

Durability Design of Concrete Structures in Severe Environments

Lin Xu

Jiangsu Engineering of Career Technical College, Nantong, Jiangsu, 226007, China.

jiahuahb@nttec.edu.cn

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Abstract. Concrete has a high performance corrosion resistance, with the choice of the thickness of the active alkali aggregate, grain shape structured, well-graded, small porosity. Superfine cement with mineral powder instead of 30% to 50%, mineral superfine powder participate hydration, solve concrete interface structure $\text{Ca}(\text{OH})_2$ enrichment and directional crystallization problems, improve the coagulation. The internal structure of the soil, improving the strength and density of concrete. Meanwhile ultra-fine powder mixed with minerals, reducing the C_3A content in the powder and the concrete in the late ettringite hazards greatly. Improve the corrosion resistance of concrete, with also improve the internal structure of concrete and the strength of concrete, compactness and corrosion resistance. Composite type superplasticizer, reducing water consumption unilateral concrete, air-entraining agent is added to improve the density of concrete, the concrete has good impermeability and frost resistance. On the use of ordinary portland cement, it gets high performance, by the ratio test, developed the corrosion and frost resistance of concrete for the chloride, sulfate alone or jointly under the action of the environment concrete structures in corrosive environments, such as coastal areas, inland lakes, underground sewage or chemical zones, there are concrete structure durability requirements, with good economic and promotional value.

Introduction

Engineering coastal areas, concrete in saline environments, by the chloride ion, corrosion and freezing and thawing sulfate ions, the role of chloride ions will intensify the process of carbonation of concrete reinforcement corrosion so, the role will generate calcium sulphate in concrete ettringite, so that the concrete strength is lowered, gradually collapse; the water in the concrete at a low freezing temperature will make cracking the concrete spalling, gradually lose carrying capacity, durability severely affected structures. Owing to the lack of understanding of the durability of concrete, did not take the necessary precautions and the use of corrosion-resistant concrete, so there is a considerable number of projects after completion, soon appeared along the ribs cracked concrete structures, steel corrosion, protective layer off, reducing the structure of life, causing serious consequences need of major repairs or demolition and reconstruction (Fig1) .



Fig.1 Oil Storage Vision

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Sidney Mindess



Durability Design Of Concrete Structures In The Severe Environments:

Durability Design of Concrete Structures in Severe Environments Odd E. GjØrv, 2014-02-07 One of the most pressing problems facing the construction industry globally is the deterioration of major concrete infrastructure in marine and other chloride containing environments While recent advancements in concrete technology have made it easier to control the negative impact of deteriorating processes such as alkali aggregate reaction free

Durability Design of Concrete Structures in Severe Environments Odd E. GjØrv, 2009-01-21 By designing in corrosion prevention and through preventive maintenance the overall service cost of a concrete structure can be substantially reduced This book takes a probabilistic approach to the engineering design issues for controlling durability and service life of concrete structures in severe environments Many durability problems are caused by poor quality control as well as special problems during concrete construction The issue of construction quality and variability need to be grasped before durability can be successfully controlled This book helps by giving reviews of field performance deteriorating processes and current codes and practice methods for calculation of corrosion probability performance based concrete quality control corrosion prevention and preventive maintenance calculation of life cycle costs and life cycle assessment recommended job specifications Internationally relevant with a practical focus this is the essential guide for consulting and construction engineers involved in the design and execution of new concrete structures

