

# Drain 2dx User Guide

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## REYNOLDS CRUZ

*Behaviour of Steel Structures in Seismic Areas* CRC Press  
Complete, practical coverage of the evaluation, analysis, and design and code requirements of seismic isolation systems. Based on the concept of reducing seismic demand rather than increasing the earthquake resistance capacity of structures, seismic isolation is a surprisingly simple approach to earthquake protection. However, proper application of this technology within complex seismic design code requirements is both complicated and difficult. Design of Seismic Isolated Structures provides complete, up-to-date coverage of seismic isolation, complete with a systematic development of concepts in theory and practical application supplemented by numerical examples. This book helps design professionals navigate and understand the ideas and procedures involved in the analysis, design, and development of specifications for seismic isolated structures. It also provides a framework for satisfying code requirements while retaining the favorable cost-effective and damage control aspects of this new technology. An indispensable resource for practicing and aspiring engineers and architects, Design of Seismic Isolated Structures includes: \* Isolation system components. \* Complete coverage of code provisions for seismic isolation. \* Mechanical characteristics and modeling of isolators. \* Buckling and stability of elastomeric isolators. \* Examples of seismic isolation designs. \* Specifications for the design, manufacture, and testing of isolation devices.

*Proceedings of the 4th International Specialty Conference, Naples, Italy, 9-12 June 2003* CRC Press

discusses the new developments in the field of earthquake engineering and allied areas, \* gives information about present state-of-the-art and current practices adopted globally in prediction and mitigation of earthquake hazards, \* explores novel and innovative methods for prediction and mitigation of hazards considering the future earthquakes for building sustainable/ safe infrastructures and ensuring safety of community.

*Earthquake Resistant Engineering Structures VI* WIT Press

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 res

*Local/global Approach to Nonlinear Simulation of Compliant Marine Structures* Routledge

This is a review of developments in the behaviour and design of steel structures in seismic areas. The proceedings look at the analytical and experimental research on the seismic response of steel structures, and cover topics such as global behaviour and codification, design and application.

*Refined Inelastic Truss Bar Element (Type 01) with Isotropic Hardening for DRAIN-2DX* Springer Nature

Geotechnical Earthquake Engineering and Soil Dynamics, as well as their interface with Engineering Seismology, Geophysics and Seismology, have all made remarkable progress over the past 15 years, mainly due to the development of instrumented large scale experimental facilities, to the increase in the quantity and quality of recorded earthquake data, to the numerous well-documented case studies from recent strong earthquakes as well as enhanced computer capabilities. One of the major factors contributing to the aforementioned progress is the increasing social need for a safe urban environment, large infrastructures and essential facilities. The main scope of our book is to provide the geotechnical engineers, geologists and seismologists, with the most recent advances and developments in the area of earthquake geotechnical engineering, seismology and soil dynamics.

**Seismic Design Methodologies for the Next Generation of Codes** CRC Press

This book assembles, identifies and highlights the most recent developments in Rehabilitation and retrofitting of historical and heritage structures. This is an issue of paramount importance in countries with great built cultural heritage that also suffer from high seismicity, such as the countries of the eastern Mediterranean basin. Heritage structures range from traditional residential constructions to monumental structures, ancient temples, towers, castles, etc. It is generally recognized that these structures present particular difficulties in seismic response calculation through computer simulation due to the complexity of the structural system which is, generally, inhomogeneous, with several contact problems, gaps/joints, nonlinearities and brittleness in material constituents. This book contains selected papers from the ECCOMAS Thematic Conferences on Computational Methods in Structural Dynamics & Earthquake

Engineering (COMPdyn) that were held in Corfu, Greece in 2011 and Kos, Greece in 2013. The Conferences brought together the scientific communities of Computational Mechanics, Structural Dynamics and Earthquake Engineering in an effort to facilitate the exchange of ideas in topics of mutual interest and to serve as a platform for establishing links between research groups with complementary activities.

*Seismic Behaviour and Design of Irregular and Complex Civil Structures* Springer Science & Business Media

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.

**6-11 September 1998, Paris, France** CRC Press

This book forms the proceedings of the International Workshop organised by the European Convention for Constructional Steelwork held in Timisoara, Romania, in June 1994. It presents the latest progress in theoretical and experimental research on the behaviour of steel structures in seismic areas, taking into account the basic problems of local and global ductility, codification, design and applications. It relates strongly to the activities on international codification taking place in Europe.

