

Geotechnical, Geological and Earthquake Engineering

Alper Ilki
Michael N. Fardis *Editors*

Seismic Evaluation and Rehabilitation of Structures



Springer

Seismic Evaluation And Rehabilitation Of Structures Geotechnical Geological And Earthquake Engineering

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Seismic Evaluation And Rehabilitation Of Structures Geotechnical Geological And Earthquake Engineering:

Seismic Evaluation and Rehabilitation of Structures Alper Ilki, Michael N. Fardis, 2013-08-15 In the past facilities considered to be at the end of their useful life were demolished and replaced with new ones that better met the functional requirements of modern society including new safety standards Humankind has recently recognised the threats to the environment and to our limited natural resources due to our relentless determination to destroy the old and build anew With the awareness of these constraints and the emphasis on sustainability in future the majority of old structures will be retrofitted to extend their service life as long as feasible In keeping with this new approach the EU s Construction Products Regulation 305 2011 which is the basis of the Eurocodes included the sustainable use of resources as an Essential Requirement for construction So the forthcoming second generation of EN Eurocodes will cover not only the design of new structures but the rehabilitation of existing ones as well Most of the existing building stock and civil infrastructures are seismically deficient When the time comes for a decision to prolong their service life with the help of structural and architectural upgrading seismic retrofitting may be needed Further it is often decided to enhance the earthquake resistance of facilities that still meet their functional requirements and fulfil their purpose if they are not earthquake safe In order to decide how badly a structure needs seismic upgrading or to prioritise it in a population of structures a seismic evaluation is needed which also serves as a guide for the extent and type of strengthening Seismic codes do not sufficiently cover the delicate phase of seismic evaluation nor the many potential technical options for seismic upgrading therefore research is on going and the state of the art is constantly evolving All the more so as seismic evaluation and rehabilitation demand considerable expertise to make best use of the available safety margins in the existing structure to adapt the engineering capabilities and techniques at hand to the particularities of a project to minimise disruption of use etc Further as old structures are very diverse in terms of their materials and layout seismic retrofitting does not lend itself to straightforward codified procedures or cook book approaches As such seismic evaluation and rehabilitation need the best that the current state of the art can offer on all aspects of earthquake engineering This volume serves this need as it gathers the most recent research of top seismic experts from around the world on seismic evaluation retrofitting and closely related subjects

Earthquake Geotechnical Engineering Design Michele Maugeri, Claudio Soccodato, 2014-02-03 Pseudo static analysis is still the most used method to assess the stability of geotechnical systems that are exposed to earthquake forces However this method does not provide any information about the deformations and permanent displacements induced by seismic activity Moreover it is questionable to use this approach when geotechnical systems are affected by frequent and rare seismic events Incidentally the peak ground acceleration has increased from 0.2 to 0.3 g in the seventies to the current value of 0.6 to 0.8 g Therefore a shift from the pseudo static approach to performance based analysis is needed Over the past five years considerable progress has been made in Earthquake Geotechnical Engineering Design EGED The most recent advances are

presented in this book in 6 parts The evaluation of the site amplification is covered in Part I of the book In Part II the evaluation of the soil foundation stability against natural slope failure and liquefaction is treated In the following 3 Parts of the book the EGED for different geotechnical systems is presented as follows the design of levees and dams including natural slopes in Part III the design of foundations and soil structure interaction analysis in Part IV underground structures in Part V Finally in Part VI new topics like the design of reinforced earth retaining walls and landfills are covered

