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Nondestructive Testing involves the use of methods such as wave propagation, electromagnetism, electrical conductivity, and thermal conductivity to test structural integrity and thereby allow nondestructive assessment of structures and the possibility of structural failures before they occur. Nondestructive Testing of Deep Foundations covers different techniques designed to provide information about the integrity and quality of the material that makes up a deep foundation. Nondestructive Testing methods are used at all stages of a structure's life - from new construction quality control to residual lifetime prediction, and even during the monitoring of demolition. In addition, Nondestructive Testing is being increasingly specified in deep foundation projects, though often without a good understanding of its limitations and with the result that methods are often misused. In order to be able to specify an appropriate method, or to recognize an inappropriate specification, it is necessary for the engineer, specifier and/or contractor to understand the capabilities

and limitations of each of the methods currently in use. Nondestructive Testing of Deep Foundations: Describes the most commonly used deep foundation construction techniques, including typical use of material Provides a brief history of the development of commercially available nondestructive methods Summarises each method's capabilities and limitations Acts as a one stop reference drawing together resources only previously available in conference proceedings and journal papers This manual will prove to be a welcome addition to the bookshelf of all practitioners in civil/structural and geotechnical engineering and architecture. It will also provide a valuable insight into this highly technical field for university researchers, lecturers and postgraduate students in civil/structural and geotechnical engineering.

Acoustic Emission and Related Non-destructive Evaluation Techniques in the Fracture Mechanics of Concrete: Fundamentals and Applications, Second Edition presents innovative Acoustic Emission (AE) and related non-destructive evaluation (NDE) techniques that are used for damage detection and inspection of

aged and deteriorated concrete structures. This new edition includes multi-modal applications such as DIC, thermography, X-ray and in-situ implementations, all of which are helpful in better understanding feasibility and underlying challenges. This new edition is an essential resource for civil engineers, contractors working in construction, and materials scientists working both in industry and academia. Completely updated, with a new chapter on multi-technique damage monitoring Presents new applications and novel technologies on AE and related NDT in the fracture mechanics of concrete Features contributions from recognized world-leaders in the application of acoustic emission (AE) and NDE techniques used for the damage assessment of concrete and concrete structures

Condition assessment and characterization of materials and structures by means of nondestructive testing (NDT) methods is a priority need around the world to meet the challenges associated with the durability, maintenance, rehabilitation, retrofitting, renewal and health monitoring of new and existing infrastructures including historic monuments. Numerous NDT methods that make use of certain components of the electromagnetic and acoustic spectrum are currently in use to this effect with various levels of success and there is an intensive worldwide research effort aimed at improving the existing methods and developing new ones. The knowledge and information compiled in this book captures the current state of the art in NDT methods and their application to civil and other engineering materials and structures. Critical reviews and advanced interdisciplinary discussions by world-renowned researchers point to the capabilities and limitations of the currently used NDT methods and shed light on cur-

rent and future research directions to overcome the challenges in their development and practical use. In this respect, the contents of this book will equally benefit practicing engineers and researchers who take part in characterization, assessment and health monitoring of materials and structures.

Engineers have a range of sophisticated techniques at their disposal to evaluate the condition of reinforced concrete structures and non-destructive evaluation plays a key part in assessing and prioritising where money should be spent on repair or replacement of structurally deficient reinforced concrete structures. Non-destructive evaluation of reinforced concrete structures, Volume 2: Non-destructive testing methods reviews the latest non-destructive testing techniques for reinforced concrete structures and how they are used. Part one discusses planning and implementing non-destructive testing of reinforced concrete structures with chapters on non-destructive testing methods for building diagnosis, development of automated NDE systems, structural health monitoring systems and data fusion. Part two reviews individual non-destructive testing techniques including wireless monitoring, electromagnetic and acoustic-elastic waves, laser-induced breakdown spectroscopy, acoustic emission evaluation, magnetic flux leakage, electrical resistivity, capacitometry, measuring the corrosion rate (polarization resistance) and the corrosion potential of reinforced concrete structures, ground penetrating radar, radar tomography, active thermography, nuclear magnetic resonance imaging, stress wave propagation, impact-echo, surface and guided wave techniques and ultrasonics. Part three covers case studies including inspection of concrete retaining walls using ground penetrating

