout the past few years, there has been extensive research done on structural design in terms of optimization methods or problem formulation. But, much of this attention has been on the linear elastic structural behavior, under static loading condition. Such a focus has left researchers scratching their heads as it has led to vulnerable structural configurations. What researchers have left out of the equation is the element of seismic loading. It is essential for researchers to take this into account in order to develop earthquake resistant real-world structures. Structural Seismic Design Optimization and Earthquake Engineering: Formulations and Applications focuses on the research around earthquake engineering, in particular, the field of implementation of optimization algorithms in earthquake engineering problems. Topics discussed within this book include, but are not limited to, simulation issues for the accurate prediction of the seismic response of structures, design optimization procedures, soft computing applications, and other important advancements in seismic analysis and design where optimization algorithms can be implemented. Readers will discover that this book provides relevant theoretical frameworks in order to enhance their learning on earthquake engineering as it deals with the latest research findings and their practical implementations, as well as new formulations and solutions.

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

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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

This book presents the results of a Japanese national research project carried out in 1988-1993, usually referred to as the New RC Project. Developing advanced reinforced concrete building structures with high strength and high quality materials under its auspices, the project aimed at promoting construction of high rise reinforced concrete buildings in highly seismic areas such as Japan. The project covered all the aspects of reinforced concrete structures, namely materials, structural elements, structural design, construction, and feasibility studies. In addition to presenting these results, the book includes two chapters giving an elementary explanation of modern analytical techniques, i.e. finite element analysis and earthquake response analysis. Contents: RC Highrise Buildings in Seismic Areas (H Aoyama) The New RC Project (H Hiraishi) New RC Materials (M Abe & H Shiohara) New RC Structural Elements (T Kaminosono) Finite Element Analysis (H Noguchi) Structural Design Principles (M Teshigawara) Earthquake Response Analysis (T Kabeyasawa) Construction of New RC Structures (Y Masuda) Feasibility Studies and Example Buildings (H Fujitani) Readership: Civil, ocean and marine engineers.

The aim of this state-of-art report is to present current practices for use of precast and prestressed concrete in countries in seismic regions, to recommend good practice, and to discuss current developments. The report has been drafted by 30 contributors from nine different countries. This state-of-art report covers: state of the practice in various countries; advantages and disadvantages of incorporating precast reinforced and prestressed concrete in construction; lessons learned from previous earthquakes; construction concepts; design approaches; primary lateral load resisting systems (precast and prestressed concrete frame systems and structural walls including dual systems) diaphragms of precast and prestressed concrete floor units; modelling and analytical methods; gravity load resisting systems; foundations; and miscellaneous elements (shells, folded plates, stairs and architectural cladding panels). Design equations are reported where necessary, but the emphasis is on principles. Ordinary cast-in-place reinforced concrete is not considered in this report. This fib state-of-the-art report is intended to assist designers and constructors to provide safe and economical applications of structural precast concrete and at the same time to allow innovation in design and construction to continue. This Bulletin N° 27 was approved as an fib state-of-art report in autumn 2002 by fib Commission 7, Seismic design.

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\* Presents the basics of seismic-resistant design of concrete structures. \* Provides a major focus on the seismic design of precast bracing systems.

Solid design and craftsmanship are a necessity for structures and infrastructures that must stand up to natural disasters on a regular basis. Continuous research developments in the engineering field are imperative for sustaining buildings against the threat of earthquakes and other natural disasters. Performance-Based Seismic Design of Concrete Structures and Infrastructures is an informative reference source on all the latest trends and emerging data associated with structural design. Highlighting key topics such as seismic assessments, shear wall structures, and infrastructure resilience, this is an ideal resource for all academicians, students, professionals, and researchers that are seeking new knowledge on the best methods and techniques for designing solid structural designs.

This report synthesizes the existing information on hybrid coupled wall (HCW) systems into helpful recommendations pertaining to their seismic analysis and design.

