



# FATIGUE HANDBOOK

offshore steel structures

**TAPIR**

# Fatigue Handbook Offshore Steel Structures

**Victor M. Corman**



## **Fatigue Handbook Offshore Steel Structures:**

*Fatigue Handbook* A. Almar-Naess, 1985 Soon after oil and gas exploration and production began in the North Sea in the 1960s it became apparent that the steel structure design developed for offshore activities in the Gulf of Mexico was not adequate when transferred to the rigorous North Sea environment Realizing the great need for a better understanding of the fatigue phenomenon concerned materials scientists at SINTEF and Det norske Veritas prepared a five year programme for intensified research on fatigue of offshore steel structures It became the National Five Year Programme for Fatigue of Offshore Steel Structures in 1981 This text comprises a study of fatigue in offshore steel structures It seeks to make results in the area available in a form that can be utilized and understood by those responsible for the different stages in engineering design fabrication and service of offshore structures

**Mooring System Engineering for Offshore Structures** Kai-Tung Ma, Yong Luo, Chi-Tat Thomas Kwan, Yongyan Wu, 2019-06-04 The mooring system is a vital component of various floating facilities in the oil gas and renewables industries However there is a lack of comprehensive technical books dedicated to the subject *Mooring System Engineering for Offshore Structures* is the first book delivering in depth knowledge on all aspects of mooring systems from design and analysis to installation operation maintenance and integrity management The book gives beginners a solid look at the fundamentals involved during mooring designs with coverage on current standards and codes mooring analysis and theories behind the analysis techniques Advanced engineers can stay up to date through operation integrity management and practical examples provided This book is recommended for students majoring in naval architecture marine or ocean engineering and allied disciplines in civil or mechanical engineering Engineers and researchers in the offshore industry will benefit from the knowledge presented to understand the various types of mooring systems their design analysis and operations Understand the various types of mooring systems and the theories behind mooring analysis Gain practical experience and lessons learned from worldwide case studies Combine engineering fundamentals with practical applications to solve today's offshore challenges

*Handbook of Fatigue Crack Propagation in Metallic Structures* A. Carpinteri, 2012-12-02 The purpose of this Handbook is to provide a review of the knowledge and experiences in the field of fatigue fracture mechanics It is well known that engineering structures can fail due to cyclic loading For instance a cyclically time varying loading reduces the structure strength and can provoke a fatigue failure consisting of three stages a crack initiation b crack propagation and c catastrophic failure Since last century many scientists have tried to understand the reasons for the above mentioned failures and how to prevent them This Handbook contains valuable contributions from leading experts within the international scientific community and covers many of the important problems associated with the fatigue phenomena in civil mechanical and nuclear engineering

**Fatigue Design of Marine Structures** Inge Lotsberg, 2016-04-13 *Fatigue Design of Marine Structures* provides students and professionals with a theoretical and practical background for fatigue design of marine structures including sailing ships offshore structures for oil and gas

production and other welded structures subject to dynamic loading such as wind turbine structures Industry expert Inge Lotsberg brings more than forty years of experience in design and standards setting to this comprehensive guide to the basics of fatigue design of welded structures Topics covered include laboratory testing S N data different materials different environments stress concentrations residual stresses acceptance criteria non destructive testing improvement methods probability of failure bolted connections grouted connections and fracture mechanics Featuring twenty chapters three hundred diagrams forty seven example calculations and resources for further study *Fatigue Design of Marine Structures* is intended as the complete reference work for study and practice      *Ageing and Life Extension of Offshore Structures*

Gerhard Ersdal, John V. Sharp, Alexander Stacey, 2019-02-04 A comprehensive overview of managing and assessing safety and functionality of ageing offshore structures and pipelines A significant proportion estimated at over 50% of the worldwide infrastructure of offshore structures and pipelines is in a life extension phase and is vulnerable to ageing processes This book captures the central elements of the management of ageing offshore structures and pipelines in the life extension phase The book gives an overview of the relevant ageing processes and hazards how ageing processes are managed through the life cycle including an overview of structural integrity management how an engineer should go about assessing a structure that is to be operated beyond its original design life and how ageing can be mitigated for safe and effective continued operation Key Features Provides an understanding of ageing processes and how these can be mitigated Applies engineering methods to ensure that existing structures can be operated longer rather than decommissioned unduly prematurely Helps engineers performing these tasks in both evaluating the existing structures and maintaining ageing structures in a safe manner The book gives an updated summary of current practice and research on the topic of the management of ageing structures and pipelines in the life extension phase but also meets the needs of structural engineering students and practicing offshore and structural engineers in oil gas and engineering companies In addition it should be of value to regulators of the offshore industry      **Fatigue of Materials and Structures**