radar, acoustic emission and impact echo techniques and using ground penetrating radar to assess an eight-span post-tensioned viaduct. With its distinguished editor and international team of contributors, Non-destructive evaluation of reinforced concrete structures, Volume 2: Non-destructive testing methods is a standard reference for civil and structural engineers as well as those concerned with making decisions regarding the safety of reinforced concrete structures. Reviews the latest non-destructive testing (NDT) techniques and how they are used in practice Explores the process of planning a non-destructive program features strategies for the application of NDT testing A specific section outlines significant advances in individual NDT techniques and features wireless monitoring and electromagnetic and acoustic-elastic wave technology

The non-destructive evaluation of civil engineering structures in reinforced concrete is becoming an increasingly important issue in this field of engineering. This book proposes innovative ways to deal with this problem, through the characterization of concrete durability indicators by the use of non-destructive techniques. It presents the description of the various non-destructive techniques and their combination for the evaluation of indicators. The processing of data issued from the combination of NDE methods is also illustrated through examples of data fusion methods. The identification of conversion models linking observables, obtained from non-destructive measurements, to concrete durability indicators, as well as the consideration of different sources of variability in the assessment process, are also described. An analysis of in situ applications is carried out in order to highlight the practical aspects of

the methodology. At the end of the book the authors provide a methodological guide detailing the proposed non-destructive evaluation methodology of concrete indicators. Presents the latest developments performed in the community of NDT on different aspects Provides a methodology developed in laboratory and transferred onsite for the evaluation of concrete properties which are not usually addressed by NDT methods Includes the use of data fusion for merging the measurements provided by several NDT methods Includes examples of current and potential applications

GSP 98 contains 10 papers on pavement subgrade presented at sessions of Geo-Denver 2000, held in Denver, Colorado, August 5-8, 2000.

Non Destructive Testing and Evaluation of Civil Engineering Structures discusses the development of strategies for onsite auscultations by NDT in civil engineering, including objectives, limits and the usual techniques. In addition, the book covers physics principles, applications, new developments and the quality of measurements, uncertainties and variabilities of NDT methods. In addition, the book discusses how to characterize the exploitation of NDT measurements and their methodology for the combination of methods for concrete structure assessment and data fusion. These strategies can be developed for structure auscultation and the optimization of NDT evaluation, calibration, and in the presentation of case studies. Presents the latest developments performed in the community of NDT on different aspects Provides a methodology developed in laboratory and transferred onsite for the evaluation of concrete properties which are not usually addressed by NDT methods Includes the use of data fusion for merging the measurements provided by several NDT

methods Includes examples of current and potential applications

This authoritative book provides a comprehensive review of the highly important subject of non-destructive evaluation of reinforced concrete structures. Engineers have a range of sophisticated techniques at their disposal to assess the condition of reinforced concrete structures that do not cause material damage and which usually enable the structure to be used while the surveys are carried out. Non-destructive evaluation of the infrastructure also plays a key role in calculating and prioritising where money should be spent on repair or replacement. Providing details of related techniques and case studies, this book offers an overview of how to plan and implement the NDT of reinforced concrete structures.

Civil engineers will value this resource that examines the tools and techniques used to estimate the in-place strength on concrete, permeation properties that relate to potential durability, and the methods used to assess the internal condition of concrete and the corrosion activity of steel reinforcement.

