

Concrete Repair Rehabilitation And Retrofitting Iv Proceedings Of The 4th International Conference On Concrete Repair Rehabilitation And Retrofitting Iccrrr 4 5 7 October 2015 Leipzig Germany

Rehabilitation of Concrete Structures with Fiber Reinforced Polymer is a complete guide to the use of FRP in flexural, shear and axial strengthening of concrete structures. Through worked design examples, the authors guide readers through the details of usage, including anchorage systems, different materials and methods of repairing concrete structures using these techniques. Topics include the usage of FRP in concrete structure repair, concrete structural deterioration and rehabilitation, methods of structural rehabilitation and strengthening, a review of the design basis for FRP systems, including strengthening limits, fire endurance, and environmental considerations. In addition, readers will find sections on the strengthening of members under flexural stress, including failure modes, design procedures, examples and anchorage detailing, and sections on shear and torsion stress, axial strengthening, the installation of FRP systems, and strengthening against extreme loads, such as earthquakes and fire, amongst other important topics. Presents worked design examples covering flexural, shear, and axial strengthening Includes complete coverage of FRP in Concrete Repair Explores the most recent guidelines (ACI440.2, 2017; AS5100.8, 2017 and Concrete society technical report no. 55, 2012)

A great deal of research and literature has been produced on repairing concrete structures, but very little aimed at conserving the character or appearance of historic examples. This volume offers guidance as to how that should be done. It includes a brief history of the use of the material and explains the criteria for listing, before assessing decay mechanisms and determining appropriate repair strategies. The Second International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICCRRR 2005) was held in Cape Town, South Africa, from 24-26 November 2008. The Conference followed the very successful First International Conference, also in Cape Town in 2005, and continued as a collaborative venture by researchers from the South African Res

This is the first book on Engineered Cementitious Composites (ECC), an advanced concrete material attracting world-wide attention in both the academic community and in industry. The book presents a comprehensive coverage of the material design methodology, processing methodology, mechanical and durability properties, smart functions, and application case studies. It combines effective use of illustrations, graphical data, and tables. It de-emphasizes mathematics in favor of physical understanding. The book serves as an introduction to the subject matter, or as a reference to those conducting research in ECC. It will also be valuable to engineers who need to quickly search for relevant information in a single comprehensive text.

Any structural system in service is subject to age-related deterioration, leading to potential concerns regarding maintenance, health & safety, environmental and economic implications. Condition assessment of aged structures is an invaluable, single source of information on structural assessment techniques for marine and land-based structures such as ships, offshore installations, industrial plant and buildings. Topics covered include: - Current practices and standards for structural condition assessment - Fundamental mechanisms and advanced mathematical methods for predicting structural deterioration - Residual strength assessment of deteriorated structures - Inspection and maintenance of aged structures - Reliability and risk assessment of aged structures Professionals from a broad range of disciplines will be able to gain a better understanding of current practices and standards for structural condition assessment or health monitoring, and what future trends might be. Single source of information on structural assessment techniques for marine and land-based structures Examines the residual strength and reliability of aged structures Assesses current practices covering inspection, health monitoring and maintenance

Microbes and their biosynthetic capabilities have been invaluable in finding solutions for several intractable problems mankind has encountered in maintaining the quality of the environment. They have, for example, been used to positive effect in human and animal health, genetic engineering, environmental protection, and municipal and industrial waste treatment. Microorganisms have enabled feasible and cost-effective responses which would have been impossible via straightforward chemical or physical engineering methods. Microbial technologies have of late been applied to a range of environmental problems, with considerable success. This survey of recent scientific progress in usefully applying microbes to both environmental management and biotechnology is informed by acknowledgement of the polluting effects on the world around us of soil erosion, the unwanted migration of sediments, chemical fertilizers and pesticides, and the improper treatment of human and animal wastes. These harmful phenomena have resulted in serious environmental and social problems around the world, problems which require us to look for solutions elsewhere than in established physical and chemical technologies. Often the answer lies in hybrid applications in which microbial methods are combined with physical and chemical ones. When we remember that these highly effective microorganisms, cultured for a variety of applications, are but a tiny fraction of those to be found in the world around us, we realize the vastness of the untapped and beneficial potential of microorganisms. At present, comprehending the diversity of hitherto uncultured microbes involves the application of metagenomics, with several novel microbial species having been discovered using culture-independent approaches. Edited by recognized leaders in the field, this penetrating assessment of our progress to date in deploying microorganisms to the advantage of environmental management and biotechnology will be widely welcomed.