Claude Bathias, André Pineau, 2013-03-04 The design of mechanical structures with improved and predictable durability cannot be achieved without a thorough understanding of the mechanisms of fatigue damage and more specifically the relationships between the microstructure of materials and their fatigue properties Written by leading experts in the field this book which is complementary to *Fatigue of Materials and Structures* Application to Damage and Design also edited by Claude Bathias and Andr Pineau provides an authoritative comprehensive and unified treatment of the mechanics and micromechanisms of fatigue in metals polymers and composites Each chapter is devoted to one of the major classes of materials or to different types of fatigue damage thereby providing overall coverage of the field The book deals with crack initiation crack growth low cycle fatigue gigacycle fatigue shorts cracks fatigue micromechanisms and the local approach to fatigue damage corrosion fatigue environmental effects and variable amplitude loadings and will be an important and much used reference for students practicing engineers and

researchers studying fracture and fatigue in numerous areas of mechanical structural civil design nuclear and aerospace engineering as well as materials science      Fracture and Fatigue of Welded Joints and Structures K Macdonald, 2011-04-19

The failure of any welded joint is at best inconvenient and at worst can lead to catastrophic accidents Fracture and fatigue of welded joints and structures analyses the processes and causes of fracture and fatigue focusing on how the failure of welded joints and structures can be predicted and minimised in the design process Part one concentrates on analysing fracture of welded joints and structures with chapters on constraint based fracture mechanics for predicting joint failure fracture assessment methods and the use of fracture mechanics in the fatigue analysis of welded joints In part two the emphasis shifts to fatigue and chapters focus on a variety of aspects of fatigue analysis including assessment of local stresses in welded joints fatigue design rules for welded structures k nodes for offshore structures and modelling residual stresses in predicting the service life of structures With its distinguished editor and international team of contributors Fracture and fatigue of welded joints and structures is an essential reference for mechanical structural and welding engineers as well as those in the academic sector with a research interest in the field Analyses the processes and causes of fracture and fatigue focusing predicting and minimising the failure of welded joints in the design process Assesses the fracture of welded joints and structure featuring constraint based fracture mechanics for predicting joint failure Explores specific considerations in fatigue analysis including the assessment of local stresses in welded joints and fatigue design rules for welded structures      *Fatigue Life Analyses of Welded Structures* Tom Lassen, Naman Récho, 2013-03-01

Avoiding or controlling fatigue damage is a major issue in the design and inspection of welded structures subjected to dynamic loading Life predictions are usually used for safe life analysis i e for verifying that it is very unlikely that fatigue damage will occur during the target service life of a structure Damage tolerance analysis is used for predicting the behavior of a fatigue crack and for planning of in service scheduled inspections It should be a high probability that any cracks appearing are detected and repaired before they become critical In both safe life analysis and the damage tolerance analysis there may be large uncertainties involved that have to be treated in a logical and consistent manner by stochastic modeling This book focuses on fatigue life predictions and damage tolerance analysis of welded joints and is divided into three parts The first part outlines the common practice used for safe life and damage tolerance analysis with reference to rules and regulations The second part emphasises stochastic modeling and decision making under uncertainty while the final part is devoted to recent advances within fatigue research on welded joints Industrial examples that are included are mainly dealing with offshore steel structures Spreadsheets which accompany the book give the reader the possibility for hands on experience of fatigue life predictions crack growth analysis and inspection planning As such these different areas will be of use to engineers and researchers      **Petroleum and Marine Technology Information Guide** J. Hutcheon, A. Myers, S. Oue, B. Rodden, J. Whittick, 2003-09-02

First published in 1981 as the Offshore Information Guide this guide to information sources has been hailed internationally as an indispensable

