

Advanced Materials and Structural EngineeringAdvances in Bridge Maintenance, Safety Management, and Life-Cycle Performance, Set of Book & CD-ROM.

ADVANCED MODELLING TECHNIQUES IN STRUCTURAL DESIGN: BLAST PROTECTION OF CIVIL INFRASTRUCTURES AND CIVIL BUILDINGS USING ABAQUS FINITE ELEMENT PACKAGE.

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or when head accelerations are so extreme that brain injury is easily detectable. Less understood are the mechanisms behind bTBI when external signs of trauma are not present and initially the person retains most of their cognitive abilities and shows no signs of mental health issues. Most helmets and personnel protective equipment (PPE) are primarily designed to reduce the head acceleration on an impact or when head acceleration is the primary mode of injury. However, improvements to better mitigate the effects of an explosive blast are desirable and studies are needed to specifically measure and evaluate the blast performance of PPE systems.

An experiment was developed that uses a compressed gas driven open-end shock tube to impinge a square target plate with a shock wave similar to one resulting when detonating an explosive charge. Since this experiment is intended to evaluate the ability of materials to mitigate the effects of the blast resistant helmet, the target plate dimensions are representative of the frontal area and approximate skull thickness of the human head. The target plate was clamped in a rigid fixture and several blast experiments were conducted with test panels of different material composition placed in front of the instrumented target plate. Several performance metrics were established based on the literature and were used to evaluate the mitigation effectiveness of the test panels. Since numerical simulations can be used to study multiple variables at multiple locations and provide a deeper understanding of the event, a numerical simulation of the experimental setup was conducted using the commercial finite element analysis software ABAQUS®. It was found that the polyurethane foam reduced the positive phase specific impulse measured behind the target plate the most (33%), but did not significantly reduce the maximum velocity or deflection of the target plate. The high density polyurethane foam and low density polyurethane foam were able to noticeably reduce the maximum transmitted overpressures, transmitted positive phase specific impulses, and maximum velocities of the target plate and had the highest average percent reductions in the performance metrics out of all the materials tested (29% and 25%). Although it was difficult to detect differences in the deflection of the target plate under the current blast conditions, the experimental setup was able to distinguish differences in all the other performance metrics. The initial numerical modeling that was conducted showed that the Coupled Eulerian-Lagrangian (CEL) solver in ABAQUS® is capable of simulating the compressed gas blast generator and subsequent shock wave loading on the target plate with a reasonable level of accuracy. Although the simulation under predicted the positive phase specific impulses on the target plate by about 20% to 40%, the simulations were able to predict the peak overpressure within about 2% to 13% for all the sensors.