This book provides an overview and up-to-date synthesis of the most commonly used non-destructive technologies for the reverse engineering of built infrastructure facilities. These technologies tackle both the geometric and radiometric characterization of built structures, and thus, validated technologies such as laser scanning, photogrammetry, and The Mercia Mudstone Group, part of the Triassic Series formerly known as the Keuper Marl, is a sequence dominated by mudstones that underlies much of central and southern England and parts of Northern Ireland, on which many urban areas and their attendant infrastructure

are built. These strata affect the construction industry mainly in operations such as foundations, excavations and earthworks. When designing earthworks or structural foundations in, on or using Mercia mudstone, the designer needs to understand how the engineering properties are linked to the geological history. Non-Destructive Testing (NDT) is an activity closely related to the quality and reliability of products, and to the reliable and safe operation of industrial plants. Physical measuring techniques are used to examine parts of constructional assemblies for hidden imperfections and defects. A wide choice of measuring techniques is available to meet the demand of examining a wide variety of materials such as metals, plastics, rocks, as well as different structures and sizes ranging from semiconductor chips to nuclear reactors and off-shore oil platforms. Activities in the field of NDT encompass: Fundamental research to understand and describe the way in which reactions of certain imperfections to a physical measuring technique can be optimized and used to assess type and grade of imperfection; Methods to characterize materials and materials properties; Applications in product quality control; Applications in plant inspection to ensure a reliable operation of components, avoiding damage to both man and environment, as well as financial losses; Personnel education and qualification schemes; The spread of NDT applications to newly industrialized countries. The two proceedings volumes contain over 400 review and specialist papers. The most recent developments in the field of NDT are presented with contributions by outstanding experts from all over the world. Papers are grouped according to technique for those dealing with fundamental research and to field of application for the more

practical oriented ones. In this way each chapter provides an easy overview of related current research. Extensive keyword indexes have been included to facilitate the retrieval of information according to individual requirements. The high technical level of the papers and their up-to-date content will make them an indispensable source of information for students, researchers and professionals in the areas covered.

Non-destructive methods for materials testing are being increasingly used in testing concrete structures. In the construction industry, their use has resulted in improvements in the quality of concrete products and structures. It is no longer possible to rely solely on the traditional methods of quality control, and progressive, non-destructive methods must be applied in modern quality-control practice. This new approach in the field of non-destructive testing of concrete structures requires that new parameters be introduced for their verification and evaluation with regard to concrete strength, and for the solution of problems related to the use of combined multiparameter non-destructive methods. The present work provides a comprehensive overview on the solutions available for problems encountered in the non-destructive testing of concrete. Including the use of original combined ultrasonic-pulse methods developed by the author for testing concrete strength. Special attention is given to specific issues of testing in concrete structures and members by means of the combined and one-parameter methods and to the interpretation of the measurement results.

This book provides an overview and up-to-date synthesis of the most commonly used non-destructive technologies for

the reverse engineering of built infrastructure facilities. These technologies tackle both the geometric and radiometric characterization of built structures, and thus, validated technologies such as laser scanning, photogrammetry, and multispectral remote sensing are presented in depth, from their fundamentals to their application to management systems for diverse applications in civil engineering (damage inspection, structural calculations, road inventory and inspections, BIM, etc.). Alternative methods are therefore presented for routine sub-surface inspections by using non-invasive geophysics (e.g. magnetic, electrical and electromagnetic), as well as thermography for the nearest sub-surface. The book is divided into three sections, whose main features are as follows: Section 1: Fundamentals, principles and applications of: laser scanning, photogrammetry, geophysics, ground penetrating radar, IR thermography, multispectral imaging. Section 2: Applications to the inspection of infrastructure facilities: tunnels, breakwaters, railways, roads, and modeling of existing buildings (damage inspection in constructions, thermographic 3D modeling, structural modeling of industrial constructions). Section 3: new management tools and intelligent modeling: infrastructure management systems based on non-destructive technologies for masonry arch bridges, computational approaches for GPR processing and interpretation, automatic processing and object recognition from laser scanning data, BIM for existing buildings. This cutting-edge edited volume will be a valuable resource for students, researchers and professional engineers with an interest in non-destructive technologies and their applications to reverse engineering of structures and infrastructure.