handbook for the oil gas and marine industries      *Tubular Structures* Paul Grundy,Alan Holgate,Bill Wong,2021-10-06  
Tubular structures remain a source of architectural inspiration and practical solutions to difficult performance specifications  
New developments are covered in this text which contains papers on design innovations and applications presented at an international symposium held in Australia in 1994      **Offshore Wind Energy Technology** Olimpo Anaya-Lara,John Olav Tande,Kjetil Uhlen,Karl Merz,2018-05-29 A COMPREHENSIVE REFERENCE TO THE MOST RECENT ADVANCEMENTS IN OFFSHORE WIND TECHNOLOGY Offshore Wind Energy Technology offers a reference based on the research material developed by the acclaimed Norwegian Research Centre for Offshore Wind Technology NOWITECH and material developed by the expert authors over the last 20 years This comprehensive text covers critical topics such as wind energy conversion systems technology control systems grid connection and system integration and novel structures including bottom fixed and floating The text also reviews the most current operation and maintenance strategies as well as technologies and design tools for novel offshore wind energy concepts The text contains a wealth of mathematical derivations tables graphs worked examples and illustrative case studies Authoritative and accessible Offshore Wind Energy Technology Contains coverage of electricity markets for offshore wind energy and then discusses the challenges posed by the cost and limited opportunities Discusses novel offshore wind turbine structures and floaters Features an analysis of the stochastic dynamics of offshore marine structures Describes the logistics of planning designing building and connecting an offshore wind farm Written for students and professionals in the field Offshore Wind Energy Technology is a definitive resource that reviews all facets of offshore wind energy technology and grid connection      **Trends in the Analysis and Design of Marine Structures** Carlos Guedes Soares,Joško Parunov,2019-04-15 Trends in the Analysis and Design of Marine Structures is a collection of the papers presented at MARSTRUCT 2019 the 7th International Conference on Marine Structures held in Dubrovnik Croatia 6 8 May 2019 The MARSTRUCT series of Conferences started in Glasgow UK in 2007 the second event of the series having taken place in Lisbon Portugal in March 2009 the third in Hamburg Germany in March 2011 the fourth in Espoo Finland in March 2013 the fifth in Southampton UK in March 2015 and the sixth in Lisbon Portugal in May 2017 This Conference series specialises in dealing with Ships and Offshore Structures addressing topics in the fields of Methods and Tools for Loads and Load Effects Methods and Tools for Strength Assessment Experimental Analysis of Structures Materials and Fabrication of Structures Methods and Tools for Structural Design and Optimisation Structural Reliability Safety and Environmental Protection Trends in the Analysis and Design of Marine Structures is an essential document for academics engineers and all professionals involved in the area of analysis and design of Ships and Offshore Structures About the series The Proceedings in Marine Technology and Ocean Engineering series is devoted to the publication of proceedings of peer reviewed international conferences dealing with various aspects of Marine Technology and Ocean Engineering The Series includes the proceedings of the following conferences the International Maritime Association of the Mediterranean IMAM conferences the

Marine Structures MARSTRUCT conferences the Renewable Energies Offshore RENEW conferences and the Maritime Technology MARTECH conferences The Marine Technology and Ocean Engineering series is also open to new conferences that cover topics on the sustainable exploration and exploitation of marine resources in various fields such as maritime transport and ports usage of the ocean including coastal areas nautical activities the exploration and exploitation of mineral resources the protection of the marine environment and its resources and risk analysis safety and reliability The aim of the series is to stimulate advanced education and training through the wide dissemination of the results of scientific research

Engineering Dynamics and Vibrations Junbo Jia, Jeom Kee Paik, 2018-12-12 Engineering dynamics and vibrations has become an essential topic for ensuring structural integrity and operational functionality in different engineering areas However practical problems regarding dynamics and vibrations are in many cases handled without success despite large expenditures This book covers a wide range of topics from the basics to advances in dynamics and vibrations from relevant engineering challenges to the solutions from engineering failures due to inappropriate accounting of dynamics to mitigation measures and utilization of dynamics It lays emphasis on engineering applications utilizing state of the art information

*Bridge Engineering Handbook* Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts 14 countries and 89 chapters are represented in the second edition of The Bridge Engineering Handbook This extensive collection highlights bridge engineering specimens from around the world contains detailed information on bridge engineering and thoroughly explains the concepts and practical applications surrounding the subject

Optimal Stochastic Control Schemes within a Structural Reliability Framework Bernt J. Leira, 2013-09-07 The book addresses the topic of on line implementation of structural and mechanical design criteria as an explicit part of optimal control schemes The intention of the present research monograph is to reflect recent developments within this area Examples of application of relevant control algorithms are included to illustrate their practical implementation These examples are mainly taken from the area of marine technology with the multi component external loading being represented as both varying in time and with magnitudes that are represented as statistical quantities The relevant target group will be mechanical and structural engineers that are concerned with smart components and structures where optimal design principles and control actuators are combined The book is also relevant for engineers e g involved in mechatronics and control applications