Guide for Strengthening of Concrete Structures FIB – International Federation for Structural Concrete, 2022-05-01 The idea of preparing a technical document for the repairs and interventions upon concrete structures goes back to the former fib COM 5 Structural Service Life Aspects being the goal of the then TG 5.9 After a long period of reduced activity and taking into account the reorganization of fib commissions that meanwhile took place on June 2017 a different approach was proposed to push forward the task of TG 8.1 formerly TG 5.9 The new goal of TG 8.1 was to deliver a how to do guide gathering together protection repair and strengthening techniques for concrete structures Chapters are intended to provide both guidelines and case studies serving as support to the application of fib MC 2020 pre normative specifications Each chapter was written by an editorial team comprising desirably at least a researcher a designer and a contractor Templates have been prepared in order to harmonize the contents and the presentation of the different methods Following the writing process chapters were reviewed by experts and after amendments by the authors they underwent a second review process by COM 8 and TG 3.4 members as well as by different practitioners For each protection repair and strengthening method addressed in this guide readers have a description of when to adopt it which materials and systems are required which techniques are available and what kind of equipment is needed It then presents a summary of stakeholders roles and qualifications design guidelines referring to most relevant codes and references the intervention procedure quality control measures and monitoring and maintenance activities Due to the extent of the guide it was decided to publish it as bulletin 102 addressing protection and repair methods and bulletin 103 addressing strengthening methods We would like to thank the authors reviewers and members of COM 8 and TG 3.4 for their work in developing this fib Bulletin which we hope will be useful for professionals working in the field of existing concrete structures especially those concerned with life cycle management and conservation activities As noted above this Bulletin is also intended to act as a background and supporting document to the next edition of the fib Model Code for Concrete Structures which is currently under development under the auspices of TG10.1 with the working title of fib Model Code 2020

NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings Eugene Zeller, 2000-06 This document from the National Earthquake Hazards Reduction Program NEHRP was prepared for the Building Seismic Safety Council BSSC with funding from the Federal Emergency Management Agency FEMA It provides commentary on the NEHRP Guidelines for the Seismic Rehabilitation of Buildings It contains systematic guidance enabling design professionals to formulate effective reliable rehabilitation approaches that will limit the expected earthquake damage

to a specified range for a specified level of ground shaking This kind of guidance applicable to all types of existing buildings in all parts of the country has never existed before Illustrated *Energy and Seismic Renovation Strategies for Sustainable Cities* Giuseppe Margani, 2019-06-11 The principle of sustainability should be strictly connected with safety since both aim to conserve resources in the case of sustainability the resources are typically thought of as environmental while in the case of safety the resources are basically human In spite of this common ground discussions on sustainability usually give insufficient attention to safety In the last years the EU has made large investments to increase the energy efficiency of the existing building stock paving the way for a low carbon future however less effort has been made to enhance its seismic resilience Therefore the safety and consequently the sustainability of towns situated in earthquake prone countries remain inadequate In such countries energy renovation actions should be combined with seismic retrofitting However a number of barriers considerably limit the real possibility of extensively undertaking combined retrofit actions especially for multi owner housing and high rise buildings These barriers are of different kinds technical e g unfeasibility and or ineffectiveness of conventional retrofit solutions financial e g high renovation costs insufficient incentives subsidies organizational e g occupants disruption and relocation renovation consensus by condominium ownerships and cultural social insufficient information and skills lack of adequate policy measures for promoting renovation actions This book aims to overcome these barriers and to bridge the gap between sustainability and safety so to conserve both human and environmental resources

Brick and Block Masonry Claudio Modena, F. da Porto, M.R. Valluzzi, 2016-11-03 *Brick and Block Masonry Trends Innovations and Challenges* contains the lectures and regular papers presented at the 16th International Brick and Block Masonry Conference Padova Italy 26-30 June 2016 The contributions cover major topics Analysis of masonry structures Bond of composites to masonry Building physics and durability Case studies Codes and standards Conservation of historic buildings Earthen constructions Eco materials and sustainability Fire resistance blasts and impacts Masonry bridges arches and vaults Masonry infill walls and RC frames Masonry materials and testing Masonry repair and strengthening New construction techniques and technologies Reinforced and confined masonry Seismic performance and vulnerability assessment In an ever changing world in which innovations are rapidly implemented but soon surpassed the challenge for masonry the oldest and most traditional building material is that it can address the increasingly pressing requirements of quality of living safety and sustainability This abstracts volume and full paper USB device focusing on challenges innovations trends and ideas related to masonry in both research and building practice will prove to be a valuable source of information for researchers and practitioners masonry industries and building management authorities construction professionals and educators *Proceedings of 17th Symposium on Earthquake Engineering (Vol. 2)* Manish Shrikhande, Pankaj Agarwal, P. C. Ashwin Kumar, 2023-07-19 This book presents select proceedings of the 17th Symposium on Earthquake Engineering organized by the Department of Earthquake Engineering Indian Institute of Technology Roorkee The topics covered in the

