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Design of Structures for Earthquake Resistance

WARD LEONIDAS

Earthquake Resistant Engineering Structures VI Springer Science & Business Media
My involvement in the use of natural rubber as a method for the protec 1976. At that time, tion of buildings against earthquake attack began in I was working on the development of energy-dissipating devices for the same purpose and had developed and tested a device that was even tually used in a stepping-bridge structure, this being a form of partial isolation. It became clear to me that in order to use these energy devices for the earthquake protection of buildings, it would be best to combine them with an isolation system which would give them the large displace ments needed to develop sufficient hysteresis. At this appropriate point in time, I was approached by Dr. C. J. Derham, then of the Malaysian Rubber Producers' Research Association (MRPRA), who asked if I was interested in looking at the possibility of conducting shaking table tests at the Earthquake Simulator Laboratory to see to what extent natural rubber bearings could be used to protect buildings from earthquakes. Very soon after this meeting, we were able to do such a test using a 20-ton model and hand-made isolators. The eady tests were very promising. Accordingly, a further set of tests was done with a more realistic five storey model weighing 40 tons with bearings that were commercially made. In both of the test series, the isolators were used both alone and with a number of different types of energy-dissipating devices to en hance damping.
Guidelines for earthquake resistant non-engineered construction Springer
An earthquake is a powerful surface

acoustic wave (SAW) generated by a seismic event, such as a volcano or motion of the Earth's layers, that propagates on the Earth's surface. This book explains the design of earthquake resistant structures using SAW techniques that offer a variety of experimental setups and theoretical models. Designs of protecting systems able to dissipate or deflect SSW energy built around buildings or towns located in earthquake regions set this book apart from other seismology publications.

Earthquake Resistant Design and Risk Reduction Springer Science & Business Media

This book focuses on the seismic design of Structures, Piping Systems and Components (SSC). It explains the basic mechanisms of earthquakes, generation of design basis ground motion, and fundamentals of structural dynamics; further, it delves into geotechnical aspects related to the earthquake design, analysis of multi degree-of-freedom systems, and seismic design of RC structures and steel structures. The book discusses the design of components and piping systems located at the ground level as well as at different floor levels of the structure. It also covers anchorage design of component and piping system, and provides an introduction to retrofitting, seismic response control including seismic base isolation, and testing of SSCs. The book is written in an easy-to-understand way, with review questions, case studies and detailed examples on each topic. This educational approach makes the book useful in both classrooms and professional training courses for students, researchers, and professionals alike.

Earthquake Resistant Design and Risk Reduction John Wiley & Sons

Earthquake engineering is the ultimate challenge for structural engineers. Even if natural phenomena involve great uncertainties, structural engineers need to design buildings, bridges, and dams capable of resisting the destructive forces produced by them. These disasters have created a new awareness about the disaster preparedness and mitigation. Before a building, utility system, or transportation structure is built, engineers spend a great deal of time analyzing those structures to make sure they will perform reliably under seismic and other loads. The purpose of this book is to provide structural engineers with tools and information to improve current building and bridge design and construction practices and enhance their sustainability during and after seismic events. In this book, Khan explains the latest theory, design applications and Code Provisions. Earthquake-Resistant Structures features seismic design and retrofitting techniques for low and high raise buildings, single and multi-span bridges, dams and nuclear facilities. The author also compares and contrasts various seismic resistant techniques in USA, Russia, Japan, Turkey, India, China, New Zealand, and Pakistan. Written by a world renowned author and educator Seismic design and retrofitting techniques for all structures Tools improve current building and bridge designs Latest methods for building earthquake-resistant structures Combines physical and geophysical science with structural engineering

Design and Analytical Aspects CRC Press

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

CRC Press

Whenever there is an earthquake-related disaster in the news bulletin with depictions of distorted buildings and other structures dispersed all over the place, one may doubtless think that earthquake-resistant design of structures is quiet in the dark ages. Obviously, the aim of professionals engaged in the field of earthquake-resistant design is to generate several cost-effective design solutions to make structures less vulnerable to earthquakes, even large earthquakes. As one of the most devastating natural events, earthquakes impose economic challenges on communities and governments. The number of human and economic assets at risk is growing as megacities and urban areas develop all over the world. The earthquake events have not only inflicted human and physical damage, they have also been able to cause considerable economic conflict in vulnerable cities and regions. The importance of the economic issues and the consequences of earthquakes attracted the attention of engineers and provided new research and working opportunities for engineers, who up until then had been concerned only with risk reduction options through engineering strategies. This book `Earthquake Resistant Design and Risk Reduction¿ is packed with the comprehensive information on recent development in earthquake-resistant structures, such as, buildings, bridges and liquid storage tanks. It contains 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 will also discuss the factors which will define the success of earthquake-resistant design concepts, approaches and techniques in the coming years.This book is an valuable guiding tool to civil and structural practicing engineers, researchers and postgraduate students in earthquake engineering and engineering seismology, policy makers and risk management officials.