Non-destructive testing (NDT) is based

on inspection methodologies that do not require the change or destruction of the component or system under evaluation. Numerous NDT techniques are increasingly used, thanks to the recent advances in sensing technologies, data acquisition, data storage and signal processing. Inspection information is widely employed in order to make effective maintenance decisions based on the defects identified, their location and severity. This book presents the main advances recently made on different NDT techniques, together with the principal approaches employed to process the signals obtained during inspection.

Non-Destructive Testing (NDT) is of worldwide significance, and is strongly related to the detection of damage in engineering structures (buildings, bridges, aircrafts, ships, pressure vessels, etc.) using non-invasive techniques (ultrasound, X-rays, Radar, neutrons, thermography, vibrations, acoustic emission, etc.).

Emerging Technologies in Non-D

The aim of this book is to help those involved in the construction process to arrive as quickly as possible at pragmatic, cost-effective solutions that are acceptable to all the parties concerned.

Concrete floors should be diagnosed in order to obtain the proper durability. Non-destructive testing (NDT) methods, which have numerous advantages and are very effective for in situ testing, are recommended for this purpose. *Non-Destructive Diagnostics of Concrete Floors: Methods and Case Studies* offers useful NDT methods, test methodologies, and case studies. This book contains classifications of NDT methods, examines their areas of usefulness in floor diagnostics, and explains the complementarity and reliability of NDT methods as well as the need to calibrate research equipment. It

presents interesting case studies of concrete floors, such as dowelled floors, floors with a top layer made of stone slabs, industrial floors, industrial floors with a top layer of polyurethane-cement, layered floors, post-tensioned floors, and cement screeds. The authors have drawn on many years of experience in both academia and the practical diagnosis of concrete floors using NDT methods.

This book was proposed and organized as a means to present recent developments in the field of nondestructive testing of materials in civil engineering. For this reason, the articles highlighted in this editorial relate to different aspects of nondestructive testing of different materials in civil engineering—from building materials to building structures. The current trend in the development of nondestructive testing of materials in civil engineering is mainly concerned with the detection of flaws and defects in concrete elements and structures, and acoustic methods predominate in this field. As in medicine, the trend is towards designing test equipment that allows one to obtain a picture of the inside of the tested element and materials. From this point of view, interesting results with significance for building practices have been obtained

The Special Issue “Non-Destructive Testing of Structures” has been proposed to present the recent developments in the field of the diagnostics of structural materials and components in civil and mechanical engineering. The papers highlighted in this editorial concern various aspects of non-invasive diagnostics, including such topics as the condition assessments of civil and mechanical structures and the connections of structural elements, the inspection of cultural heritage monuments, the testing of structu-

ral materials, structural health monitoring systems, the integration of non-destructive testing methods, advanced signal processing for the non-destructive testing of structures (NDT), damage detection and damage imaging, as well as modeling and numerical analyses for supporting structural health monitoring (SHM) systems.

Nondestructive testing enables scientists and engineers to evaluate the integrity of their structures and the properties of their materials or components non-intrusively, and in some instances in real-time fashion. Applying the Nondestructive techniques and modalities offers valuable savings and guarantees the quality of engineered systems and products. This technology can be employed through different modalities that include contact methods such as ultrasonic, eddy current, magnetic particles, and liquid penetrant, in addition to contact-less methods such as in thermography, radiography, and shearography. This book seeks to introduce some of the Nondestructive testing methods from its theoretical fundamentals to its specific applications. Additionally, the text contains several novel implementations of such techniques in different fields, including the assessment of civil structures (concrete) to its application in medicine.