proceedings include engineering seismology and seismotectonics earthquake hazard assessment seismic microzonation and urban planning dynamic properties of soils and ground response ground improvement techniques for seismic hazards computational soil dynamics dynamic soil structure interaction codal provisions on earthquake resistant design seismic evaluation and retrofitting of structures earthquake disaster mitigation and management and many more This book also discusses relevant issues related to earthquakes such as human response and socioeconomic matters post earthquake rehabilitation earthquake engineering education public awareness participation and enforcement of building safety laws and earthquake prediction and early warning system This book is a valuable reference for researchers and professionals working in the area of earthquake engineering

Engineering Materials, Structures, Systems and Methods for a More Sustainable Future Alphose Zingoni, 2025-08-07 Engineering Materials Structures Systems and Methods for a More Sustainable Future comprises 275 papers that were presented at SEMC 2025 the Ninth International Conference on Structural Engineering Mechanics and Computation This event held in Cape Town South Africa from 1 to 3 September 2025 was attended by around 300 participants from 42 countries worldwide The Proceedings are divided into 15 sections The various topics may be grouped into five broad categories covering i the mechanics of materials solids and structures ii numerical modelling computational simulations and experimental testing iii analysis design and construction in the traditional engineering materials iv innovative engineering materials structures and methods v maintenance long term performance life cycle considerations and sustainable construction Engineering Materials Structures Systems and Methods for a More Sustainable Future will be of interest to civil structural mechanical marine and aerospace engineers as well as planners and architects Two versions of the papers are available full papers of length six pages are included in the e book while short papers of length two pages intended to be concise but self contained summaries of the full papers are in the printed book

Resilient Structures and Infrastructure Ehsan Noroozinejad Farsangi, Izuru Takewaki, Tony Y. Yang, Abolhassan Astaneh-Asl, Paolo Gardoni, 2019-05-03 This book discusses resilience in terms of structures and infrastructures responses to extreme loading conditions These include static and dynamic loads such as those generated by blasts terrorist attacks seismic events impact loadings progressive collapse floods and wind In the last decade the concept of resilience and resilient based structures has increasingly gained in interest among engineers and scientists Resilience describes a given structure s ability to withstand sudden shocks In other words it can be measured by the magnitude of shock that a system can tolerate This book offers a valuable resource for the development of new engineering practices codes and regulations public policy and investigation reports on resilience and provides broad and integrated coverage of the effects of dynamic loadings and of the modeling techniques used to compute the structural response to these loadings

Earthquake Engineering Yousef Bozorgnia, Vitelmo V. Bertero, 2004-05-11 This multi contributor book provides comprehensive coverage of earthquake engineering problems an overview of traditional methods and the scientific background on recent developments It discusses computer methods on

structural analysis and provides access to the recent design methodologies and serves as a reference for both professionals and researchers

Seismic Risk Assessment and Retrofitting Alper Ilki, Faruk Karadogan, Sumru Pala, Ercan Yuksel, 2009-10-03 Many more people are coming to live in earthquake prone areas especially urban ones. Many such areas contain low rise low cost housing while little money is available to retrofit the buildings to avoid total collapse and thus potentially save lives. The lack of money especially in developing countries is exacerbated by difficulties with administration implementation and public awareness. The future of modern earthquake engineering will come to be dominated by new kinds of measuring technologies, new materials developed especially for low rise low cost buildings, simpler and thus lower cost options for retrofitting, cost cutting and raising public awareness. The book covers all the areas involved in this complex issue from the prevention of total building collapse through improvement techniques to legal financial taxation and social issues. The contributors have all made valuable contributions in their own particular fields; all of them are or have been closely involved with the issues that can arise in seismic zones in any country. The recent research results published here offer invaluable pointers to practicing engineers and administrators as well as other scientists whose work involves saving the lives and property of the many millions of people who live and work in hazardous buildings.

