Book reviews

The use of a grillage analogy for the analysis of slab and pseudo-slab bridge decks

R. West

Published by the Cement and Concrete Association, 1973. A4. pp. 104. Price: £2. Research Report 21 (Publication 41.021).

Recommendations on the use of grillage analysis for slab and pseudo-slab bridge decks

R. West

Published by the Cement and Concrete Association and the Construction Industry Research and Information Association, 1973. A4. pp. 24. Price 50p. Publication 46.017.

These two publications may be regarded as the definitive statement on the use of grillage analysis in the design of slab and pseudo-slab bridge decks. The exercise carried out by Dr West is an essential one that might have been done several years ago by earlier proponents of the method but was not. The information now made available will be welcomed by all concerned with the design of concrete bridges.

Research Report 21 contains careful comparisons of grillage analyses with experimental results from many different research centres around the world. No less than 53 bridge decks of various types are considered in this comprehensive but compact presentation.

The bridge decks are arranged into three main groups:

- (1) right simply supported single-span decks
- (2) skew simply supported single-span decks
- (3) continuous decks

The main conclusions consider the decks as grids, slabs and pseudo-slabs and also comment on support reactions and on the advantages of grillage analysis. A full list of references is given at the end of the report.

The author has difficulties in interpreting some of the experimental evidence, especially where the material properties are poorly documented or imprecisely determined. Despite such difficulties, the evidence in

favour of the general applicability of grillage analysis to slabs and pseudo-slabs comes through strongly and convincingly.

One of the most surprising features of Dr West's report is the good correlation obtained for slab structures even where Poisson's ratio was quite high. Even peak values of moment under load were predicted with reasonable accuracy.

At the time the comparisons in this report were made, there was little experimental work available on skew multi-cell voided slab or box decks; in this area the reviewer at least has had mixed success with grillage analysis and would have appreciated information. In this situation, it would have been interesting to see comparisons made between grillage analysis and the finite element method for this type of deck.

Research Report 21 provides the background for the author's design booklet 46.017 which gives specific recommendations on the use of grillage analysis for this class of structure with useful notes on the computation of stiffness parameters for representative cross-sections.

Practical advice is provided for the choice of grillage layouts for

- (a) grid-type structures
- (b) box or U beams connected by top slab
- (c) slab structures
- (d) pseudo-slab structures

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

E. Fumagalli*

Istituto Sperimentale Modelli e Strutture, Bergamo

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