The field of Concrete Repair and Rehabilitation is gaining importance in view of its positive impacts in terms of socio-economic benefits and environmental sustainability. Due to growing importance of this field, many engineering colleges have included the subject of concrete repair and rehabilitation in the senior undergraduate and postgraduate course curriculums of civil engineering. This book is an earnest attempt to help students of civil engineering in enhancing their understanding and awareness about critical elements of repair and rehabilitation of concrete structure. The content is organised in such a way that it fulfils the academic needs of the students. This text attempts to dovetail all important aspects such as causes of distress, assessment and evaluation of deterioration, techniques for repair and rehabilitation along with selection of repair and rehabilitation materials and other important aspects related to preventive maintenance and rehabilitation/structural safety measures. The primary objective of this textbook is to guide students to:

- Understand the underlying causes and types of deterioration in concrete structure
- Learn about the field and laboratory testing methods available to evaluate the level of deterioration.
- Get well acquainted with options of repair materials and techniques available to address different types of distress in concrete structure.
- Grasp the knowledge of available techniques and their application for strengthening existing structural systems.

In most parts of the developed world, the building stock and the civil infrastructure are ageing and in constant need of maintenance, repair and upgrading. Moreover, in the light of our current knowledge and of modern codes, the majority of buildings stock and other types of structures in many parts of the world are substandard and deficient. This is especially so in earthquake-prone regions, as, even there, seismic design of structures is relatively recent. In those regions the major part of the seismic threat to human life and property comes from old buildings. Due to the infrastructure's increasing decay, frequently combined with the need for structural upgrading to meet more stringent design requirements (especially against seismic loads), structural retrofitting is becoming more and more important and receives today considerable emphasis throughout the world. In

response to this need, a major part of the fib Model Code 2005, currently under development, is being devoted to structural conservation and maintenance. More importantly, in recognition of the importance of the seismic threat arising from existing substandard buildings, the first standards for structural upgrading to be promoted by the international engineering community and by regulatory authorities alike are for seismic rehabilitation of buildings. This is the case, for example, of Part 3: Strengthening and Repair of Buildings of Eurocode 8 (i. e. of the draft European Standard for earthquake-resistant design), and which is the only one among the current (2003) set of 58 Eurocodes attempting to address the problem of structural upgrading. It is also the case of the recent (2001) ASCE draft standard on Seismic evaluation of existing buildings and of the 1996 Law for promotion of seismic strengthening of existing reinforced concrete structures in Japan. As noted in Chapter 1 of this Bulletin, fib - as CEB and FIP did before - has placed considerable emphasis on assessment and rehabilitation of existing structures. The present Bulletin is a culmination of this effort in the special but very important field of seismic assessment and rehabilitation. It has been elaborated over a period of 4 years by Task Group 7.1 Assessment and retrofit of existing structures of fib Commission 7 Seismic design, a truly international team of experts, representing the expertise and experience of all the important seismic regions of the world. In the course of its work the team had six plenary two-day meetings: in January 1999 in Pavia, Italy; in August 1999 in Raleigh, North Carolina; in February 2000 in Queenstown, New Zealand; in July 2000 in Patras, Greece; in March 2001 in Lausanne, Switzerland; and in August 2001 in Seattle, Washington. In October 2002 the final draft of the Bulletin was presented to public during the 1st fib Congress in Osaka. It was also there that it was approved by fib Commission 7 Seismic Design. The contents is structured into main chapters as follows: 1 Introduction - 2 Performance objectives and system considerations - 3 Review of seismic assessment procedures - 4 Strength and deformation capacity of non-seismically detailed components - 5 Seismic retrofitting techniques - 6 Probabilistic concepts and methods - 7 Case studies