**From Theory to Practice** CRC Press

Proceedings of the June, 1998 conference. Seventy contributions discuss Monte Carlo and signal processing methods, random vibrations, safety and reliability, control/optimization and modeling of nonlinearity, earthquake engineering, random processes and fields, damage/fatigue materials, applied prob  
*Computational Methods in Earthquake Engineering* CRC Press  
This report presents reliable techniques for modeling extremely compliant structures. The research focuses on severe geometric nonlinearities associated with very large displacements and rotations. The solution requires two major modeling improvements: formulation of well-conditioned finite elements and development of specific control strategies for nonlinear step-by-step solution. Inherent in the physics of the structure, natural events condition the new finite elements. Associated event control directs the numerical solution to adhere closely to the true nonlinear structural response path. The numerical strategies are a simple extension of the trapezoidal rule for time integration and Newton iteration for nonlinear step-by-step solution. The result is extremely fast, efficient, and stable nonlinear structural simulation. A high level of computational robustness is essential for development of fully nonlinear substructured models. A local/global approach allows each substructure to have its own specialized local submodel and its own associated local solution strategy. A global model then integrates all the super-element representations of each diverse submodel. The local/global framework allows the nonlinear solution strategies to efficiently concentrate computational power where and when needed among the submodels. Code development and test problems focus primarily on compliant marine structures, where the need for robust, highly nonlinear simulation is so great.

*Proceedings of the Third National Seismic Conference on Bridges and Highways* Springer Science & Business Media

This set of proceedings is based on the International Conference on Advances in Building Technology in Hong Kong on 4-6 December 2002. The two volumes of proceedings contain 9 invited keynote papers, 72 papers delivered by 11 teams, and 133 contributed papers from over 20 countries around the world. The papers cover a wide spectrum of topics across the three technology sub-themes of structures and construction, environment, and information technology. The variety within these categories spans a width of topics, and these proceedings provide readers with a good general overview of recent advances in building research.

*New Advances in Modal Synthesis of Large Structures: Non-linear Damped and Non-deterministic Cases* Taylor & Francis

This book provides an insight on advanced methods and concepts for the design and analysis of structures against earthquake loading. This second volume is a collection of 28 chapters written by leading experts in the field of structural analysis and earthquake engineering. Emphasis is given on current state-of-the-art methods and concepts in computing methods and their application in engineering practice. The book content is suitable for both practicing engineers and academics, covering a wide variety of topics in an effort to assist the timely dissemination of research findings for the mitigation of seismic risk. Due to the devastating socioeconomic consequences of seismic events, the topic is of great scientific interest and is expected to be of valuable help to scientists and engineers. The chapters of this volume are extended versions of selected papers presented at the COMPdyn 2011 conference, held in the island of Corfu, Greece, under the auspices of the European Community on Computational Methods in Applied Sciences (ECCOMAS).

*From Engineering Seismology to Performance-Based Engineering* I. K. International Pvt Ltd

Drain-2DX User Guide  
Drain-2DXBase Program User Guide  
DRAIN-2DXElement Description and User Guide for Element Type 01, Type 02, Type 04, Type 06, Type 09, and Type 15 :  
Version 1.10

Drain-2D User's Guide  
STESSA 2000: Behaviour of Steel Structures in Seismic Areas  
Proceedings of the Third International Conference STESSA 2000, Montreal, Canada, 21-24 August 2000  
CRC Press

*Practical Deterministic and Probabilistic Approaches* CRC Press

Structural irregularities are one of the most frequent causes of severe damages in buildings, as evidenced by the numerous earthquakes in recent years. This issue is of particular importance, since real structures are almost all irregular. Furthermore, structural irregularities depend on several factors often very difficult to predict. This book is an essential tool for understanding the problem of structural irregularities and provides the most up-to-date review on this topic, covering the aspects of ground rotations, analysis, design, control and monitoring of irregular structures. It includes 24 contributions from authors of 13 countries, giving a complete and international view of the problem.

*DRAIN-2D - a general purpose computer program for dynamic analysis of inelastic plane structures with user's guide and supplement* Drain-2DX User Guide  
Drain-2DXBase Program User Guide  
DRAIN-2DXElement Description and User Guide for Element Type 01, Type 02, Type 04, Type 06, Type 09, and Type 15 :  
Version 1.10

Drain-2D User's Guide  
STESSA 2000: Behaviour of Steel Structures in Seismic Areas  
Proceedings of the Third International Conference STESSA 2000, Montreal, Canada, 21-24 August 2000