Marine Structural Design Yong Bai, 2003-08-05 This new reference describes the applications of modern structural engineering to marine structures It will provide an invaluable resource to practicing marine and offshore engineers working in oil and gas as well as those studying marine structural design The coverage of fatigue and fracture criteria forms a basis for limit state design and re assessment of existing structures and assists with determining material and inspection requirements Describing applications of risk assessment to marine and offshore industries this is a practical and useful book to help engineers conduct structural design Presents modern structural design principles helping the engineer understand how to conduct structural design by analysis Offers

practical and usable theory for industrial applications of structural reliability theory      **Bridge Engineering Handbook, Second Edition** Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts 14 countries and 89 chapters are represented in the second edition of The Bridge Engineering Handbook This extensive collection highlights bridge engineering specimens from around the world contains detailed information on bridge engineering and thoroughly explains the concepts and practical applications surrounding the subject Published in five books Fundamentals Superstructure Design Substructure Design Seismic Design and Construction and Maintenance this new edition provides numerous worked out examples that give readers step by step design procedures includes contributions by leading experts from around the world in their respective areas of bridge engineering contains 26 completely new chapters and updates most other chapters It offers design concepts specifications and practice as well as the various types of bridges The text includes over 2 500 tables charts illustrations and photos The book covers new innovative and traditional methods and practices explores rehabilitation retrofit and maintenance and examines seismic design and building materials The first book Fundamentals contains 22 chapters and covers aesthetics planning design specifications structural modeling fatigue and fracture What's New in the Second Edition Covers the basic concepts theory and special topics of bridge engineering Includes seven new chapters Finite Element Method High Speed Railway Bridges Concrete Design Steel Design Structural Performance Indicators for Bridges High Performance Steel and Design and Damage Evaluation Methods for Reinforced Concrete Beams under Impact Loading Provides substantial updates to existing chapters including Conceptual Design Bridge Aesthetics Achieving Structural Art in Bridge Design and Application of Fiber Reinforced Polymers in Bridges This text is an ideal reference for practicing bridge engineers and consultants design construction maintenance and can also be used as a reference for students in bridge engineering courses      *Essentials of Offshore Structures* D.V. Reddy, A. S. J. Swamidas, 2016-04-19 Essentials of Offshore Structures Framed and Gravity Platforms examines the engineering ideas and offshore drilling platforms for exploration and production This book offers a clear and acceptable demonstration of both the theory and application of the relevant procedures of structural fluid and geotechnical mechanics to offshore structures It      Bridge Engineering Handbook, Five Volume Set Wai-Fah Chen, Lian Duan, 2014-01-24 Over 140 experts 14 countries and 89 chapters are represented in the second edition of the Bridge Engineering Handbook This extensive collection provides detailed information on bridge engineering and thoroughly explains the concepts and practical applications surrounding the subject and also highlights bridges from around the world This second edition of the bestselling Bridge Engineering Handbook covers virtually all the information an engineer would need to know about any type of bridge from planning to construction to maintenance It contains more than 2 500 tables charts and illustrations in a practical ready to use format An abundance of worked out examples gives readers numerous practical step by step design procedures Special attention is given to rehabilitation retrofit and maintenance Coverage also includes seismic design and building materials Thoroughly revised and updated this second



edition contains 26 new chapters      Advances in Fatigue Science and Technology C. Moura Branco, L. Guerra Rosa, 2012-12-06 This volume contains the edited version of lectures and selected research contributions presented at the NATO ADVANCED STUDY INSTITUTE on ADVANCES IN FATIGUE SCIENCE AND TECHNOLOGY held in Alvor Portugal 4th to 15th of April 1988 and organized by CEMUL Center of Mechanics and Materials of The Technical University of Lisbon The Institute was attended by 101 participants including 15 lecturers from 14 countries The participants were leading scientists and engineers from universities research institutions and industry and also Ph D students Some participants presented papers during the Institute reporting the state of art of their research projects All the sessions were very active and quite extensive discussions on scientific aspects took place during the Institute The Advanced Study Institute provided a forum for interaction among eminent scientists and engineers from different schools of thought and young researchers The Institute addressed the foundations and current state of the art of essential aspects related to fatigue science and technology namely Short Cracks Metallurgical Aspects Environmental Fatigue Threshold Behaviour Notch Behaviour Creep and Fatigue Interactions at High Temperature Multiaxial Fatigue Low Cycle Fatigue Methodology of Fatigue Testing Variable Amplitude Fatigue Fatigue of Advanced Materials Elastic Plastic Fatigue and several engineering applications such as welded joints energy systems offshore structures automotive industry machine and engine components This book is organized in three parts Part I Fundamentals of Fatigue Part II Engineering Applications Part III Research Contributions The research contributions covered most of the areas referred above

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