

Book reviews

TENSION STRUCTURES: FORM AND BEHAVIOUR

W. J. Lewis. Thomas Telford, 2003. ISBN 0 7277 3236 6, £30, 201 pp.

Tension Structures: Form and Behaviour by W. J. Lewis has been a welcome addition to the plethora of modern books concentrating on specific types of structural systems, as books focusing on tension structures are very few and far between. Moreover, detailed coverage of the 'form' of tension structures does not feature in other books, although 'form-finding' has been the focus of numerous research papers over the years.

The book is divided into seven main chapters, including the very interesting and easy to read introductory chapter. This chapter appropriately includes a good number of photographs of mainly fairly new (post-1990) modern structures, which are used to supplement the explanation of different types of tension structure given in the text. Chapter 2 gives a good background to form-finding, in an informative and appealing manner, keeping mathematical expressions simple and to the minimum, so as not to overburden the reader early on. Worth mentioning is the beginning of this chapter that, by deliberating on 'nature's secrets', motivates the reader to want to learn more. Form-finding, from a technical perspective, is revisited later in the book, especially in the fifth and sixth chapters where cable roof structures and suspension bridges are considered, respectively.

Chapters 3–7 examine various issues related to the behaviour and modelling of tension structures, with emphasis given to cable nets, cable roof structures and tension membranes, as well as suspension bridges. All chapters are well written and include references to relevant material, and there are helpful diagrams of good quality throughout. Apart from Chapters 5 and 6 that present case studies on particular types of tension structures as mentioned above, the remaining chapters concern tension structures in general. As well as having short sections that evaluate some of the addressed modelling methods, in some cases alternative methods are presented and direct comparisons are made. These features are supportive, particularly to the less experienced reader. Another favourable feature of this book is its allusion to several well-known tension structures. This appears not only in the first two chapters, but also in later chapters and some case studies. Examples include the Millennium Bridge (London) and the Tête

Defence Cube (Paris) in the sixth and seventh chapters, respectively.

Although design is not one of the primary remits of the book, much of the covered material would, in fact, be of use to the designer of tension structures. Indeed, the entirety of the fifth chapter is concerned with design issues surrounding the form-finding and patterning of cable roof structures, while there is also a concise case study in Chapter 7 that is concerned with the implications of mesh control for design.

The preface states that the book aims to 'enhance understanding of tension structures. . . and to provide insights into the problems associated with computational modelling of their structural form and behaviour'. In addition to enhancing understanding, this book should also be valuable for those who are at the initial stage of exploring tension structures. Therefore, this book is a recommended text to practicing structural engineers, whether involved in design or assessment, as well as to advanced structural engineering students.

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MODERN STRUCTURAL ANALYSIS

I. A. Macleod. Thomas Telford, 2005. ISBN 0 7277 3279 X, £65, 190 pp.

As all practicing structural engineers know, we are well and truly in the age of computer-driven structural analysis, where in an instant modern-day software can complete the sort of calculations our predecessors could only begin to attempt. This has certainly been the case for the past 20 years or more, and in the future the computer's influence will only continue to increase. However, even today there is still a shortage of adequate published guidance on the topic of computer structural analysis and modelling; a gap Macleod intends to fill with this text.

The first chapters introduce the basic processes of structural modelling, that is, how to develop the model, what elements to use, when to increase the model complexity and how to look out for any modelling errors. As a warning of the consequences of inaccurate analysis, MacLeod looks at the deficiencies in modelling that caused the Sleipner platform collapse. Importantly the author reiterates the importance of proper

checking throughout the modelling process, giving rationalised procedures for the engineer to validate and verify his or her results.

The book gives a concise introduction to the basic building blocks of any analysis model (line elements, surface elements and so on) and then describes in practical terms how to put these elements together to give an accurate representation of the structure. The sections on connection, support and ground modelling are particularly useful in this respect. The later chapters, 'Modelling with line elements' and 'Modelling plates and slabs', go into detail about how to correctly apply the methods for specific structural situations. Again, Macleod continually reminds the reader not to forget the role of traditional structural calculations, always to be performed in tandem with computer analysis. This is a key point that must not be lost in the minutiae of the modelling process—Macleod may be a strong advocate of the power of computational methods, but he still insists that computers should complement, not replace, classical structural engineering techniques.

The text is concluded with two case studies that succinctly bring together the lessons learnt in the earlier sections; the first a 2D plane frame analysis, the second a 3D model of a four-

storey composite steel and concrete structure. These case studies neatly follow the uniform modelling process defined previously, from model choice to model development, followed by validation, verification (qualitative and quantitative) and sensitivity analyses. Indeed Macleod's standardised route of analysis, as traced by each case study, is perhaps the most valuable message that any inexperienced modeller should take from this book.

Macleod's book satisfies its objective of being both a useful reference for the experienced modelling practitioner and an equally useful guidance text for the inexperienced engineer. The pages are helpfully illustrated with an assortment of figures, equations and tables, and the author's style is such that the subject matter is broken down into easily digestible nuggets of information. It is a thorough, well thought out and authoritative work in a subject area where few other texts are available. However, for all the worthy content of the book, one has to be concerned that the £65 cost of the 191-page book will perhaps dissuade those students and young engineers for which this book will prove most beneficial.

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