This handbook contains up-to-date existing structures, computer applications, and information on planning, analysis, and design seismic design of wood structures. A new and very useful feature of this edition of earthquake-resistant building structures. Its intention is to provide engineers, architects, is the inclusion of a companion CD-ROM disc developers, and students of structural containing the complete digital version of the handbook itself and the following very engineering and architecture with authoritative, yet practical, design information. It represents important publications: an attempt to bridge the persisting gap between I. UBC-IBC (1997-2000) Structural advances in the theories and concepts of Comparisons and Cross References, ICBO, earthquake-resistant design and their 2000.

implementation in seismic design practice. 2. NEHRP Guidelines for the Seismic Rehabilitation of Buildings, FEMA-273, Federal Emergency Management Agency, composed of 22 experts from industry and universities, recognized for their knowledge and 1997. extensive practical experience in their fields. 3. NEHRP Commentary on the Guidelines for They have aimed to present clearly and the Seismic Rehabilitation of Buildings, FEMA-274, Federal Emergency Management Agency, composed of 22 experts from industry and universities, recognized for their knowledge and 1997. practical examples the application of these 4. NEHRP Recommended Provisions for principles and procedures in seismic design Seismic Regulations for New Buildings and practice. Where applicable, the provisions of Older Structures, Part 1 - Provisions, various seismic design standards such as mc FEMA-302, Federal Emergency Management Agency, 2000, UBC-97, FEMA-273/274 and ATC-40 Management Agency, 1997.

*Advances in Building Technology* Springer Science & Business Media

The problem of protecting the built environment in earthquake-prone regions of the world involves not only the optimal design

and construction of new facilities, but also the upgrading and rehabilitation of existing structures and infrastructures. The latter is a laborious and expensive task, which can be accomplished only gradually. However, the inestimable loss of life and the colossal costs following a major earthquake in a metropolitan area provide sufficient reason to make it an important challenge for the scientific and technical community. Containing papers presented at the Sixth International Conference on Earthquake Resistance and Engineering Structures, this book will be invaluable to engineers, scientists and managers working in industry, academia, research organizations and governments. The book encompasses a wide range of topics such as: Site Effects and Geotechnical aspects; Earthquake resistant design; Seismic Behaviour and Vulnerability; Structural Dynamics; Monitoring and Testing; Bridges; Heritage Buildings; Masonry Construction; Retrofitting; Passive Protection Devices and Seismic Isolation; Lifelines; Design Codes and Response Spectre.

**Moment Resistant Connections of Steel Frames in Seismic Areas** CRC Press

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.

**Design of Seismic Isolated Structures** Frontiers Media SA  
This is a collection of peer-reviewed papers originally presented at the 19th Australasian Conference on the Mechanics of Structures and Materials by academics, researchers and practitioners largely from Australasia and the Asia-Pacific region. The topics under discussion include: composite structures and materials; computational mechanics; dynamic analysis of structures; earthquake engineering; fire engineering; geomechanics and foundation engineering; mechanics of materials; reinforced and prestressed concrete structures; shock and impact loading; steel structures; structural health monitoring and damage identification; structural mechanics; and timber engineering. It is a valuable reference for academics, researchers, and civil and

mechanical engineers working in structural and material engineering and mechanics.

**DRAIN-2DX** Springer

Nowadays, numerical computation has become one of the most vigorous tools for scientists, researchers and professional engineers, following the enormous progress made during the last decades in computing technology, in terms of both computer hardware and software development. Although this has led to tremendous achievements in computer-based structural engineering, the increasing necessity of solving complex problems in engineering requires the development of new ideas and innovative methods for providing accurate numerical solutions in affordable computing times. This collection aims at providing a forum for the presentation and discussion of state-of-the-art innovative developments, concepts, methodologies and approaches in scientific computation applied to structural engineering. It involves a wide coverage of timely issues on computational structural engineering with a broad range of both research and advanced practical applications. This Research Topic encompasses, but is not restricted to, the following scientific areas: modeling in structural engineering; finite element methods; boundary element methods; static and dynamic analysis of structures; structural stability; structural mechanics; meshless methods; smart structures and systems; fire engineering; blast engineering; structural reliability; structural health monitoring and control; optimization; and composite materials, with application to engineering structures. *Proceedings of the 19th Australasian Conference on the Mechanics of Structures and Materials (ACMSM19), Christchurch, New Zealand, 29 November - 1 December 2006* CRC Press  
The increasing necessity to solve complex problems in Structural Dynamics and Earthquake Engineering requires the development of new ideas, innovative methods and numerical tools for providing accurate numerical solutions in affordable computing times. This book presents the latest scientific developments in Computational Dynamics, Stochastic Dynam