Advances in Engineering Materials, Structures and Systems: Innovations, Mechanics and Computation comprises 411 papers presented at SEMC 2019, the Seventh International Conference on Structural Engineering, Mechanics and Computation, held in Cape Town, South Africa, from 2 to 4 September 2019. The subject matter reflects the broad scope of SEMC conferences, and covers a wide variety of engineering materials (both traditional and innovative) and many types of structures. The many topics featured in these Proceedings can be classified into six broad categories that deal with: (i) the mechanics of materials (elasticity, plasticity, flow through porous media, fluid dynamics, fracture, fatigue, damage, delamination, corrosion, bond, creep, shrinkage, etc.); (ii) the mechanics of structures and systems (structural dynamics, vibration, seismic response, soil-structure interaction, fluid-structure interaction, response to blast and impact, response to fire, structural stability, buckling, collapse behaviour); (iii) the numerical modelling and experimental testing of materials and structures (numerical methods, simulation techniques, multi-scale modelling, computational modeling, laboratory, experimental measurements); (iv) innovations and special structures (nanostructures, adaptive structures, smart structures, composite structures, bio-inspired structures, shell structures, membranes, space structures, lightweight structures, long-span structures, tall buildings, wind turbines, etc.); (v) design in traditional engineering materials (steel, concrete, steel-concrete composite, aluminium, masonry, timber, glass); (vi) the process of architectural design, optimization, assembly, planning, testing, construction, operation, maintenance, monitoring, assessment, repair, strengthening, retrofitting, decommissioning). The SEMC 2019 Proceedings will be of interest to civil, structural, mechanical, marine and aerospace engineers. Researchers, developers, practitioners and academics in these disciplines will find them useful. Two versions of the papers are available. Short versions, intended to be concise but self-contained summaries of the full papers, are in this printed book. The full versions of the papers are in the e-book Collection of selected, peer reviewed papers from the 2013 3rd International Conference on Materials Science and Information Technology (MSIT 2013), September 14-15, 2013. Nanjing, Jiangsu, China. The 958 papers are grouped as follows: Chapter 1: Materials Science and Engineering; Chapter 2: Mechatronics, Control, Testing, Measurement, Instrumentation, Detection and Monitoring Technologies; Chapter 3: Communication, Computer Engineering and Information Technologies; Chapter 4: Data Processing and Applied Computational Methods and Algorithms; Chapter 5: Power Systems and Electronics, Microelectronics and Embedded, Integrated Systems, Electric Applications; Chapter 6: Manufacturing, Industry Development and Automation. Controlling a system's vibrational behavior, whether for reducing harmful vibrations or for enhancing useful types, is critical to ensure safe and economical operation as well as longer structural and equipment lifetimes. A related issue is the effect of vibration on humans and their environment. Achieving control of vibration requires thorough understanding of system behavior followed by an application of measurement, monitoring, and instrumentation to help provide dynamic data, and up-to-date source of tools, techniques, and data for instrumenting, experimenting, monitoring, modeling, and analyzing vibration in a variety of mechanical and structural systems and environments. Drawn from the immensely popular Vibration and Shock Handbook, each expertly crafted chapter of this book includes convenient summary windows, tables, graphs, and lists to provide ready access to the important concepts and results. The authors give equal emphasis to the theoretical and practical aspects, supplying methodologies for analyzing shock, vibration, and seismic behavior. They thoroughly review instrumentation and testing methods such as accelerators, sensors, and LabVIEW® tools for virtual instrumentation as well as signal acquisition, conditioning, and recording. Illustrative examples and case studies accompany a wide array of industrial and experimental techniques, analytical formulations, and design approaches. The book also includes a chapter on human response to vibration. It reflects the broad scope of SEMC conferences, and covers a wide variety of engineering materials (both traditional and innovative) and many types of structures. The many topics featured in these Proceedings can be classified into six broad categories that deal with: (i) the mechanics of materials and fluids (elasticity, plasticity, flow through porous media, fluid dynamics, fracture, fatigue, damage, delamination, corrosion, bond, creep, shrinkage, etc.); (ii) the mechanics of structures and systems (structural dynamics, vibration, seismic response, soil-structure interaction, fluid-structure interaction, response to blast and impact, response to fire, structural stability, buckling, collapse behaviour); (iii) the numerical modelling and experimental testing of materials and structures (numerical methods, simulation techniques, multi-scale modelling, computational modeling, laboratory, experimental measurements); (iv) innovations and special structures (nanostructures, adaptive structures, smart structures, composite structures, bio-inspired structures, shell structures, membranes, space structures, lightweight structures, long-span structures, tall buildings, wind turbines, etc.); (v) design in traditional engineering materials (steel, concrete, steel-concrete composite, aluminium, masonry, timber, glass); (vi) the process of architectural design, optimization, assembly, planning, testing, construction, operation, maintenance, monitoring, assessment, repair, strengthening, retrofitting, decommissioning).
structural failure, develop designs for lighter and highly efficient structural members for blast energy absorption, discuss vulnerability of underground structures, present methods for dampering blast overpressures, discuss structural post blast collapse and give attention to underwater explosion and implosion effects on submerged infrastructure and mitigation measures for future challenges. Challenges in Structural Engineering and Solutions, discusses the latest developments in innovative and integrative technologies and solutions in structural engineering and construction, including: Concrete, masonry, steel and composite structures; Dynamic impact and earthquake engineering; Bridges and Explosions Response of Composites contains key information on the effects of explosions, shock waves, and detonation products (e.g. fragments) on the deflection of composites. The book considers blast response of metal and sandwich composites, along with blast mitigation of composites (including coating systems and energy absorbing materials). Broken down following the key themes: Introduction to explosive blast response of composites, Air explosion blast response of composites, Underwater explosion blast response of composites, and High strain rate and dynamic properties of composites, the book deals with an important and contemporary topic due to the extensive use of composites in applications where blast and explosions are an ever-present threat. Aircraft, armoured vehicles, ships, body armour, and other defense applications. In addition, the growing use of IEDs and other types of bombs used by terrorists to attack civilian and military targets highlights the need for this book. Many terrorist attacks occur in subways, trains, buses, aircraft, buildings, and other civil infrastructure made of composite materials. Designers, engineers and terrorist experts need the essential information to protect civilians, military personnel, and assets from explosive blasts. Focuses on key aspects including both modeling, analysis, and experimental work Written by leading international experts from academia, defense agencies, and other organizations Timely book due to the