Durability Design of Concrete Structures in Severe Environments, Second Edition Odd E. GjØrv, 2014-02-07 One of the most pressing problems facing the construction industry globally is the deterioration of major concrete infrastructure in marine and other chloride containing environments While recent advancements in concrete technology have made it easier to control the negative impact of deteriorating processes such as alkali aggregate reaction freezing and thawing and chemical attack chloride induced corrosion of embedded steel continues to pose the biggest threat to structure durability and performance The second edition of *Durability Design of Concrete Structures in Severe Environments* focuses on enhancing the durability and service life of concrete structures The text describes field experience and deteriorating processes of concrete structures in severe environments and includes current data based on extensive field investigations It presents a durability design based on calculation of corrosion probability and outlines additional protective strategies and measures The text also describes procedures for performance based concrete quality control and quality assurance with documentation of achieved construction quality and compliance with specified durability The text further covers calculation of life cycle costs and life cycle assessment and includes some new recommended job specifications What's New in the Second Edition This second edition delivers more results and experience from practical applications of the probability based durability design and the performance based concrete quality control It includes recent commercial projects both for Oslo Harbor KF and Nye Tjuvholmen KS in Oslo and contains some preliminary results from the more comprehensive research program Underwater Infrastructure and Underwater City of the

Future at Nanyang Technological University in Singapore The book serves as an essential guide both for the owners and the consulting and construction engineers involved in new and major concrete infrastructure design and construction

Durability of Concrete Mark Alexander, Arnon Bentur, Sidney Mindess, 2017-06-26 This book provides an up to date survey of durability issues with a particular focus on specification and design and how to achieve durability in actual concrete construction It is aimed at the practising engineer but is also a valuable resource for graduate level programs in universities Along with background to current philosophies it gathers together in one useful reference a summary of current knowledge on concrete durability includes information on modern concrete materials and shows how these materials can be combined to produce durable concrete The approach is consistent with the increasing focus on sustainability that is being addressed by the concrete industry with the current emphasis on design for durability

Proceedings fib Symposium in London UK
FIB - International Federation for Structural Concrete, 2009-06-01 Developments in the Formulation and Reinforcement of Concrete Sidney Mindess, 2019-06-14 Developments in the Formulation and Reinforcement of Concrete Second Edition presents the latest developments on topics covered in the first edition In addition it includes new chapters on supplementary cementitious materials mass concrete the sustainability of concrete service life prediction limestone cements the corrosion of steel in concrete alkali aggregate reactions and concrete as a multiscale material The book's chapters introduce the reader to some of the most important issues facing today's concrete industry With its distinguished editor and international team of contributors users will find this to be a must have reference for civil and structural engineers Summarizes a wealth of recent research on structural concrete including material microstructure concrete types and variation and construction techniques Emphasizes concrete mixture design and applications in civil and structural engineering Reviews modern concrete materials and novel construction systems such as the precast industry and structures requiring high performance concrete

Concrete Under Severe Conditions 2 Odd E. Gjrv, Koji Sakai, Nemkumar Banthia, 1998 Integrated Design and Environmental Issues in Concrete Technology K. Sakai, 2014-04-21 The two themes of integration of structural and durability design and integration of concrete technologies in relation to global environmental issues are drawn together in this book It presents the views of distinguished international researchers and engineers on these key topics as the 21st century approaches American Environmentalism J. Michael Martinez, 2013-06-20 Protecting the natural environment and promoting sustainability have become important objectives but achieving such goals presents myriad challenges for even the most committed environmentalist American Environmentalism Philosophy History and Public Policy examines whether competing interests can be reconciled while developing consistent coherent effective public policy to regulate uses and protection of the natural environment without destroying the national economy It then reviews a range of possible solutions The book delves into key normative concepts that undergird American perspectives on nature by providing an overview of philosophical concepts found in the western intellectual tradition the presuppositions inherent in neoclassical economics and

anthropocentric human centered and biocentric earth centered positions on sustainability It traces the evolution of attitudes about nature from the time of the Ancient Greeks through Europeans in the Middle Ages and the Renaissance the Enlightenment and the American Founders the nineteenth and twentieth centuries and up to the present Building on this foundation the author examines the political landscape as non governmental organizations NGOs industry leaders and government officials struggle to balance industrial development with environmental concerns Outrageous claims silly misrepresentations bogus arguments absurd contentions and overblown prophesies of impending calamities are bandied about by many parties on all sides of the debate industry spokespeople elected representatives unelected regulators concerned citizens and environmental NGOs alike In lieu of descending into this morass the author circumvents the silliness to explore the crucial issues through a more focused disciplined approach Rather than engage in acrimonious debate over minutiae as so often occurs in the context of green claims he recasts the issue in a way that provides a cohesive look at all sides This effort may be quixotic but how else to cut the Gordian knot