Concrete Repair, Rehabilitation and Retrofitting IV Proceedings of the 4th International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICRRR-4), 5-7 October 2015, Leipzig, Germany CRC Press

The Second International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICRRR 2005) was held in Cape Town, South Africa, from 24-26 November 2008. The Conference followed the very successful First International Conference, also in Cape Town in 2005, and continued as a collaborative venture by researchers from the South African Research Programme in Concrete Materials (based at the Universities of Cape Town and The Witwatersrand) and The Construction Materials Sections at Leipzig University and MIPA Leipzig in Germany. The background, in industry and the state of national infrastructures, continues to be highly challenging and demanding. The facts remain that much of our concrete infrastructure deteriorates at unacceptable rates, that we need appropriate tools and techniques to undertake the vast task of sound repair, maintenance and rehabilitation of such infrastructure, and that all this must be undertaken with due cognisance of the limited budgets available for such work. New ways need to be found to extend the useful life of concrete structures cost-effectively. Confidence in concrete as a viable construction material into the 21st century needs to be retained and sustained, particularly considering the environmental challenges that the industry and society now face. The conference proceedings contain papers, presented at the conference, and classified into a total of 12 sub themes which can be grouped under the three main themes of (i) Concrete durability aspects, (ii) Condition assessment of concrete structures, and (iii) Concrete repair, rehabilitation and retrofitting. The major interests in terms of submissions exists in the fields of innovative materials for durable concrete construction, integrated service life modelling of reinforced concrete structures, NDE/NDT and measurement techniques, repair methods and materials, and structural strengthening and retrofitting techniques. The large number of high-quality papers presented and the wide range of relevant topics covered confirm that these proceedings will be a valued reference for many working in the important fields of concrete durability and repair, and that they will form a suitable base for discussion and provide suggestions for future development and research. Set of book of abstracts (476 pp) and a searchable full paper CD-ROM (1396 pp).

Selected, peer reviewed papers from the 2013 3rd International Conference on Key Engineering Materials (ICKEM 2013), March 8-9, 2013, Kota Kinabalu, Malaysia

Many concrete structures around the world have reached or exceeded their design life and are showing signs of deteriorating. Any concrete structure which has deteriorated or has sustained damage is a potential hazard.

Repair and Rehabilitation of Structures provides practitioners with a host of new and traditional strategies for rooting out structural problems and deploying an efficient repair or rehabilitation solution. The success of repair activity depends on the identification of the root cause of the deterioration of structures. A straight forward approach to the repair and rehabilitation of structures, the book discusses the different aspects of repair, causes of repair, strength and durability of concrete, special concrete, techniques for repair and protection method, retrofitting of structures, structural health monitoring (SHM) demolition techniques and seismic retrofitting of structures. In addition, the book includes real world case studies to better illustrate techniques adopted for the rehabilitation throughout the world. Presents a framework for evaluating maintenance and repair strategies Provides an Introduction to SHM, Smart Materials and SHM versus NDT Includes case studies to illustrate practical techniques adopted for the rehabilitation of the existing structure Outlines the performance of construction materials and components in actual structure, permeability and thermal properties of concrete

The Concrete Solutions series of International Conferences on Concrete Repair began in 2003 with a conference held in St. Malo, France in association with INSA Rennes. Subsequent conferences have seen us partnering with the University of Padua in 2009 and with TU Dresden in 2011. This conference is being held for the first time in the UK, in association with Queen's University Belfast and brings together delegates from 36 countries to discuss the latest advances and technologies in concrete repair. Earlier

conferences were dominated by electrochemical repair, but there has been an interesting shift to more unusual methods, such as bacterial repair of concrete plus an increased focus on service life design aspects and modelling, with debate and discussion on the best techniques and the validity of existing methods. Repair of heritage structures is also growing in importance and a number of the papers have focused on the importance of getting this right, so that we may preserve our rich cultural heritage of historic structures. This book is an essential reference work for those working in the concrete repair field, from Engineers to Architects and from Students to Clients.