The increased use of polymer matrix composites in structural applications has led to the growing need for a very high level of quality control and testing of products to ensure and monitor performance over time. Non-destructive evaluation (NDE) of polymer matrix composites explores a range of NDE techniques and the use of these techniques in a variety of application areas. Part one provides an overview of a range of NDE and NDT techniques including eddy cur-

rent testing, shearography, ultrasonics, acoustic emission, and dielectrics. Part two highlights the use of NDE techniques for adhesively bonded applications. Part three focuses on NDE techniques for aerospace applications including the evaluation of aerospace composites for impact damage and flaw characterisation. Finally, the use of traditional and emerging NDE techniques in civil and marine applications is explored in part four. With its distinguished editor and international team of expert contributors, Non-destructive evaluation (NDE) of polymer matrix composites is a technical resource for researchers and engineers using polymer matrix composites, professionals requiring an understanding of non-destructive evaluation techniques, and academics interested in this field. Explores a range of NDE and NDT techniques and considers future trends Examines in detail NDE techniques for adhesively bonded applications Discusses NDE techniques in aerospace applications including detecting impact damage, ultrasonic techniques and structural health monitoring

This book considers the composition, production, testing methods and application of modern cellulose fibre cement boards (FCB). FCB replaced widespread but now illegal and harmful asbestos building products. Despite the complexity of the FCB fabrication process, the material is currently widely implemented. In the first chapter, the basic idea and microstructure of cellulose FCB is described, with the next chapter concerned with the process of the industrial fabrication of the composite material. The third chapter explores both the basic testing procedures described in international standards and more novel methods. The last section of the book deals with the practical applications of the product,

which are illustrated by many existing examples. The pictures of the aesthetical façades of building as well as the remarks on FCB exploitation and economics of implementation of the product are included here. The book will be valuable for researchers, architects, and both graduate and post-graduate students, as well as practicing engineers concerned with building technology.

This report contains nine specific-application cases of various nondestructive test (NDT) methods in fatigue and fracture reliability assessment of structures.

This book provides an introduction to Acoustic Emission Testing and its applications to different materials like concrete, steel, ceramics, geotechnical materials, polymers, biological structures and wood. Acoustic Emission Techniques (AET) techniques have been studied in engineering for a long time. The techniques are applied more and more to practical investigations and are more and more standardized in codes. This is because the degradation of structures due to ageing urgently demand for maintenance and rehabilitation of structures in service. It results in the need for the development of advanced and efficient inspection techniques. In mechanical engineering and concerning the monitoring of machines and mechanical components, AE is a widely accepted observing deterioration in the frame of structural health monitoring. The advantages of AE like sensitivity, damage localization potential, non-intrusive nature as well as developments in signal analysis and data transmission allow applications that could not be considered decades ago. As such, AE techniques draw great attention to diagnostic applications and in material testing. This book covers all levels from the description of AE basics for AE

beginners (level of a student) to sophisticated AE algorithms and applications to real large-scale structures as well as the observation of the cracking process in laboratory specimen to study fracture processes. This book has proved its worth over the past twelve years. Now in its second edition, it will be a resource that sets the standard and equips readers for the future. All chapters from the 1st edition have been updated and rewritten and eight extra chapters (e.g also regarding AE tomography, AE in plate-like structures and AE for investigations of hardening of fresh concrete) have been added.

The development of NDT (non-destructive testing) techniques used for the inspection of concrete structures is currently in high demand, because many existing structures have become aged and deteriorated in service. In order to formulate predictions on their stability and to estimate their safety, it is necessary to identify damage signals and to determine their causes. In this regard, the development and establishment of innovative and highly advanced non-destructive methods are required. Acoustic Emission (AE) and related NDE (non-destructive evaluation) techniques have been extensively used to determine crack detection and damage evaluation in concrete. With the move towards a more sustainable society, and the need to extend the long-term service life of infrastructure and aging and disastrous damage due to recent earthquakes, Acoustic Emission (AE) and Related Non-destructive Evaluation (NDE) Techniques in the Fracture Mechanics of Concrete: Fundamentals and Applications is a critical reference source for civil engineers, contractors working in construction and materials scientists working both in industry and academia. Presents innovative