Providing real world applications for different structural types and seismic characteristics, Seismic Design of Steel Structures combines knowledge of seismic behavior of steel structures with the principles of earthquake engineering. This book focuses on seismic design, and concentrates specifically on seismic-resistant steel structures. Drawing on experience from the Northridge to the Tohoku earthquakes, it combines understanding of the seismic behavior of steel structures with the principles of earthquake engineering. The book focuses on the global as well as local behavior of steel structures and their effective seismic-resistant design. It recognises different types of earthquakes, takes into account the especial danger of fire after earthquake, and proposes new bracing and connecting systems for new seismic resistant steel structures, and also for upgrading existing reinforced concrete structures. Includes the results of the extensive use of the DUCTROCT M computer program, which is used for the evaluation of the seismic available ductility, both monotonic and cyclic, for different types of earthquakes Demonstrates good design principles by highlighting the behavior of seismic-resistant steel structures in many applications from around the world Provides a methodological approach, making a clear distinction between strong and low-to-moderate seismic regions This book serves as a reference for structural engineers involved in seismic design, as well as researchers and graduate students of seismic structural analysis and design.

This book examines and presents essential aspects of the behavior, analysis, design and detailing of reinforced concrete buildings subjected to strong seismic activity. Seismic design is an extremely complex problem that has seen spectacular development in the last decades.

The present volume tries to show how the principles and methods of earthqua

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-

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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.

Tools to Safeguard New Buildings and Assess Existing Ones Nonlinear analysis methods such as static pushover are globally considered a reliable tool for seismic and structural assessment. But the accuracy of seismic capacity estimates—which can prevent catastrophic loss of life and astronomical damage repair costs—depends on the use of the correct basic input parameters. *Seismic Design Aids for Nonlinear Analysis of Reinforced Concrete Structures* simplifies the estimation of those vital parameters. Many design engineers make the relatively common mistake of using default properties of materials as input to nonlinear analyses without realizing that any minor variation in the nonlinear characteristics of constitutive materials, such as concrete and steel, could result in a solution error that leads to incorrect assessment or interpretation. *Streamlined Analysis Using a Mathematical Model To achieve a more accurate pushover analysis and improve general performance-based design*, this book reassesses some key inputs, including axial force-bending moment yield interaction, moment-curvature, and moment-rotation characteristics. It analyzes these boundaries using a detailed mathematical model of reinforced concrete sections based on international codes, and then proposes design curves and tables derived from the authors' studies using a variety of nonlinear tools, computer programs, and software. The text reviews relevant literature and describes mathematical modeling, detailing numerical procedures step by step. Including supplementary online material that can be used to compute any parameter, this reference delineates nonlinear properties of materials so that they can be used instantly for seismic analysis without having to solve cumbersome equations.

Complete coverage of earthquake-resistant concrete building design Written by a renowned seismic engineering expert, this authoritative resource discusses the theory and practice for the design and evaluation of earthquakeresisting reinforced concrete buildings. The book addresses the behavior of reinforced concrete materials, components, and systems subjected to routine and extreme loads, with an emphasis on response to earthquake loading. Design methods, both at a basic level as required by current building codes and at an advanced level needed for special problems such as seismic performance assessment, are described. Data and models useful for analyzing reinforced concrete structures as well as numerous illustrations, tables, and equations are included in this detailed reference. *Seismic Design of Reinforced Concrete Buildings* covers: Seismic design and performance verification Steel reinforcement Concrete Confined concrete Axially loaded members Moment and axial force Shear in beams, columns, and walls Development and anchorage Beam-column connections Slab-column and slab-wall connections Seismic design overview Special moment frames Special structural walls Gravity framing Diaphragms and collectors Foundations

The costs of inadequate earthquake engineering are huge, especially for reinforced concrete buildings. This book presents the principles of earthquake-resistant structural engineering, and uses the latest tools and techniques to give practical design guidance to address single or multiple seismic performance levels. It presents an elegant, simple and theoretically coherent design framework. Required strength is determined on the basis of an estimated yield displacement and desired limits of system ductility and drift demands. A simple deterministic approach is presented along with its elaboration into a probabilistic treatment that allows for design to limit annual probabilities of failure. The design method allows the seismic force resisting system to be designed on the basis of elastic analysis results, while nonlinear analysis is used for performance verification. Detailing requirements of ACI 318 and Eurocode 8 are presented. Students will benefit from the coverage of seismology, structural dynamics, reinforced concrete, and capacity design approaches, which allows the book to be used as a

foundation text in earthquake engineering.