Seismic Behaviour and Design of Irregular and Complex Civil Structures IV Rita Bento, Mario De Stefano, Dietlinde Köber, Zbigniew Zembaty, 2022-01-18 This volume contains papers of the 9th European Workshop on the Seismic Behaviour of Irregular and Complex Structures (9EWICS) held in Lisbon, Portugal, in 2020. This workshop, organized at Instituto Superior Técnico University of Lisbon, continued the successful three annual series of workshops started back in 1996. Its organization had the sponsorship of Working Group 8 Seismic Behaviour of Irregular and Complex Structures of the European Association of Earthquake Engineering. This international event provided a platform for discussion and exchange of ideas and unveiled new insights on the possibilities and challenges of irregular and complex structures under seismic actions. The topics addressed include criteria for regularity, seismic design of irregular structures, seismic assessment of irregular and complex structures, retrofit of irregular and complex structures, and soil structure interaction for irregular and complex structures. Beyond an excellent number of interesting papers on these topics, this volume includes the papers of the two invited lectures: one devoted to irregularities in RC buildings including perspectives in current seismic design codes, difficulties in their application and further research needs; and another one dedicated to the challenging and very up to date topic in the area of seismic response of masonry building aggregates in historical centers. This volume includes 26 contributions from authors of 11 countries, giving a complete and international view of the problem. It holds particular interest for all the community involved in the challenging task of seismic design, assessment and/or retrofit of irregular and complex structures.

Modern Earthquake Engineering Junbo Jia, 2016-10-01 This book addresses applications of earthquake engineering for both offshore and land based structures. It is self contained as a reference work and covers a wide range of topics including topics related to

engineering seismology geotechnical earthquake engineering structural engineering as well as special contents dedicated to design philosophy determination of ground motions shock waves tsunamis earthquake damage seismic response of offshore and arctic structures spatial varied ground motions simplified and advanced seismic analysis methods sudden subsidence of offshore platforms tank liquid impacts during earthquakes seismic resistance of non structural elements and various types of mitigation measures etc The target readership includes professionals in offshore and civil engineering officials and regulators as well as researchers and students in this field

Seismic Assessment and Rehabilitation of Existing Buildings S.

Tanvir Wasti, Güney Özcebe, 2012-12-06 The present volume contains a total of 23 papers centred on the research area of Seismic Assessment and Rehabilitation of Existing Buildings This subject also forms the core of Project SfP977231 sponsored by the NATO Science for Peace Office and supported by the Scientific and Technical Research Council of Turkey TUBITAK Most of these papers were presented by the authors at a NATO Science for Peace Workshop held in Izmir on 13-14 May 2003 and reflect a part of their latest work conducted within the general confines of the title of the NATO Project Middle East Technical University Ankara Turkey serves as the hub of Project SfP977231 and coordinates research under the project with universities within Turkey e.g. Istanbul Technical University and Kocaeli University and with partner institutions in Greece and the Former Yugoslav Republic of Macedonia A few articles have also been contributed by invited experts who are all noted researchers in the field Altogether the contents of the volume deal with a vast array of problems in Seismic Assessment and Rehabilitation and cover a wide range of possible solutions techniques and proposals It is intended to touch upon many of these aspects separately below Earthquakes constitute possibly the most widely spread and also the most feared of natural hazards Recent earthquakes within the first six months of 2003 such as the Bingöl Earthquake in Turkey and the Algerian earthquake have caused both loss of life and severe damage to property

Handbook of Research on Seismic

Assessment and Rehabilitation of Historic Structures Asteris, Panagiotis G., Plevris, Vagelis, 2015-07-13 Rehabilitation of heritage monuments provides sustainable development and cultural significance to a region The most sensitive aspect of the refurbishment of existing buildings lies in the renovation and recovery of structural integrity and public safety The Handbook of Research on Seismic Assessment and Rehabilitation of Historic Structures evaluates developing contributions in the field of earthquake engineering with regards to the analysis and treatment of structural damage inflicted by seismic activity This book is a vital reference source for professionals researchers students and engineers active in the field of earthquake engineering who are interested in the emergent developments and research available in the preservation and rehabilitation of heritage buildings following seismic activity