2nd fib Congress in Naples Italy Vol2 FIB - International Federation for Structural Concrete,2006-06-01 Structures and Infrastructure Systems Dan M. Frangopol,2019-12-18 Our knowledge to model design analyse maintain manage and predict the life cycle performance of infrastructure systems is continually growing However the complexity of these systems continues to increase and an integrated approach is necessary to understand the effect of technological environmental economic social and political interactions on the life cycle performance of engineering infrastructure In order to accomplish this methods have to be developed to systematically analyse structure and infrastructure systems and models have to be formulated for evaluating and comparing the risks and benefits associated with various alternatives Civil engineers must maximize the life cycle benefits of these systems to serve the needs of our society by selecting the best balance of the safety economy resilience and sustainability requirements despite imperfect information and knowledge Within the context of this book the necessary concepts are introduced and illustrated with applications to civil and marine structures This book is intended for an audience of researchers and practitioners world wide with a background in civil and marine engineering as well as people working in infrastructure maintenance management cost and optimization analysis The chapters originally published as articles in Structure and Infrastructure Engineering

Bridge Maintenance, Safety, Management, Digitalization and Sustainability Jens Sandager Jensen,Dan M. Frangopol,Jacob Wittrup Schmidt,2024-07-12 Bridge Maintenance Safety Management Digitalization and Sustainability collects the lectures and technical papers presented at the 12th International Conference on Bridge Maintenance Safety and Management IABMAS 2024 Copenhagen Denmark 24 28 June 2024 This Open Access book contains 480 contributions including the T Y Lin Lecture 9 Keynote Lectures and 470 technical papers from 44 countries The contributions are presented bring together academic and technological developments in Bridge Maintenance Safety Management Digitalization and Sustainability to solve new and old problems with innovative solutions Major topics

include advanced bridge design construction and maintenance approaches safety reliability and risk evaluation life cycle management life cycle resilience sustainability standardization analytical models bridge management systems service life prediction structural health monitoring non destructive testing and field testing robustness and redundancy durability enhancement repair and rehabilitation fatigue and corrosion extreme loads needs of bridge owners whole life costing and investment for the future financial planning and application of information and computer technology extensive data analysis and artificial intelligence for bridges among others Bridge Maintenance Safety Management Digitalization and Sustainability provides an up to date overview of the field of bridge engineering and significant contributions to making more rational decisions on bridge safety maintenance management life cycle resilience sustainability and bridge innovations to enhance society's welfare The Editors hope that this book will serve as a valuable reference to all concerned with bridge structure and infrastructure systems including engineers researchers academics and students from all areas of bridge engineering

Structural Reliability Analysis and Prediction Robert E. Melchers, Andre T. Beck, 2018-04-02 **Structural Reliability Analysis and Prediction** Third Edition is a textbook which addresses the important issue of predicting the safety of structures at the design stage and also the safety of existing perhaps deteriorating structures Attention is focused on the development and definition of limit states such as serviceability and ultimate strength the definition of failure and the various models which might be used to describe strength and loading This book emphasises concepts and applications built up from basic principles and avoids undue mathematical rigour It presents an accessible and unified account of the theory and techniques for the analysis of the reliability of engineering structures using probability theory This new edition has been updated to cover new developments and applications and a new chapter is included which covers structural optimization in the context of reliability analysis New examples and end of chapter problems are also now included