The First International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICCRRR 2005) was held in Cape Town, South Africa, from 21-23 November 2005. The conference was a collaborative venture by researchers from the South African Research Programme in Concrete Materials (based at the Universities of Cape Town and The Witwatersrand) and The Construction Materials Section at Leipzig University in Germany. The conference has come at an opportune moment for concrete construction worldwide and sought to focus on an increasingly important aspect in modern infrastructure provision and retention: that of appropriately repairing, maintaining, rehabilitating, and if necessary retrofitting existing infrastructure with a view to extending its life and maximising its economic return. The conference Proceedings contain papers, presented at the conference, and classified into a total of 15 sub themes which can be grouped under the four main themes of (i) Concrete durability aspects, (ii) Condition assessment of concrete structures, (iii) Concrete repair, rehabilitation and retrofitting, and (iv) Performance monitoring and health assessment. The major interest in terms of submissions exists in the fields of concrete durability aspects in connection with material compositions, NDE/NDT and measurement techniques, repair methods and materials, and structural strengthening and retrofitting techniques. The large number of high-quality papers presented and the wide range of relevant topics covered confirm that these Proceedings will be a valued reference for many working in the important fields of concrete durability and repair and that they form a suitable base for discussion and provide suggestions for future development and research.

This present book describes the different construction systems and structural materials and elements within the main buildings typologies, and it analyses the particularities of each of them, including, at the end, general aspects concerning laboratory and in-situ testing, numerical modeling, vulnerability assessment and construction maintenance.

PART 1: DURABILITY AND DETERIORATION: Physical Cause* Corrosion* PART 2: DAMAGE ASSESSMENT: Destructive Testing Systems* Non-Destructive Testing Systems* Semi-Destructive Testing Systems* PART 3: REPAIR MATERIALS: Selection and Evaluation of Repair Materials* Function of Repair Materials* Special Repair Materials* PART 4: REPAIR AND REHABILITATION: Repair of Cracks* Rehabilitation Techniques* Strengthening Techniques* PART 5: MAINTENANCE AND DEMOLITION: Maintenance Classification And Process* Maintenance Procedure* Safety In Maintenance And Demolition* Index.

The series Advances in Polymer Science presents critical reviews of the present and future trends in polymer and biopolymer science. It covers all areas of research in polymer and biopolymer science including chemistry, physical chemistry, physics, material science. The thematic volumes are addressed to scientists, whether at universities or in industry, who wish to keep abreast of the important advances in the covered topics. Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic, and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles, and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring field, or as a compilation of detailed information for the specialist. Review articles for the individual volumes are invited by the volume editors. Single contributions can be specially commissioned. Readership: Polymer scientists, or scientists in related fields interested in polymer and biopolymer science, at universities or in industry, graduate students

Report 2 is a guide to commercially available instruments and equipment which can be used to automate measurements of structural behavior and environmental conditions at US Army Corps of Engineers' hydraulic structures. It also presents suggested methods to replace or retrofit existing instruments at Corps structures. Report 1 presented instrumentation automation techniques. Because of the many options which exist in selecting the appropriate hardware, the procedures in Report 1 for determining system requirements should be followed closely. Also, available software listed in Report 3 will influence system selection. Keywords: Computer programs, Concrete construction, Hydraulic structures, Measuring instruments.