An Original Source of Expressions and Tools for the Design of Concrete Elements with Eurocode Seismic design of concrete buildings needs to be performed to a strong and recognized standard. Eurocode 8 was introduced recently in the 30 countries belonging to CEN, as part of the suite of Structural Eurocodes, and it represents the first European Standard for seismic design. It is also having an impact on seismic design standards in countries outside Europe and will be applied there for the design of important facilities. This book: Contains the fundamentals of earthquakes and their effects at the ground level, as these are affected by local soil conditions, with particular reference to EC8 rules Provides guidance for the conceptual design of concrete buildings and their foundations for earthquake resistance Overviews and exemplifies linear and nonlinear seismic analysis of concrete buildings for design to EC8 and their modelling Presents the application of the design verifications, member dimensioning and detailing rules of EC8 for concrete buildings, including their foundations Serves as a commentary of the parts of EC8 relevant to concrete buildings and their foundations, supplementing them and explaining their proper application Seismic Design of Concrete Buildings to Eurocode 8 suits graduate or advanced undergraduate students, instructors running courses on seismic design and practicing engineers interested in the sound application of EC8 to concrete buildings. Alongside simpler examples for analysis and detailed design, it includes a comprehensive case study of the conceptual design, analysis and detailed design of a realistic building with six stories above grade and two basements, with a complete structural system of walls and frames. Homework problems are given at the end of some of the chapters.

Sets out basic theory for the behavior of reinforced concrete structural elements and structures in considerable depth. Emphasizes behavior at the ultimate load, and, in particular, aspects of the seismic design of reinforced concrete structures. Based on American practice, but also examines European practice.

Reflecting the historic first European seismic code, this professional book focuses on seismic design, assessment and retrofitting of concrete buildings, with thorough reference to, and application of, EN-Eurocode 8. Following the publication of EN-Eurocode 8 in 2004-05, 30 countries are now introducing this European standard for seismic design, for application in parallel with existing national standards (till March 2010) and exclusively after that. Eurocode 8 is also expected to influence standards in countries outside Europe, or at the least, to be applied there for important facilities. Owing to the increasing awareness of the threat posed by existing buildings substandard and deficient buildings and the lack of national or international standards for assessment and retrofitting, its impact in that field is expected to be major. Written by the lead person in the development of the EN-Eurocode 8, the present handbook explains the principles and rationale of seismic design according to modern codes and provides thorough guidance for the conceptual seismic design of concrete buildings and their foundations. It examines the experimental behaviour of concrete members under cyclic loading and modelling for design and analysis purposes; it develops the essentials of linear or nonlinear seismic analysis for the purposes of design, assessment and retrofitting (especially using Eurocode 8); and gives detailed guidance for modelling concrete buildings at the member and at the system level. Moreover, readers gain access to overviews of provisions of Eurocode 8, plus an understanding for them on the basis of the simple models of the element behaviour presented in the book. Also examined are the modern trends in performance- and displacement-based seismic assessment of existing buildings, comparing the relevant provisions of Eurocode 8 with those of new US prestandards, and details of the most common and popular seismic retrofitting techniques for concrete buildings and guidance for retrofitting strategies at the system level. Comprehensive walk-through examples of detailed design elucidate the application of Eurocode 8 to common situations in practical design. Examples

and case studies of seismic assessment and retrofitting of a few real buildings are also presented. From the reviews: "This is a massive book that has no equal in the published literature, as far as the reviewer knows. It is dense and comprehensive and leaves nothing to chance. It is certainly taxing on the reader and the potential user, but without it, use of Eurocode 8 will be that much more difficult. In short, this is a must-read book for researchers and practitioners in Europe, and of use to readers outside of Europe too. This book will remain an indispensable backup to Eurocode 8 and its existing Designers' Guide to EN 1998-1 and EN 1998-5 (published in 2005), for many years to come. Congratulations to the author for a very well planned scope and contents, and for a flawless execution of the plan". AMR S. ELNASHAI "The book is an impressive source of information to understand the response of reinforced concrete buildings under seismic loads with the ultimate goal of presenting and explaining the state of the art of seismic design. Underlying the contents of the book is the in-depth knowledge of the author in this field and in particular his extremely important contribution to the development of the European Design Standard EN 1998 - Eurocode 8: Design of structures for earthquake resistance. However, although Eurocode 8 is at the core of the book, many comparisons are made to other design practices, namely from the US and from Japan, thus enriching the contents and interest of the book". EDUARDO C. CARVALHO