Dictionary of Concrete Technology Natt Makul, 2025-06-04 The Dictionary of Concrete Technology is a thorough resource encapsulating the progressions in concrete technology which connects traditional methodologies with contemporary innovations With over 1 000 meticulously selected terminologies it provides clear definitions context and cross references catering to professionals students and researchers This dictionary addresses the necessity for an updated lexicon to keep pace with the swift advancements in materials science and civil engineering Compiled through years of collaboration with scholars engineers and industry specialists it ensures precision and relevance Organized alphabetically with detailed elucidations the dictionary is straightforward to navigate supported by an extensive index and references for further exploration Focusing on both current methodologies and emerging trends such as sustainability and digital construction it offers insights into the future of the discipline Designed as an essential instrument it continues evolving with updates supporting its users quest for knowledge and excellence

Concrete Solutions Michael Grantham, 2016-09-19 *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 3rd fib Congress Washington USA FIB - International Federation for Structural Concrete,2010-06-01

Concrete Technology for a Sustainable Development in the 21st Century Odd E. Gjorv,Koji Sakai,1999-12-23 Concrete technology for a sustainable development in the 21st century focuses on the problems and challenges for the concrete industry today and in the future with particular emphasis on environmental consciousness Primary topics include the improvement of concretes service life to ease technical and economical problems and the waste of natural re Cathodic Protection for Reinforced Concrete Structures Paul M. Chess,2018-10-12 Cathodic protection of reinforced concrete structures is a technique for rescuing corrosion damaged structures and in certain instances preventing them from corroding in the first place and its use is growing This book is for specialist contractors large consultants and owners of corrosion damaged structures and looks at international experience with this technique It examines why corrosion is occurring the differences in the application of CP with the stark dichotomy in its success and failure and finally ways in which its performance can be improved on future installations Information is valuable as the success or failure of the CP system has a marked effect on the service life of the structure PRO 32: International Conference on Advances in Concrete and Structures - ICACS 2003 (Volume 2) Ying-shu Yuan,Surendra P. Shah,Heng-lin Lü,2003 Concrete Library International ,2001

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Table of Contents Durability Design Of Concrete Structures In The Severe Environments

1. Understanding the eBook Durability Design Of Concrete Structures In The Severe Environments
 - The Rise of Digital Reading Durability Design Of Concrete Structures In The Severe Environments
 - Advantages of eBooks Over Traditional Books
2. Identifying Durability Design Of Concrete Structures In The Severe Environments
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Durability Design Of Concrete Structures In The Severe Environments
 - User-Friendly Interface
4. Exploring eBook Recommendations from Durability Design Of Concrete Structures In The Severe Environments
 - Personalized Recommendations
 - Durability Design Of Concrete Structures In The Severe Environments User Reviews and Ratings
 - Durability Design Of Concrete Structures In The Severe Environments and Bestseller Lists
5. Accessing Durability Design Of Concrete Structures In The Severe Environments Free and Paid eBooks
 - Durability Design Of Concrete Structures In The Severe Environments Public Domain eBooks
 - Durability Design Of Concrete Structures In The Severe Environments eBook Subscription Services
 - Durability Design Of Concrete Structures In The Severe Environments Budget-Friendly Options
6. Navigating Durability Design Of Concrete Structures In The Severe Environments eBook Formats
 - ePub, PDF, MOBI, and More
 - Durability Design Of Concrete Structures In The Severe Environments Compatibility with Devices
 - Durability Design Of Concrete Structures In The Severe Environments Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Durability Design Of Concrete Structures In The Severe Environments
 - Highlighting and Note-Taking Durability Design Of Concrete Structures In The Severe Environments
 - Interactive Elements Durability Design Of Concrete Structures In The Severe Environments

8. Staying Engaged with Durability Design Of Concrete Structures In The Severe Environments
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Durability Design Of Concrete Structures In The Severe Environments
9. Balancing eBooks and Physical Books Durability Design Of Concrete Structures In The Severe Environments
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Durability Design Of Concrete Structures In The Severe Environments
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Durability Design Of Concrete Structures In The Severe Environments
 - Setting Reading Goals Durability Design Of Concrete Structures In The Severe Environments
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Durability Design Of Concrete Structures In The Severe Environments
 - Fact-Checking eBook Content of Durability Design Of Concrete Structures In The Severe Environments
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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