Design, Build, and Retrofit John Wiley & Sons

This is arguably the most comprehensive book on the subject of architectural-

structural design decisions that influence the seismic performance of buildings. It explores the intersection between the architecture and the structural design through the lens of earthquake engineering. The main aim of this unique book, written by renowned engineer M.Llunji, is to explain in the simplest terms, the architecture and structure of earthquake-resistant buildings, using many practical examples and case studies to demonstrate the fact that structures and buildings react to earthquake forces mainly according to their form, configuration and material. The purpose of this book is to introduce a new perspective on seismic design,a more visual, conceptual and architectural one, to both architects and engineers. In a word, it is to introduce architectural opportunities for earthquake resistant- buildings, treating seismic design as a central architectural issue. A non-mathematical and practical approach emphasizing graphical presentation of problems and solutions makes it equally accessible to architectural and engineering professionals.The book will be invaluable for practicing engineers, architects, students and researches. .More than 500 illustrations/photographs and numerous case studies. Seismic Architecture covers: • Earthquake effects on structures • Seismic force resisting systems • Advanced systems for seismic protection • Architectural/structural configuration and its influence on seismic response • Contemporary architecture in seismic regions • Seismic response of nonstructural elements • Seismic retrofit and rehabilitation of existing buildings • Seismic architecture.

Wind and Earthquake Resistant Buildings WIT Press

Introducing important concepts in the study of earthquakes related to retrofitting of structures to be made earthquake resistant. The book investigates the pounding effects on base-isolated buildings, the soil-structure-interaction effects on adjacent buildings due to the impact, the seismic protection of adjacent buildings and the mitigation of earthquakeinduced vibrations of two adjacent structures. These concepts call for a new understanding of controlled systems with passive-active dampers and semi-active dampers. The passive control strategy of coupled buildings is investigated for seismic protection in comparison to active and semi-active control strategies.

Earthquake-resistant Structures CRC Press

The book provides an overview of the latest developments and advances related to earthquake-resistant structures. It comprises of research works contributed by various experts and researchers in the field of earthquake engineering. The book discusses seismic-resistance design of masonry and reinforcement of concrete structures with safety measurements of strengthening and rehabilitation of existing structures against earthquake loads. It also covers topics dedicated to assessment and rehabilitation of jacket platforms, electromagnetic sensing mechanisms for health assessment of structures, post-earthquake examining of steel buildings in fire environment and response of underground pipes to blast loads. This book will be of help to graduate students, researchers and practicing structural engineers.

Structures, Piping Systems, and Components CRC Press

It aims to explain the different sources of damage that can be triggered by an earthquake and the conceptual method of earthquake-resistant design. The book would also be useful for postgraduate students of civil engineering, practising engineers, and architects.

Earthquake Design Practice for Buildings Springer Science & Business Media

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.

Seismic Resistant Design and Technology IGI Global

Earthquake-resistant structures are the structures considered to withstand earthquakes. While no structure can be entirely resistant to damage from earthquakes, the goal of earthquake-resistant building is to create structures that fare better during seismic activity than their predictable counterparts. Earthquake-resistant structures are envisioned to resist the largest earthquake of a certain probability that is likely to occur at their location. This means the loss of life should be minimized by preventing collapse of the buildings for rare earthquakes while the loss of functionality should be limited for more frequent ones. To be earthquake proof, buildings, structures and their foundations need to be built to be resistant to sideways loads. The lighter the building is, the less the loads. This is particularly so when the weight is higher up. They must be strong enough to take the loads. They must be tied in to any framing, and reinforced to take load in their weakest direction. They must not fall apart and must remain in place after the worst shock waves so as to retain strength for the aftershocks. Currently, there are several design philosophies in earthquake engineering, making use of experimental results, computer simulations and observations from past earthquakes to offer the required performance for the seismic threat at the site of interest. These range