Acoustic Emission (AE) and related non-destructive evaluation (NDE) techniques, used for damage detection and inspection of aged and deteriorated concrete structures Contributions from recognized world-leaders in the application of acoustic emission (AE) and NDE techniques used for the damage assessment of concrete and concrete structures With the move towards a more sustainable society, and the need to extend the long-term service life of infrastructure and damage due to recent earthquakes, this book is of critical importance An essential knowledge resource for civil engineers, contractors working in construction and materials scientists working both in industry and academia

Many concrete structures and elements of concrete infrastructure have exceeded their original design lives and are deteriorating to an extent where they are becoming dangerous. The deterioration can be internal or not obvious and therefore only shows up with detailed testing. Non-destructive evaluation of reinforced concrete structures, Volume 1: Deterioration processes and standard test methods reviews the processes of deterioration and classical and standard test methods. Part one discusses deterioration of reinforced concrete and testing problems with chapters on topics such as key issues in the non-destructive testing of concrete structures, when to use non-destructive testing of reinforced concrete structures, deterioration processes in reinforced concrete, modelling ageing and corrosion processes in reinforced concrete structures, components in concrete and their impact on quality, and predicting the service life of reinforced concrete structures. Part two reviews classical and standard testing methods including microscopic examination of deteriorated concrete, the analysis of solid

components and their ratios in reinforced concrete structures, the determination of chlorides in concrete structures, and investigating the original water content of reinforced concrete structures. With its distinguished editors and international team of contributors, Non-destructive evaluation of reinforced concrete structures, Volume 1: Deterioration processes and standard test methods will be a standard reference for civil and structural engineers as well as those concerned with making decisions regarding the safety of reinforced concrete structures. Provides a comprehensive discussion from examination of the components in concrete and their affect on quality through to the role of and tools required for lifetime management Experts in the field identify the testing problems associated with infrastructure considering design, build and maintenance stages Presents a guide for when to use non-destructive testing of reinforced concrete structures including the role of time in testing

This volume contains the papers presented at the 2nd International Conference entitled: "Emerging Technologies in NDT" which was held in Athens, Greece, May 24-26, 1999. This work covers frequently used non-destructive testing methods and introduces innovative ideas in the field. The title also focuses on visual and optical inspection, acoustic emission and ultrasonics as well as a range of other closely related topics. More than 50 papers were presented at the conference by invited and distinguished researchers from all over the world. This volume forms a valuable record of important contributions to the relevant literature. It contains not only the most up-to-date technology developments but provides also information regarding emerging NDT techniques/technologies and

their potential applications in the field. The book covers frequently used NDT methods and introduces new and innovative ideas. Focussing on visual and optical inspection, acoustic emission, ultrasonics, nonlinear ultrasonics, infrared methods, X-ray radiography, special techniques, material characterisation, NDT of civil engineering structures, inspection of pipes and reliability and validation this volume will be a great boon to engineers, researchers, quality control managers, as well as teachers and graduate students in the field.

Microwave and millimeter-wave non-destructive testing and evaluation (NDT&E) is generally understood to mean using high-frequency electromagnetic energy to inspect and characterize materials and structures. In spite of possessing some distinct advantages in certain applications to other NDT&E techniques, microwave NDT&E has only found compared limited practical application during the past 45 years. These advantages include lack of a need for contact between the sensor and the object being inspected, the ability to penetrate dielectric materials, and superior sensitivity to certain material constituents and flaws. One factor contributing to this minimal acceptance by the NDT &E community has been a generally poor understanding in this community of the theory and practice that underlie the technology. This situation exists partly because of a paucity of microwave NDT&E textbook and reference material. Some chapters, reviews, and books aimed at filling this need have been published in the past but, for the most part, this material is based on the use of older microwave technology. However, during the past ten years great strides have been made in terms of the cost, size, and ease of use of microwave

components. In addition, recent advances in modeling and measurement techniques have expanded the range of applications for microwave NDT&E. Such applications include inspecting modern materials such as composites, detecting and characterizing surface flaws, and evaluating the compressive strength of cement structures. These advances have created an urgent need for up-to-date textbook material on this subject.