Concrete Solutions contains the contributions from some 30 countries to Concrete Solutions, the 6th International Conference on Concrete Repair (Thessaloniki, Greece, 20-23 June 2016). Strengthening and retrofitting are major themes in this volume, with NDT and electrochemical repair following closely, discussing the latest advances and technologies in concrete repair. The book brings together some interesting and challenging theoretical approaches and questions if we really understand and approach such topics as corrosion monitoring correctly. Concrete Solutions is an essential reference work for those working in the concrete repair field, from engineers to architects and from students to clients. The Concrete Solutions Series of international conferences on concrete repair began in 2003 with a conference held in St. Malo, France in association with INSA Rennes. Subsequent conferences have seen the Series partnering with the University of Padua (Italy) in 2009, with TU Dresden (Germany) in 2011 and with Queen's University Belfast (Northern Ireland) in 2014. In 2016 Thessaloniki (Greece) hosted the conference, partnering with both Aristotle University of Thessaloniki (AUTH) and Democritus University of Thrace (DUTH). The next conference in the series will be held in 2019 in Istanbul.

The Concrete Solutions series of International Conferences on Concrete Repair began in 2003, with a conference held in St. Malo, France in association with INSA Rennes, followed by the second conference in 2006 (with INSA again, at St. Malo, France), and the third conference in 2009 (in Padova and Venice, in association with the University of Padova). Now in 2011, the event is being held in Dresden in Germany and has brought together some 112 papers from 33 countries. Whereas electrochemical repair tended to dominate the papers in earlier years, new developments in structural strengthening with composites have been an increasingly important topic, with a quarter of the papers now focusing on this area. New techniques involving Near Surface Mounted (NSM) carbon fibre rods, strain hardening composites, and new techniques involving the well established carbon fibre and polyimide wrapping and strengthening systems are presented. Seventeen papers concentrate on case studies which are all-important in such conferences, to learn about what works (and what doesn't work) on real structures. Thirteen papers

are devoted to new developments in Non-Destructive Testing (NDT). Other topics include service life modelling, fire damage, surface protection methods and coatings, patch repair, general repair techniques and whole life costing. This book is essential reading for anyone engaged in the concrete repair field, from engineers, to academics and students and also to clients, who, as the end user, are ultimately responsible for funding these projects and making those difficult decisions about which system or method to use.

Life-Cycle and Sustainability of Civil Infrastructure Systems contains the lectures and papers presented at the Third International Symposium on Life-Cycle Civil Engineering (IALCCE 2012) held in one of Vienna's most famous venues, the Hofburg Palace, October 3rd-6th, 2012. This volume consists of a book of extended abstracts (516 pp) and a DVD-ROM

The State-of-the-Art Report of RILEM Technical Committee 228-MPS on Mechanical properties of Self-Compacting Concrete (SCC) summarizes an extensive body of information related to mechanical properties and mechanical behaviour of SCC. Due attention is given to the fact that the composition of SCC varies significantly. A wide range of mechanical properties are considered, including compressive strength, stress-strain relationship, tensile and flexural strengths, modulus of elasticity, shear strength, effect of elevated temperature, such as fire spalling and residual properties after fire, in-situ properties, creep, shrinkage, bond properties and structural behaviour. A chapter on fibre-reinforced SCC is included, as well as a chapter on specialty SCC, such as light-weight SCC, heavy-weight SCC, preplaced aggregate SCC, special fibre reinforced SCC and underwater concrete.

This book comprises select papers presented at the International Conference on Trends and Recent Advances in Civil Engineering (TRACE 2018). The book covers a wide range of topics related to recent advancements in structural engineering, structural health monitoring, rehabilitation and retrofitting of structures, and earthquake-resistant structures. Based on case studies and laboratory investigations, the book highlights latest techniques and innovative methods for building repair and maintenance. Recent development in materials being used in structural rehabilitation and retrofitting is also discussed. The contents of this book can be useful for researchers and professionals working in structural engineering and allied areas.

