

Friedhelm Stangenberg
Rolf Breitenbücher
Otto T. Bruhns
Dietrich Hartmann
Rüdiger Höffer
Detlef Kuhl
Günther Meschke *Editors*

Lifetime-Oriented Structural Design Concepts

 Springer

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Günther Meschke (Eds.)

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Prof. Dr.-Ing. Friedhelm Stangenberg
Ruhr-University Bochum
Institute for Reinforced and
Prestressed Concrete Structures
Universitätsstr. 150
44780 Bochum, Germany
E-mail: sandra.krimpmann@
ruhr-uni-bochum.de,
friedhelm.stangenberg@
ruhr-uni-bochum.de

Prof. Dr.-Ing. Rolf Breitenbücher
Ruhr-University Bochum
Institute for Building Materials
Universitätsstr. 150
44780 Bochum, Germany

Prof. Dr.-Ing. Otto T. Bruhns
Ruhr-University Bochum
Institute of Mechanics
Universitätsstr. 150
44780 Bochum, Germany

Prof. Dr.-Ing. Dietrich Hartmann
Ruhr-University Bochum
Institute for Computational Engineering
Universitätsstr. 150
44780 Bochum, Germany

Prof. Dr.-Ing. Rüdiger Höffer
Ruhr-University Bochum
Building Aerodynamics Laboratory
Universitätsstr. 150
44780 Bochum, Germany

Prof. Dr.-Ing. Detlef Kuhl
University of Kassel
Institute of Mechanics and Dynamics
Mönchebergstr. 7
34109 Kassel, Germany

Prof. Dr.-Ing. Günther Meschke
Ruhr-University Bochum
Institute for Structural Mechanics
Universitätsstr. 150
44780 Bochum, Germany

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The Team of SFB 398

Mark Alexander Ahrens • Hussein Alawieh • Matthias Baitsch • Falko Bangert • Yavuz Başar • Christian Becker • Ivanka Bevanda • Jörg Bockhold • Ndzi Christian Bongmba • Dietrich Braess • Rolf Breitenbücher • Otto T. Bruhns • Christian Duckheim • Andreas Eckstein • Frank Ensslen • Olaf Faber • Mózes Gálffy • Volkmar Görnandt • Jaroslaw Gorski • Stefan Grasberger • Klaus Hackl • Ulrike Hanskötter • Gerhard Hanswille • Dietrich Hartmann • Anne Hartmann • Gunnar Heibroock • Martin Heiderich • Jan Helm • Christa Hermichen • Erich Heymer • Rüdiger Höffer • Norbert Hölscher • Jan-Hendrik Hommel • Wolfgang Hubert • Hurşit Ibuk • Mikhail Itskov • Hans-Ludwig Jessberger • Daniel Jun • Dirk Kamarys • Michael Kasperski • Christoph Kembrowski • Olaf Kintzel • Andreas S. Kompalka • Diethard König • Karsten Könke • Stefan Kopp • Wilfried B. Krätzig • Sandra Krimpmann • Jens Kruschwitz • Detlef Kuhl • Jan Laue • Armin Lenzen • Roland Littwin • Ludger Lohaus • Dimitar Mancevski • Günther Meschke • Kianoush Molla-Abbassi • Jörn Mosler • Stephan Müller • Thomas Nerzak • Hans-Jürgen Niemann • Andrzej Niemunis • Sam-Young Noh • Markus Peters • Lasse Petersen • Yuri Petryna • Daniel Pfanner • Tobias Pfister • Gero Pflanz • Igor Plazibat • Rainer Pölling • Markus Porsch • Thorsten Quent • Stefanie Reese • Christian Rickelt • Matthias Roik • Jan Saczuk • Jörg Sahlmen • E. Scholz • Henning Schütte • Robert Schwetzke • Max J. Setzer • Björn Siebert • Anne Sprünken • Friedhelm Stangenberg • Zoran Stankovic • Sascha Stiehler • Mathias Strack • Helmut Stumpf • Theodoros Triantafyllidis • Cenk Üstündag • Heinz Waller • Claudia Walter • Heiner Weber • Gisela Wegener • Andrés Wellmann Jelic • Torsten Wichtmann • Xuejin Xu • Natalia Yalovenko

Preface

At the beginning of 1996, the Cooperative Research Center SFB 398 financially supported by the German Science Foundation (DFG) was started at Ruhr-University Bochum (RUB). A scientists group representing the fields of structural engineering, structural mechanics, soil mechanics, material science, and numerical mathematics introduced a research program on “lifetime-oriented design concepts on the basis of damage and deterioration aspects”. Two scientists from neighbourhood universities, one from Wuppertal and the other one from Essen, joined the Bochum Research Center, after a few years. The SFB 398 was sponsored for 12 years, until the beginning of 2008 – this is the maximum possible duration of DFG financial support for an SFB.

Safety and reliability are important for the whole expected service duration of an engineering structure. Therefore, prognostical solutions are needed and uncertainties have to be handled. A differentiation according to building types with different service life requirements is necessary. Life-cycle strategies to control future structural degradations by concepts of appropriate design have to be developed, in case including means of inspection, maintenance, and repair. Aspects of costs and sustainability also matter.

The importance of structural life-cycle management is well recognized in the international science community. Therefore, parallel corresponding activities are proceeding in many countries. In Germany, two other related SFBs were established: SFB 524 “Materials and Structures in Revitalisation of Buildings” at Weimar University and the still running SFB 477 “Life-Cycle Assessment of Structures via Innovative Monitoring” at Braunschweig University of Technology. With these two SFBs, a fruitful cooperation was developed.

The Cooperative Research Center for Lifetime-Oriented Design Concepts (SFB 398) at Ruhr-University has carried out substantial work in many fields of structural lifetime management. Lifetime-related fundamentals are provided with respect to structural engineering, structural and soil mechanics, material science as well as computational methods and simulation techniques. Stochastic aspects and interactions between various influences are included.

Thus, a solid basis is provided for future practical use and, e.g. also for standardization.

The wide range of scientific topics among the specification and determination of external loading and the simulation based lifetime-oriented structural design concepts is presented in an extraordinary format. All scientists of the SFB 398, professors and Ph.D. students, have contributed with a great effort in matchless team work to the present book. As a result of this, the present work is not only a collection of project reports, in fact it is almost written in the style of a monograph, whereby several authors fruitfully interact in all sections from the highest to the deepest level. Within this philosophy of joint authorship, authors are denoted in chapters and sections down to the third level. In special cases, where authors have contributed to a selected deeper section level, they are denoted beside the standard procedure in the regarding text episode.

All members of SFB 398, with sincere thanks, acknowledge the financial support of DFG over more than 12 years. The dedicated research work of all participating colleagues and of many guest scientists from diverse countries also is gratefully mentioned.

Finally, the great efforts of Springer-Verlag, Heidelberg, to produce this attractive volume is appreciated very much.

Bochum,
March 26th, 2009

Friedhelm Stangenberg, Chairman of SFB 398
Otto T. Bruhns, Vice-chairman of SFB 398

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