The first international symposium on NDT-CE (Non-Destructive Testing in Civil Engineering) was held in Berlin, Germany in 1991. Successive symposia were held throughout Europe until 1997. This, the 5th symposium is organized as SEIKEN SYMPOSIUM No. 26, and is sponsored by the Institute of Industrial Science, at the University of Tokyo, Japan. Original objectives of the NDT-CE symposium have been to provide an opportunity for discussing current issues and future perspectives of NDT and for promoting mutual understanding among engineers and researchers. Asia is one of the key regions for further development in NDT and this symposium in Japan will be a good opportunity not only to exchange technical information on NDT, but to promote worldwide friendship between engineers in Asian countries and other nations of the world. This volume contains 70 papers providing the most recent research results and findings. The papers are grouped under the following areas: (1) keynote papers, (2) magnetic / electric, (3) steel structures, (4) integrated test, (5) moisture, (6) strength, (7) acoustic emission, (8) various tests, (9) ultrasonic, (10) impact echo, (11) radar, (12) quality and (13) corrosion / cover.

This edition has been prepared to alert operatives and construction professionals to the hazards often present on site, to provide advice on safer practices for

themselves and others, and to help them manage these important responsibilities. *Ultrasonic Nondestructive Testing of Materials: Theoretical Foundations* explores the mathematical foundations and emerging applications of this testing process, which is based on elastic wave propagation in isotropic and anisotropic solids. In covering ultrasonic nondestructive testing methods, the book emphasizes the engineering point of view, yet it relies on the physics and mathematics aspects involved in elastic wave propagation theory. As a result, this resource becomes a missing link in the literature by combining coverage of the theoretical aspects of testing and providing intuitive assessments of numerous standard problems to illustrate fundamental assertions. Content includes a brief description of the theory of acoustic and electromagnetic fields to underline the similarities and differences as compared to elastodynamics. It also covers vector algebra and analysis, elastic plane and Rayleigh surface waves, and ultrasonic beams, as well as transducer radiation, inverse scattering, and ultrasonic nondestructive imaging. Includes numerical computations to explain wave propagation phenomena and compare results of analytical formulations. Although ultrasonic nondestructive testing can often be roughly understood in terms of plane waves and beams, this book addresses the key issues of transducer radiation and defect scattering and imaging, respectively. The authors physically formulate point source synthesis, and, in mathematical terms, they use representation integrals with Green functions, always including intuitive interpretations with mathematical evaluations. Replacing cumbersome in-

dex notation with a coordinate-free version, this reference offers step-by-step documentation of relevant tensorial elastodynamic cases involving isotropic and anisotropic materials. It provides all necessary mathematical tools readers require to understand the mathematical and physical basis for ultrasonic nondestructive testing.

This book was proposed and organized as a means to present recent developments in the field of testing of materials and elements in civil engineering. For this reason, the articles highlighted in this editorial relate to different aspects of testing of different materials and elements in civil engineering, from building materials to building structures. The current trend in the development of testing of materials and elements in civil engineering is mainly concerned with the detection of flaws and defects in concrete elements and structures, and acoustic methods predominate in this field. As in medicine, the trend is towards designing test equipment that allows one to obtain a picture of the inside of the tested element and materials. Interesting results with significance for building practices were obtained.

The handbook outlines the principles, equipment, materials maintenance, methodology, and interpretation skills necessary for liquid penetration testing. The third edition adds new sections on filtered particle testing of aerospace composites, quality control of down hole oil field tubular assemblies, and probability of detection, and considers new regulations on CFC fluids throughout the text. Annotation copyrighted by Book News, Inc., Portland, OR