This book is intended to serve as a textbook for engineering courses on earthquake resistant design. The book covers important attributes for seismic design such as material properties, damping, ductility, stiffness and strength. The subject coverage commences with simple concepts and proceeds right up to nonlinear analysis and push-over method for checking building adequacy. The book also provides an insight into the design of base isolators highlighting their merits and demerits. Apart from the theoretical approach to design of multi-storey buildings, the book highlights the care required in practical design and construction of various building components. It covers modal analysis in depth including the important missing mass method of analysis and tension shift in shear walls and beams. These have important bearing on reinforcement detailing. Detailed design and construction features are covered for earthquake resistant design of reinforced concrete as well as confined and reinforced masonry structures. The book also provides the methodology for assessment of seismic forces on basement walls and pile foundations. It provides a practical approach to design and detailing of soft storeys, short columns, vulnerable staircases and many other components. The book bridges the gap between design and construction. Plenty of worked illustrative examples are provided to aid learning. This book will be of value to upper undergraduate and graduate students taking courses on seismic design of structures.

Emphasizes actual structural design, not analysis, of multistory buildings for seismic resistance. Strong emphasis is placed on specific detailing requirements for construction. Fundamental design principles are presented to create buildings that respond to a wide range of potential seismic forces, which are illustrated by numerous detailed examples. The discussion includes the design of reinforced concrete ductile frames, structural walls, dual systems, reinforced masonry structures, buildings with restricted ductility and foundation walls. In addition to the examples, full design calculations are given for three prototype structures. This detailed guide is designed to enable the reader to understand the relative importance of the numerous parameters involved in seismic design and the relationships between them, as well as the motivations behind the choices adopted by the codes.

An exploration of the world of concrete as it applies to the construction of buildings, Reinforced Concrete Design of Tall Buildings provides a practical perspective on all aspects of reinforced concrete used in the design of structures, with particular focus on tall and ultra-tall buildings. Written by Dr. Bungale S. Taranath, this work explains the fundamental principles and state-of-the-art technologies required to build vertical structures as sound as they are eloquent. Dozens of cases studies of tall buildings throughout the world, many designed by Dr. Taranath, provide

in-depth insight on why and how specific structural system choices are made. The book bridges the gap between two approaches: one based on intuitive skills and experience and the other based on computer skills and analytical techniques. Examining the results when experiential intuition marries unfathomable precision, this book discusses: The latest building codes, including ASCE/SEI 7-05, IBC-06/09, ACI 318-05/08, and ASCE/SEI 41-06 Recent developments in studies of seismic vulnerability and retrofit design Earthquake hazard mitigation technology, including seismic base isolation, passive energy dissipation, and damping systems Lateral bracing concepts and gravity-resisting systems Performance based design trends Dynamic response spectrum and equivalent lateral load procedures Using realistic examples throughout, Dr. Taranath shows how to create sound, cost-efficient high rise structures. His lucid and thorough explanations provide the tools required to derive systems that gracefully resist the battering forces of nature while addressing the specific needs of building owners, developers, and architects. The book is packed with broad-ranging material from fundamental principles to the state-of-the-art technologies and includes techniques thoroughly developed to be highly adaptable. Offering complete guidance, instructive examples, and color illustrations, the author develops several approaches for designing tall buildings. He demonstrates the benefits of blending imaginative problem solving and rational analysis for creating better structural systems.

This book introduces practising engineers and post-graduate students to modern approaches to seismic design, with a particular focus on reinforced concrete structures, earthquake resistant design of new buildings and assessment, repair and strengthening of existing buildings.

Forty scientists working in 13 different countries detail in this work the most recent advances in seismic design and performance assessment of reinforced concrete buildings. It is a valuable contribution in the mitigation of natural disasters.

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