The third edition of the Structural Concrete Textbook is an extensive revision that reflects advances in knowledge and technology over the past decade. It was prepared in the intermediate period from the CEP-FIP Model Code 1990 (MC90) to fib Model Code for Concrete Structures 2010 (MC2010), and as such incorporates a significant amount of information that has been already finalized for MC2010, while keeping some material from MC90 that was not yet modified considerably. The objective of the textbook is to give detailed information on a wide range of concrete engineering from selection of appropriate structural system and also materials, through design and execution and finally behaviour in use. The revised fib Structural Concrete Textbook covers the following main topics: phases of design process, conceptual design, short and long term properties of conventional concrete (including creep, shrinkage, fatigue and temperature influences), special types of concretes (such as self compacting concrete, architectural concrete, fibre reinforced concrete, high and ultra high performance concrete), properties of reinforcing and prestressing materials, bond, tension stiffening, moment-curvature, confining effect, dowel action, aggregate interlock; structural analysis (with or without time dependent effects), definition of limit states, control of cracking and deformations, design for moment, shear or torsion, buckling, fatigue, anchorages, splices, detailing; design for durability (including service life design aspects, deterioration mechanisms, modelling of deterioration mechanisms, environmental influences, influences of design and execution on durability); fire design (including changes in material and structural properties, spalling, degree of deterioration), member design (linear members and slabs with reinforcement layout, deep beams); management, assessment, maintenance, repair (including, conservation strategies, risk management, types of interventions) as well as aspects of execution (quality assurance), formwork and curing. The updated textbook provides the basics of material and structural behaviour and the fundamental knowledge needed for the design, assessment or retrofitting of concrete structures. It will be essential reading material for graduate students in the field of structural concrete, and also assist designers and consultants in understanding the background to the rules they apply in their practice.

Furthermore, it should prove particularly valuable to users of the new editions of Eurocode 2 for concrete buildings, bridges and container structures, which are based only partly on MC90 and partly on more recent knowledge which was not included in the 1999 edition of the textbook.

This volume contains the proceedings of the 8th International PhD Student Workshop on Service Life and Durability of Reinforced Concrete Structures that was held in Marne-la-Vallée, France, on September the 26th and 27th 2016. Topics discussed in the book are related to durability performance of reinforced concrete, service life modelling, prevention, protection and repair. Reinforced concrete structures may prove to be very durable, however, their gradual degradation over time impairing both serviceability and structural safety is still a matter of great practical concern in view of the large economic consequences for assessment, maintenance and repair. Corrosion of steel reinforcement is considered to be the most detrimental process responsible for structural deterioration. Many studies are in progress to develop a comprehensive engineering approach for assessment of the initiation and the propagation period of corrosion in both uncracked and cracked concrete. Modelling of chloride penetration and carbonation has attracted a great deal of attention in recent years, however, there is still much debate on several essential aspects such as the chloride threshold level. ASR, and acid, sulphate and frost attack and other mechanisms remain important areas of study. In addition, the interaction between different degradation mechanisms requires further understanding. The workshop was organised under the auspices of RILEM EAC (Educational Activities Committee), with the aim to bring together young researchers in the field of durability of concrete.

Volume is indexed by Thomson Reuters BCI (WoS). The field of "polymers in concrete" is rather well consolidated within the construction industry, and its future will be one of benefiting fully from the synergy between the organic and mineral materials. Concrete-polymer composites (C-PC) exhibit excellent adhesion strength and durability in aggressive environments and the good performance of these materials makes innovative applications possible; including new technologies for restoring and renovating buildings.

In a presentation that formalizes what makes up decision based design, Decision Based Design defines the major concepts that go into product realization. It presents all major concepts in design decision making in an integrated way and covers the fundamentals of decision analysis in engineering design. It also trains engineers to understand the impacts of design decision. The author teaches concepts in demand modeling and customer preference modeling and provides examples. This book teaches most fundamental concepts encountered in engineering design like: concept generation, multiattribute decision analysis, reliability engineering, design optimization, simulation, and demand modeling. The book provides the tools engineering practitioners and researchers need to first understand that engineering design is best viewed as a sequence of decisions made by the stakeholders involved and then apply the decision based design concepts in practice. It teaches fundamental concepts encountered in engineering design, such as concept generation, multiattribute decision analysis, reliability engineering, design optimization, simulation, and demand modeling. This book helps students and practitioners understand that there is a rigorous way to analyze engineering decisions taking into consideration all the potential technical and business impacts of their decisions. It can be used in its entirety to teach a course in decision based design, while selected chapters can also be used to cover courses in subdisciplines that make up decision based design.

The Fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICCRRR 2015) was held 5-7 October 2015 in Leipzig, Germany. This conference is a collaborative venture by researchers from the South African Research Programme in Concrete Materials (based at the Universities of Cape Town and The Witwatersrand) and

the Material Science Group at Leipzig University and The Leipzig Institute for Materials Research and Testing (MFPA) in Germany. ICCRRR 2015 continues to seek and to extend a sound base of theory and practice in repair and rehabilitation, through both theoretical and experimental studies, and through good case study literature. Two key aspects need to be addressed: that of developing sound and easily applied standard practices for repair, possibly codified, and the need to study seriously the service performance of repaired structures and repair systems. In fact, without making substantial efforts to implement the latter goal, much of the effort in repair and rehabilitation may prove to be less than economical or satisfactory. The conference proceedings contain papers presented at the conference which can be grouped under the six main themes of (i) Concrete durability aspects, (ii) Condition assessment of concrete structures, (iii) Modern materials technology, (iv) Concrete repair, rehabilitation and retrofitting, (v) Performance and health monitoring and (vi) Education, research and specifications. The large number of high quality papers presented and the wide range of relevant topics covered confirm that these proceedings will be a valued reference for many working in this important field and that they will form a suitable base for discussion and provide suggestions for future development and research. Set of book of abstracts (244 pp) and a searchable full paper CD-ROM (1054 pp).

This book discusses how to identify the level of adhesion in layered systems made of cement composites using a multi-scale approach based on experimental and numerical analyses. In particular, it explains

1. The suitability of previously used artificial intelligence tools and learning algorithms for reliable assessment of the level of adhesion of layered systems made of cement composites based on non-destructive tests
2. The development of the methodology for a reliable non-destructive evaluation of the level of adhesion in newly constructed layered systems of any overlay thickness and in existing layered systems made of cement composites
3. How to determine whether to assess the level of adhesion of the layered systems, and discusses the amplitude parameters, spatial, hybrid and volume parameters describing the morphology of the concrete substrate surface in the mesoscale
4. How to ascertain whether the effective surface area of the existing concrete substrate and the contribution of the exposed aggregate on this substrate, determined in mesoscale, have an impact on the level of adhesion of layered systems made of cement composites
5. The assessment of the structure of air pores in the microscale and the chemical composition of the cement composite on the nanoscale in the interphase zone together with the determination of their impact on the level of adhesion of layered systems made of cement composites
6. The development of an effective methodology for testing the level of adhesion of layered systems made of cement composites in a multi-scale approach, including the research methods and descriptors used.

Annotation Collection of papers focusing on repairing, maintaining, rehabilitating, and retrofitting of existing infrastructures to extend their life and maximize economic return. Moreover, structural performance and material durability are discussed. Contributions are classified (i) Concrete durability aspects, (ii) Condition assessment of concrete structures, and (iii) Concrete repair, rehabilitation and retrofitting. Major attention is paid to innovative materials for durable concrete construction, integrated service life modelling of reinforced concrete structures, NDE/NDT and measurement techniques, repair methods and materials, and structural strengthening and retrofitting techniques. For researchers and practitioners in structure and infrastructure engineering. Set of book of abstracts (458 pp) and a searchable full paper CD-ROM (1396 pp).

This proceedings volume consists of papers focusing on repairing, maintaining, rehabilitating, and retrofitting of existing infrastructures to extend their life and maximize economic return. Moreover, structural performance and material durability are discussed. Contributions fall under the following headings: (i) Concrete durability aspects, (ii)

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