

Review

 This useful and informative book offers good value for money, says **John Lyness**. It provides many insights for those required to verify and check designs for different structural forms.

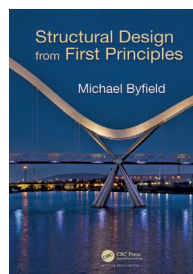
Structural design from first principles

Author: Michael Byfield

Publisher: CRC Press

Price: £38.99 (paperback/e-book)

ISBN: 978-1-49874-121-7



This book comprises 11 chapters, which describe various design methods for steel, concrete and timber structural members. Exemplar structural members are taken from building structures, bridge structures and temporary works structures. There is little focus on the derivation of loads and load cases, so the book's focus is on useful structural design methods and contextual member design.

Of the 11 chapters, four revise structural design topics, such as the limit state philosophy, steel beam design, reinforced concrete beam design and timber member design. The other seven chapters introduce more specialised approaches to design topics, such as accounting for the buckling of steel columns, trusses, arches and thin-walled structures, steel-concrete composite design, prestressed concrete, strut-and-tie models, design for reinforced concrete crack control and checks for the accidental action capacity of members.

The prerequisite structural mechanics knowledge is that of a post-second-year civil engineering degree student, but some principles used in application to the design methods are more advanced.

At the end of each chapter, one, or more, classic mechanics texts or design practice guides are cited. Within the chapters, there are also references and comments on Eurocodes. Indeed, a most attractive and interesting feature of this book is the many useful and informed comments made *en passant* during the structural design 'narratives' within the chapters.

While there is some revision material in four of the 11 chapters, this is certainly not a standard design text or handbook. In the preface, the author states that while he has used Eurocode safety factors and notation throughout, he uses sourceable formulae which permit the portability of application between codes and facilitate design checking. There is no use of sequenced design method 'bullet points' and parallel, corresponding Eurocode clause numbers.

The narrative style of presentation, moving through the design examples and case studies, is easy to follow and the range of design examples for steel, reinforced, precast and prestressed concrete, and timber structural members in temporary works, buildings and bridges is very informative.

I found some very useful design examples within this text. For example, the compliance checks for beams, the extraction of the accidental action capacity for props and beams, the revision of slender truss buckling, the case study on large-scale lattice-girder arch buckling, stiffened panels for box girders, shear stud design in composite construction, M-N interaction diagrams, sequenced sizing and design guidance for prestressed concrete beams, reinforced concrete strut-and-tie design examples, strut-and-tie use in prestressed concrete tendon anchorage design, reinforced concrete design for crack control, flitch beam and timber truss design. There are also other useful and informative design examples within each chapter, again with useful 'asides' embedded in the text.

At the end of each chapter, there are

three, or more, realistic design problems for self-solution. An associated website gives answers to all the chapter-end design problems in the book.

A book of such breadth and detail would be unusual if there were no typos. I came across three kinds: some misuse of terms such as density rather than specific weight; the use of symbols with multiple meanings; and the use of unreferenced symbols. There are not many occurrences of these errors and they stand out because of the lucid narrative style.

In all, I consider this book to be good value for money. I would recommend it especially to those who are interested in crossovers between building structure design and bridge structure design. Also, although the chapters are not in the usual format, with sequenced design steps and parallel clause numbers, the book provides many insights for those who are required to verify and check designs for different structural forms.

The Foreword and the first paragraph of Chapter 9 make sobering references to the *Sleipner A* disaster of 1991. A useful account of the relevant details can be found at www.nafems.org/downloads/nbr06r02.pdf.

As more reliance is placed on decisions made by, and using, integrated structural design software, structural engineers need more appropriate qualitative and quantitative methods to assess our structural designs and prevent future computer-aided catastrophes. Structural engineers are required to be able to move from the 'big picture' domain to the domain of details. This book encourages readers to lift their eyes from the spreadsheet and the screen and be aware of the other possibilities available in comprehensible design methods.

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