

problems in concreting; development of strength; other strength properties; elasticity and creep; deformation and cracking independent of load; permeability and durability; resistance to freezing and thawing; testing; compliance with specifications; lightweight concrete; mix design; special concretes. This greater sub-division makes for easier searching, which is also helped by the list of contents including sub-headings as a single line entry with their own page numbers. There are, in addition, eight pages of Index.

Considering the market at which it is aimed, the minimal mentions of pulverized-fuel ash, ground granulated blastfurnace slag, alkali-aggregate reaction and silica fume are understandable. There is also limited coverage of the Concrete Society Technical Reports on core testing (No. 11, 1976), non-structural cracks (No. 22, 1982) and the CIRIA report on early

age thermal problems (No. 91, 1981). Only the 'bones' remain of elasticity, shrinkage and creep.

The newly organized chapters on such topics as strength, site practice, admixtures, temperature problems, freezing and thawing, specification compliance and special concretes will be welcomed and easily assimilated by new devotees. The inclusion of the 1987 version of the HMSO *Design of normal concrete mixes* is a "feather in their cap".

As is to be expected from these authors, the whole is readable and informative at the level at which it is aimed. Older readers will find the reduced coverage, compared with *Properties*, somewhat galling and will hope for a fourth edition of that classic text. New students, however, will be unaware of the change and will probably be more happy with *Technology* than they have been with *Properties*.

B. MAYFIELD

## Cement-treated pavements

### Materials, design and construction

R. I. T. Williams

London and New York, Elsevier Applied Science Publishers, 1986. 219 × 140 mm. Hardback. pp. xix, 746. ISBN 1 85166 018 6. Price £75.00.

This book contains 27 chapters, 746 pages and has over 550 references. It represents a major contribution on the subject of cement-treated pavements.

I found that the book made absorbing reading. Its value is enhanced by its clear type and presentation, together with the author's 'easy-to-read style'. I also liked the way in which most chapters give a balanced assessment of the available information on the particular subject, finishing with a conclusion in which the author gives concisely his own views. It has a most detailed index, running to 28 pages.

As the author states in the preface, this book was published prior to the publication of the sixth edition of the UK Department of Transport specification for road and bridge works. In some ways this is a pity; however, the author has managed successfully to refer where appropriate to the changes likely to be introduced.

The book's first chapter deals with 'the formative years', and traces the history of treating soils with cement in the UK and elsewhere. A minor criticism of this chapter might be that it does not sufficiently emphasize the role that geographical location has to play when cement treatment of materials is considered. For example there is little doubt that the ready availability of granular materials in some areas of the UK has economically ruled out the use of

cement-treated materials in sub-base and lower layers of construction up to the present time.

Three of the early chapters are devoted to background information on concrete roads, non-bound granular materials and bituminous materials. The comprehensive information in these chapters makes interesting reading. However, the record should be set straight on some points on concrete roads:

The change to reinforced construction of concrete roads (p. 69) was a result of changes in pavement design introduced in 1969 and was not due to the "ready availability of slipform pavers". These changes permitted the use of unreinforced construction for the first time in the UK as one of the alternative forms of construction for motorways and trunk roads. The number of joints and their spacing plays no part in a contractor's choice of paving plant (p. 70). Slipform pavers are very suited for the construction of reinforced as well as unreinforced pavements. Almost all concrete pavements in the UK are laid during the Summer period so the most common dowelled contraction joint does not have a bottom crack inducer as is shown in Fig. 3.7 viii.

Chapter 6 on the nature of cement-treated materials covers the approach in the new Department of Transport specification with the minor exception that no mention is made of CBM4. This is possibly the

best approach that could be adopted. An interesting discussion is given of current British and American thinking on these materials.

Three chapters on structural properties and design present a wealth of experience and technical information with appropriate references. In the chapter on 'a laboratory approach to design' the author states that he is now in favour of a method specification, but points out that selection of a compliance density is still necessary to assess the degree to which laboratory specimens at the mix design stage have to be compacted.

The nature of cement-treated pavements is discussed in Chapter 10 and the author concludes that pavements having bases of cement-treated materials should be analysed on the assumption that they are rigid materials.

Chapters 11, 12 and 13 deal with the subject of cracks. Chapter 11 discusses the factors influencing cracking. In Chapter 12, attitudes to cracking are considered. Both chapters contain much valuable information, although to some extent they have been upstaged by the papers at the 1986 International Conference on Bearing Capacity of Roads and Airfields. In particular, Mayhew and Potter, from their survey of 970 lane km of trunk roads and motorways, stated that transverse cracking is *not* a major factor in determining overall pavement performance. Their paper also confirmed the author's view stated elsewhere that single-layer construction should be used for cement-treated materials.

Novel approaches to methods of dealing with cracks are discussed interestingly in Chapter 13.

Chapter 15 summarizes the behaviour of cement-treated pavements in service, and contains information gleaned from experimental roads in the UK (Alconbury Hill), USA, South Africa, Germany and Holland. Reference is also made to the PIARC survey. The conclusion to this chapter draws on a Californian study of cement-treated bases on 175 projects built between 1950 and 1962 which shows that sections with the highest compressive strength had the longest maintenance-free life.

Empirical and analytical approaches to pavement design are the subject of Chapters 16 and 17 respectively. The next chapter presents a simplified semi-analytical approach to pavement design in some detail, based on a two-layer analysis. It takes into account the nature of cement-treated bases and sets out fairly the difficulties and benefits of this approach.

Construction of cement-treated layers is dealt with comprehensively in three chapters and in Chapter 24 the author gives a summary of work with wet lean materials and also the use of recycled pavement materials.

In the final chapter the author makes a plea for a move away from the empirical approach to cement-treated pavements, and sees the future for cement-treated materials as having tremendous possibilities.

This book has such wealth of information contained within it that it must remain a standard work on cement-treated pavements for many years, and the author is to be congratulated for his comprehensive coverage of the subject.

L. J. CARROLL

## **Steel fiber concrete**

US-Sweden joint seminar (NSF-STU), Stockholm, 3-5 June 1985

**Editors: Surendra P. Shah and Åke Skarendahl**

London and New York, Elsevier Applied Science Publishers, 1986. 246 × 172 mm. Typewritten, hardback. ISBN 1 85166 043 7. pp. 526. Price £50.00.

The growing understanding of steel-fibre-reinforced concrete as an engineering material is demonstrated by the collection of 25 seminar papers presented in this book. The Preface identifies five currently successful applications of steel fibre concrete (shotcrete, pavements and overlays, precast products, protective concrete structures and furnace linings) and these are all discussed to a greater or lesser extent. A note of regret is sounded in many of the papers that the advantages of the material for these and other purposes is not more widely appreciated and that its practical appli-

cation is not more widespread. Some of the authors point out the 'chicken and egg' situation in which engineers are reluctant to use the material in the absence of codes, standards and an established track record, which cannot be readily established unless the material is more widely used.

The papers vary in their scope and depth: a number are good review papers whereas some are rather narrow and do no more than describe particular applications or systems. Of the review-type papers, that on steel-fibre-reinforced shotcrete by V. Ramakrishnan is the