

Book review

COMPUTATIONAL MECHANICS FOR HERITAGE STRUCTURES

B. P. Leftheris, M. E. Stavroulaki, A. C. Sapounaki and G. E. Stavroulakis. WIT Press, 2006. ISBN 1-84564-034-9, £130, 288 pp. + CD-rom

This book deals extensively with the finite element analysis method as applied to heritage structures.

There are five principal chapters to the book, dealing in turn with: architectural form and structural systems; static and dynamic analysis; computational techniques; case studies of selected heritage structures; and restoration modelling and analysis. The latter two topics comprise about half the book. The book is accompanied by a CD which provides details of some of the case studies from chapter 4.

The cover suggests that the book is intended for students, but this reviewer had difficulty in deciding whether the book was aimed at students, practicing engineers faced with a heritage structure for the first time or experienced practitioners who deal with heritage structures regularly. Chapter 1 appeared simplistic even for engineering students and might have been an appropriate introduction for other professionals unfamiliar with basic structural mechanics and seismic actions. Chapters 2 and 3 provide a reasonable introduction to the finite element method which would be familiar to most practicing structural engineers. This reviewer was disappointed that the emphasis was so greatly in favour of the finite element method. Other computational methods which are based upon large deflections of structural geometry at one level or on the finite difference method at the other level have a significant role in the modelling of

heritage structures. These methods are not covered at all in this book.

The case studies in chapters 4 and 5 are examples of relatively straightforward structures. However, the figures within the book only come to life when they can be seen in colour, as provided electronically on the CD. The examples of seismic action and modal analyses are interesting. It was noted that one model of half a bridge structure, as a result of constraints at the centreline, only considered symmetrical modes—anti-symmetrical modes were proscribed—emphasising the care with which such models need to be built. Other criticisms are the scant mention made within the text of the effect of damping on heritage structures subject to seismic action and the need to consider the failure criteria of the materials concerned.

Chapter 5 deals with the modelling of restoration. Stone is the principal original material considered, with concrete or steel used as new materials. Insufficient attention seems to have been given to the properties of the different materials to be modelled. Many heritage structures are composed of stone, but the wide variety of stone used and the different materials (such as ashlar facing with rubble core; brickwork; combinations of brickwork and stone; timber; wrought and cast iron) deserve greater mention. Chapter 5 also deals with design optimisation for the restoration work. The examples of this technique are theoretically interesting, but may not be of much practical assistance for practitioners.

This reviewer could recommend that this book may have a place in a university library.

R. A. M. WATKINS
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