from appropriately sizing the structure to be strong and ductile enough to survive the shaking with an acceptable damage, to equipping it with base isolation or using structural vibration control technologies to minimize any forces and deformations.
This book highlights on seismic-resistance design of masonry and reinforced concrete structures to be constructed in addition to safety assessment, strengthening and rehabilitation of existing structures in contrast to earthquake loads. This book focuses on earthquake-resistant structures, such as, buildings, bridges and liquid storage tanks. It covers topics in the field of earthquake engineering. The book provides the contemporary topics on recent progress in earthquake-resistant structures and a helpful tool for graduate students, researchers and practicing structural engineers.
Design, Assessment and Rehabilitation CRC Press
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.
Earthquake Resistant Engineering Structures X World Scientific
Earthquake-resistant Design of Structures 2e is designed for undergraduate students of civil engineering.
The architecture of earthquake resistant structures OUP India
Written for engineers without a background in seismic design. Provides design standards and parameters, explaining how to interpret and apply them. Examines and recommends procedures to accommodate the enormous forces and variations in effects common to major earthquakes. Covers practical aspects of soil behavior and structural and foundation design. Gives tips on special construction situations: foundations, dams and retaining walls, strengthening existing structures and construction over active faults.
EARTHQUAKE RESISTANT DESIGN OF STRUCTURES PHI Learning Pvt. Ltd.
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.

Earthquake-Resistant Structures McGraw Hill Professional

Earthquake Design Practice for Buildings, 3rd edition provides comprehensive, practical and easy to read advice for all engineers, designers and analysts of earthquake resistant structures. This new edition has been completely revised to account for the many developments that had taken place since the publication of the bestselling second edition.

Structural Seismic Design Optimization and Earthquake Engineering: Formulations and Applications CRC Press

EARTHQUAKE RESISTANT DESIGN OF STRUCTURESPHI Learning Pvt. Ltd.

Earthquake Resistant Concrete Structures Butterworth-Heinemann

Recent advances in the development of high strength materials, coupled with more advanced computational methods and design procedures, have led to a new generation of tall and slender buildings. These structures are very sensitive to the most common dynamic loads; wind and earthquakes. The primary requirement for a successful design is to provide safety while taking into account serviceability requirements. This book provides a well-balanced and broad coverage of the information needed for the design of structural systems for wind- and earthquake-resistant buildings. It covers topics such as the basic concepts in structural dynamics and structural systems, the assessment of wind and earthquake loads acting on the system, the evaluation of the system response to such dynamic loads and the design for extreme loading. The text is generously illustrated and supported by numerical examples and will be of great interest to practising engineers and researchers in structural, civil and design engineering and also to architects. The author has drawn on his experience as a teacher, researcher and consultant.

Fundamentals of Earthquake-Resistant Construction UNESCO

Earthquake Resistant Design and Risk Reduction, 2nd edition is based upon global research and development work over the last 50 years or more, and follows the author’s series of three books Earthquake Resistant Design, 1st and 2nd editions (1977 and 1987), and Earthquake Risk Reduction (2003). Many advances have been made since the 2003 edition of Earthquake Risk Reduction, and there is every sign that this rate of progress will continue apace in the years to come. Compiled from the author’s wide design and research experience in earthquake engineering and engineering seismology, this key text provides an excellent treatment of the complex multidisciplinary process of earthquake resistant design and risk reduction. New topics include the creation of low-damage structures and the spatial distribution of ground shaking near large fault ruptures. Sections on guidance for developing countries, response of buildings to differential settlement in liquefaction, performance-based and displacement-based design and the architectural aspects of earthquake resistant design are heavily revised. This book: Outlines individual national weaknesses that contribute to earthquake risk to people and property Calculates the seismic response of soils and structures, using the structural continuum “Subsoil – Substructure – Superstructure –

Non–structure" Evaluates the effectiveness of given design and construction procedures for reducing casualties and financial losses Provides guidance on the key issue of choice of structural form Presents earthquake resistant design methods for the main four structural materials – steel, concrete, reinforced masonry and timber – as well as for services equipment, plant and non-structural architectural components Contains a chapter devoted to problems involved in improving (retrofitting) the existing built environment This book is an invaluable reference and guiding tool to practising civil and structural engineers and architects, researchers and postgraduate students in earthquake engineering and engineering seismology, local governments and risk management officials.

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