extensive use of composites in areas where explosive blasts are an ever-present threat in military applications.Effective measurement of the composition and properties of petroleum is essential for its exploration, production, and refining; however, new technologies and methodologies are not adequately documented in much of the current literature. Analytical Methods in Petroleum Upstream Applications explores advances in the analytical methods and instrumentation that allow more accurate determination of the components, classes of compounds, properties, and features of petroleum and its fractions. Recognized experts explore a host of topics, including: A petroleum molecular composition model as a context for other analytical measurements A modern modular sampling system for use in the lab or the field The importance of bitumen in petroleum reservoirs Monitoring the chemical and physical properties of heavy oils, their fractions, and products from their upgrading Analytical measurements and chemical and physical properties using gas chromatography and nuclear magnetic resonance (NMR) applications Asphaltene and heavy ends Analysis Chemometrics and modeling approaches for understanding petroleum composition and properties to improve upstream, midstream, and downstream operations According to the USGS, gas and oil production have been driven by the renewed interest in North America, in part due to technology innovation in analytical methods for a wide range of applications. The understanding provided in this text is designed to help chemists, geologists, and chemical and petroleum engineers make more accurate estimates of the crude value to specific refinery configurations, providing insight into optimum development and extraction schemes.The successful design and construction of iconic new buildings relies on a range of advanced technologies, in particular on advanced modelling techniques. In response to the increasingly complex building and architecture market, structural engineers have developed a range of sophisticated modelling software to carry out the necessary structural analysis and design work. Advanced Modelling Techniques in Structural Design introduces numerical analysis methods to both students and design practitioners. It illustrates the modelling techniques used to solve structural design problems, covering most of the issues that an engineer might face, including continuity and buckling analysis, progressive collapse and maintenance of new materials, linear geometric analysis and buckling analysis. Resolution of these design problems is demonstrated using a range of prestigious projects around the world, including the Burj Khalifa; Willis Towers; Taipei 101; the Gherkin; Millennium Bridge; Millau Viaduct and the Forth Bridge, illustrating the practical steps required to begin a modelling exercise and showing how to select appropriate software tools to address specific design problems.The ICAMEST 2015 Conference covered new developments in advanced materials and engineering structural technology. Applications in civil, mechanical, industrial and material science are covered in this book. Providing high-quality, scholarly research, addressing developments, applications and implications in the field of structural health monitoring, construction safety and management, sensors and measurements. This volume contains new models for nonlinear structural analysis and applications of modeling identification. Furthermore, advanced chemical material testing and applications with mechanical and civil engineering and new materials are discussed. In addition, a new system of pressure regulating and water conveyance based on small and medium hydropower stations is discussed. An experimental investigation of the ultimate strength and behavior of the three types of steel tubular K-joints was presented. Furthermore, real-time and frequency linear and nonlinear modeling performance of materials of structures contents were concluded with the notion of a fully brittle material, and this approach is implemented in the book by outlining a finite element predictions of cracking patterns and cracking pattern development in cracked structures. This book is an ideal reference for practicing engineers in material, mechanical and civil engineering and consultants (design, construction, maintenance), and can also be used as a reference for students in mechanical and civil engineering courses.An up-to-date record of the most recent developments and thinking in the methods, problems and challenges in the field of rock support, including cable bolting, shotcrete in mining, support in rockburst-prone ground, and support design, analysis and applications. This book aims to present specific complicated and puzzling challenges encountered for application of the Finite Element Method (FEM) in solving Structural Engineering problems by using ABAQUS software, which can fully utilize this method in complex simulation and analysis. Therefore, an attempt has been to demonstrate the all process for modeling and analysis of impenetrable problems through simplified step by step illustrations with presenting screenshots from software in each part and also showing graphs. Farzad Hejazi is the Associate Professor in the Department of Civil Engineering, Faculty of Engineering, University Putra Malaysia (UPM), and a Senior Visiting Academic at the University of Sheffield, UK. Hojjat Moghadam Esfahani, an expert on Finite Element Simulation, has more than 10 years of experience in the teaching and training of Finite Element packages, such as ABAQUS. This book comprises select proceedings of the International Conference on Smart Cities and Challenges in Construction, held in 2019. The book contains chapters based on ongoing and future research, policies and financial management, environment, energy, transportation, smart materials, sustainable development, information technologies, data management and urban sociology reflecting the major themes of the conference. The contents focus on current research towards improved governance and efficient management of infrastructure such as water, energy, transportation and housing for sustainable development, economic growth, and improved quality of life, especially for developing countries. This book was written by academicians, researchers, and policy makers interested in academic researchers, and policy makers interested in academic research and developments, advanced research and development, planning, managing, and maintaining smart cities. Proceedings of the Third International Conference on Advanced Composite Materials and Technologies for Aerospace Applications held on May 13-16, 2013, Wrexham, North Wales, United Kingdom. The book presents research papers presented by academicians, researchers, and practicing structural engineers from India and abroad in the recently held Structural Engineering Convention (SEC) 2014 at the red Indian Institute of Technology Delhi during 22nd - 24th December 2014. The book is divided into three volumes and encompasses multidisciplinary areas within structural engineering, such as earthquake engineering and structural dynamics, structural mechanics, finite element methods, structural vibration control, advanced cementitious and composite materials, bridge engineering, and soil-structure interaction. Advances in Structural Engineering is a useful reference material for structural engineering fraternity including undergraduate and postgraduate students, academicians, researchers and practicing engineers. Highlights various aspects of the analysis and design of buildings subject to impact, explosion, and fire. This reference book includes three-dimensional finite element and...
The Vibration and Shock Handbook is just such a reference. From its ambitious scope to its impressive depth, this handbook delivers on its promise to its readers. The book is designed to be a comprehensive source of information on vibration, shock, noise, and acoustics. Providing comprehensive, thorough, up-to-date, and authoritative coverage, the handbook is a valuable resource for anyone interested in the field.

