The particular problems associated with skew are dealt with in a separate section. Dr West has also included helpful comments on the interpretation of the output data from grillage analyses.

Every bridge designer will want to have a copy of

the design booklet ready to hand and will find much of value and interest in the Research Report. The Research Report should also be required reading for all research workers in this field.

A. R. CUSENS

Statical and geomechanical models

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Published by Springer-Verlag, Vienna (ISBN 3-2-11 81096 X) and New York (0-387 81096 X). 1973. 232 × 155 mm. pp. xv, 182. Price: DM80.

This fascinating book by Professor Fumagalli covers the more advanced techniques that are available for modelling the behaviour of all types of building and civil engineering structures. It will therefore be of particular interest to practising engineers faced with the design of unusual or novel structures for which no proven analytical method exists, and to all research workers involved in structural work.

The first three chapters deal with the principles of similitude, the criteria for choosing materials for models, and loading and measurement techniques. Although comparatively brief (57 pages), these chapters cover all the essentials lucidly. The chapter on methods of loading and measurement is especially good; for the section on materials, the author draws heavily on his experience at the ISMES organization in Bergamo, but covers all materials commonly used for models both for elastic tests and for loading up to failure.

Chapter 4 deals with elastic models and chapter 5 with modelling reinforced and prestressed concrete structures. Chapter 6 is concerned with models of dams (including tests to failure) and the final chapter covers geomechanical models, mainly for dams. Each chapter is well illustrated with examples from most of the principal model testing centres. Of particular value is the comprehensive, up-to-date, international biblio-

graphy provided at the end of each of the seven chapters. One might have wished to see more on the problems of size and scale effects generally, and, in the particular case of modelling structural concrete over the entire loading range, more discussion on the difficulties that can arise due to bond would have been helpful.

There is a wealth of information on all aspects of modelling contained in this book. The reviewer would agree very much with the author that modelling is an art rather than an exact science; successful modelling is therefore very dependent upon experience. Professor Fumagalli has had more than twenty intensive years of modelling, and has succeeded in setting down the knowledge gained in a clear and precise manner. The reviewer was particularly delighted with the author's preface to the book, where the interrelation between physical modelling, mathematical analysis and design is put in perspective. All research, testing, design calculations, analysis and so on are modelling in the broadest sense and should always be directed towards real structures, a fact that is sometimes forgotten in comparing models with analyses. This preface should be read by all engineers who are involved in any way with structures, to whom the book as a whole can be thoroughly recommended.

G. SOMERVILLE

*Translation made by Dr K. G. Stagg, University of Wales, Swansea.

Structural concrete elements

E. W. Bennett

Published by Chapman and Hall Ltd, London. 1973. pp. xiv, 344. 240 × 160 mm. ISBN 0 412 09020 1. Price £5.

This book is designed chiefly as a textbook for students on honours courses who have some basic knowledge of the mechanical properties of concrete. It also aims to provide basic material for more specialized post-graduate work. It deals with the behaviour, theory and design of single structural elements, but does not con-

sider the interaction of such elements in statically indeterminate structures. It does not cover slabs or shells. The book deals with both reinforced and prestressed members, emphasizing that the two types of construction are basically similar, and that the underlying design principles are often identical. This is in

line with the philosophy of the Unified Code of Practice for structural concrete in which, although the two forms of construction are considered in different sections, many of the design criteria are the same for both. The notation throughout is the standard adopted by both the British and American Codes. SI units are used with imperial equivalents in parentheses.

Part I deals with 'Mechanics of structural concrete elements', starting with linear behaviour of uncracked elements. This part progresses logically through cracking, non-linear behaviour and time-dependent deformations to the various modes of failure. Each new topic is explained succinctly and illustrated with good clear figures. However, the general lack of photographs is regrettable as they can often explain a point in far more detail than any number of line drawings. The major topics are amplified and illustrated by the use of simple worked examples. Each chapter ends with a list of references, the majority of which should be readily available in any engineering department library and so would form the basis for more detailed study of any particular topic. This part of the book also serves as a commentary on the Unified Code. Though not going into topics in as much detail as the *Handbook on the Unified Code*, it should give a student or a young practising engineer an insight into the relevant philosophy behind the clauses. Obviously it should only be used in parallel with the Code and not in place of it.

Part 2 covers 'Design of structural elements'. The first chapter outlines the various principles of structural design, starting with the method of permissible stresses, through load factor design to limit state design as incorporated in the present British Code. The rela-

tive merits and demerits of each method are discussed and the way each has grown out its predecessors is explained. The method of probabilistic design is dealt with in some detail, even though it is not at present incorporated in the British Code.

The remainder of Part 2 deals with dimensioning for simple bending, for bending combined with axial load and for shear and torsion. As each successive design constraint is introduced, it is applied in the form of an example, the design running successively through each topic. Where possible, both reinforced and prestressed members are designed in parallel, emphasizing the similarities in the design methods for the two types of construction. This section of the book is somewhat tedious, most of the calculations being taken rigorously from first principles. This underlines the fact that the book is aimed chiefly at undergraduates and not at practising engineers who would probably rely more on 'trial and error' methods using design charts.

The book concludes with three Appendixes, the largest of which lists section properties for I beams. These occupy 33 pages, which seems a disproportionate amount of space.

In conclusion, *Structural concrete elements* is straightforward and practical without being too academic. As such, it would appear to be very suitable for undergraduates and young engineers as a basic textbook on the behaviour and design of simple concrete elements. However, in any undergraduate course, it would have to be supplemented by other textbooks, for example one dealing with the design of slabs, and so, because of its relatively limited scope, it seems somewhat overpriced for the average student.

J. L. CLARKE