Structural Analysis of Historical Constructions:

Anamnesis, Diagnosis, Therapy, Controls Koen Van Balen, Els Verstrynghe, 2016-11-03 Structural Analysis of Historical Constructions Anamnesis diagnosis therapy controls contains the papers presented at the 10th International Conference on Structural Analysis of Historical Constructions SAHC2016 Leuven Belgium 13-15 September 2016 The main theme of the

book is Anamnesis Diagnosis Therapy Controls which emphasizes the importance of all steps of a restoration process in order to obtain a thorough understanding of the structural behaviour of built cultural heritage The contributions cover every aspect of the structural analysis of historical constructions such as material characterization structural modelling static and dynamic monitoring non destructive techniques for on site investigation seismic behaviour rehabilitation traditional and innovative repair techniques and case studies A special focus has been put on six specific themes Innovation and heritage Preventive conservation Computational strategies for heritage structures Sustainable strengthening of masonry with composites Values and sustainability and Subsoil interaction The knowledge insights and ideas in Structural Analysis of Historical Constructions Anamnesis diagnosis therapy controls make this book of abstracts and the corresponding digital full colour conference proceedings containing the full papers must have literature for researchers and practitioners involved in the structural analysis of historical constructions

Latest Developments in Geotechnical Earthquake Engineering and Soil Dynamics T.G. Sitharam,Ravi Jakka,Sreevalsa Kolathayar,2021-07-01 This volume brings together contributions from world renowned researchers and practitioners in the field of geotechnical engineering The chapters of this book are based on the keynote and invited lectures delivered at the 7th International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics The book presents advances in the field of soil dynamics and geotechnical earthquake engineering A strong emphasis is placed on proving connections between academic research and field practice with many examples case studies best practices and discussions on performance based design This volume will be of interest to research scholars academicians and industry professionals alike

Seismic Retrofit of Existing Reinforced Concrete Buildings Stelios Antoniou,2023-01-31 Seismic Retrofit of Existing Reinforced Concrete Buildings Understand the complexities and challenges of retrofitting building infrastructure Across the world buildings are gradually becoming structurally unsound Many were constructed before seismic load capacity was a mandatory component of building standards and were often built with low quality materials or using unsafe construction practices Many more are simply aging with materials degrading and steel corroding As a result efforts are ongoing to retrofit existing structures and to develop new techniques for assessing and enhancing seismic load capacity in order to create a safer building infrastructure worldwide Seismic Retrofit of Existing Reinforced Concrete Buildings provides a thorough book length discussion of these techniques and their applications Balancing theory and practice the book provides engineers with a broad base of knowledge from which to approach real world seismic assessments and retrofitting projects It incorporates knowledge and experience frequently omitted from the building design process for a fuller account of this critical engineering subfield Seismic Retrofit of Existing Reinforced Concrete Buildings readers will also find Detailed treatment of each available strengthening technique complete with advantages and disadvantages In depth guidelines to select a specific technique for a given building type and or engineering scenario Step by step guidance through the assessment retrofitting process Seismic Retrofit of Existing Reinforced Concrete

Buildings is an ideal reference for civil and structural engineering professionals and advanced students particularly those working in seismically active areas **The National Earthquake Hazards Reduction Program** United States. Congress. House. Committee on Science. Subcommittee on Research,2003 *Proceedings of the International Conference on Earthquake Engineering and Structural Dynamics* Rajesh Rupakhety,Simon Olafsson,Bjarni Bessason,2018-06-30 This book includes a collection of chapters that were presented at the International Conference on Earthquake Engineering and Structural Dynamics ICESD held in Reykjavik Iceland between 12 14 June 2017 The contributions address a wide spectrum of subjects related to wind engineering earthquake engineering and structural dynamics Dynamic behavior of ultra long span bridges that are discussed in this volume represent one of the most challenging and ambitious contemporary engineering projects Concepts principles and applications of earthquake engineering are presented in chapters addressing various aspects such as ground motion modelling hazard analysis structural analysis and identification design and detailing of structures risk due to non structural components and risk communication and mitigation The presented chapters represent the state of the art in these fields as well as the most recent developments

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