The handbook is divided into three parts: Part One covers the fundamentals of vibration and shock, including the physics of vibration, the response of structures to vibration, and the control of vibration. Part Two focuses on the analysis and control of vibration, including the design of vibration isolation systems, the control of noise and vibration in buildings and vehicles, and the use of vibration and shock in testing and simulation. Part Three covers noise and acoustics, including the physics of sound, the measurement and control of noise, and the use of acoustics in architectural design.

Throughout the handbook, the authors provide clear, concise explanations of complex concepts, backed by a wealth of practical examples and case studies. The handbook is written in an accessible style, making it suitable for both students and professionals. It is an essential resource for anyone working in the fields of vibration, shock, noise, and acoustics, and it is a must-have for anyone involved in the design, analysis, and testing of structures and systems that are subject to vibration and shock.

The Vibration and Shock Handbook is a comprehensive, authoritative, and accessible reference for anyone interested in vibration, shock, noise, and acoustics. It is an essential resource for students, researchers, and professionals in a wide range of fields, including engineering, architecture, and the physical sciences. Whether you are a beginner or an expert, this handbook provides the information you need to understand and work with vibration, shock, noise, and acoustics effectively.
Marine Structures (MARSTRUCT) conferences, the Renewable Energies Offshore (RENEW) conferences and the Maritime Technology (MARTech) conferences. The ‘Marine Technology and Ocean Engineering’ series is also open to new conferences that cover topics on the sustainable exploration and exploitation of marine resources in various fields, such as maritime transport and ports, usage of the ocean including coastal areas, nautical activities, the exploration and exploitation of mineral resources, the protection of the marine environment and its resources, and risk analysis, safety and reliability. The aim of the series is to stimulate advanced education and training through the wide dissemination of the results of scientific research. This book gathers peer-reviewed contributions presented at the International Conference on Structural Engineering and Construction Management (SECON'21), held on 12-15 May 2021. The meeting served as a fertile platform for discussion, sharing sound knowledge and introducing novel ideas on issues related to sustainable construction and design for the future. The respective contributions address various aspects of numerical modeling and simulation in structural engineering, structural dynamics and earthquake engineering, advanced analysis and design of foundations, BIM, building energy management, and technical project management. Accordingly, the book offers a valuable, up-to-date tool and essential overview of the subject for scientists and practitioners alike, and will inspire further investigations and research. Advances in bridge maintenance, safety, management and life-cycle performance contains the papers presented at IABMAS'06, the Third International Conference of the International Association for Bridge Maintenance and Safety (IABMAS), held in Porto, Portugal from 16 to 19 July, 2006. All major aspects of bridge maintenance, management, safety, and coThis volume comprises three keynote lectures by internationally well-known experts in the field of underground construction, the inaugural Fujita lecture to honor professor Keiichi Fujita, and the regular papers presented at the 8th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground (IS-Seoul 2014). This textbook demonstrates the application of the finite element philosophy to the solution of real-world problems and is aimed at graduate level students, but is also suitable for advanced undergraduate students. An essential part of an engineer’s training is the development of the skills necessary to analyse and predict the behaviour of engineering systems under a wide range of potentially complex loading conditions. Only a small proportion of real-life problems can be solved analytically, and consequently, there arises the need to be able to use numerical methods capable of simulating real phenomena accurately. The finite element (FE) method is one such widely used numerical method. Finite Element Applications begins with demystifying the ‘black box’ of finite element solvers and progresses to addressing the different pillars that make up a robust finite element solution framework. These pillars include: domain creation, mesh generation and element formulations, boundary conditions, and material response considerations. Readers of this book will be equipped with the ability to develop models of real-world problems using industry-standard finite element packages.