Of the other specific materials groups covered, plastics and in particular PVC attracted a number of papers. Many of these concerned the performance of PVC window frames or drainage systems.

With such a wide geographical source of authors, this conference should have provided an excellent opportunity for the interchanging of views and experience for many aspects of durability. Important lessons can be learnt and mistakes avoided by appreciating the subtle or not so subtle variations in constituent materials or environment within which building components are to be universally durable. The carbonation problem for one, may be one of low cover to reinforcement for others. Another slightly more unusual example of the way local practice creates a different range of durability problems results from the

reported Swedish approach of, unlike the UK, baths being free standing with overflow outlets built into the bathroom floor rather than the bath itself. In consequence there is a paper entitled 'Watertightness and durability of bathroom and shower room walls and floors.'

The organizing committees of this conference clearly had their efforts rewarded by the content and variety of the papers presented in Singapore. How much of this information and that from all the other conferences, seminars and symposia on the subject, can be realistically assimilated, as it should be, into the design of building structures is another problem.

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Time effects in concrete structures

R. I. Gilbert

Elsevier, Amsterdam, 1988. 241 mm × 163 mm. 336 pp. Illustrated, hardback. ISBN 0 444 70473 6. US\$ 110.50, Dfl. 210.00.

Books in the field of time-dependent effects in concrete structures are rare, and it is a courageous author who ventures to write one. He or she is faced by numerous difficulties from the general lack of understanding among readers to the presentation of an intricate web of material. The reader has to be taken through four distinct stages, each requiring a nice judgement

- (a) the estimation of the values of the time-dependent properties of concrete, especially creep and shrinkage, with their dependence on a multiplicity of variables
- (b) the expression of the time-dependence of the concrete properties with due regard for the processes of structural analysis to come
- (c) the analysis of the time-dependent stresses and strains of reinforced concrete sections, including those that are cracked
- (d) the integration of sectional effects to determine the forces, deformations and deflexions of structural members.

Nevertheless, as the author points out, the mechanics is relatively simple, and it is more a matter of good judgement and of a clear head in marshalling a mass of material. His intention is to provide the practising engineer with a usable treatment of serviceability analysis, including a better understanding of the way that structures behave. To cover the field comprehensively the book would need to be much longer than its 336 pages. It offers many pointers to good judgement and is helpful in improving understanding, especially through the use of numerical examples. However, the

range of structural applications is limited, the effects of changing the variables (such as the proportion of steel) are scarcely addressed and there are virtually no design charts or tables for structural members.

The book has five chapters, of which chapter 4 is markedly the longest.

Chapter 1 is a useful short introductory statement of the nature of the problems of time-dependent behaviour.

Chapter 2 deals with material behaviour. The general features of the deformation of concrete and steel are clearly described and, reasonably enough, the estimation of the magnitudes of the various strain components is presented through the provisions of the major codes of practice. A proper comparison is made and the uncertainty of prediction is rightly and clearly illustrated.

In chapter 3 a comparison is given of the methods for introducing into analysis the time-dependence of creep and shrinkage. These include the age-adjusted effective modulus and the rate of creep, both of which are taken for further comparison into the analysis of sections in chapter 4. The performance of the different methods in predicting the stresses and strains of an axially-loaded column are properly demonstrated, although I think it a pity that the measurements of an actual column are not included.

Chapter 4 contains the meat of the book with a clear exposition of the analysis, using the chosen methods from chapter 3, of a variety of sections, both prestressed and reinforced, cracked and uncracked, under different combinations of loading or restraint. There

are copious numerical examples, so that the algebraic expressions can easily be checked out on realistic examples. Computer listings are given for some of the examples, thus demonstrating the relative simplicity of the processing; the point might have been made even better if flow charts had been given instead.

Chapter 5 extends the work to the calculation of the effects in structural members. The approach is well stated but only in the case of slabs (evidently a particular interest of the author) is a method for the designer developed to any great extent. The one case in which time-dependent failure is a real risk is that of the slender column. I find it something of a disappointment that this receives no more than an introduction right at the end of the book.

There are many good things in this book and it makes a real contribution to understanding in what has been a neglected field. Designers will undoubtedly find it useful in extending their knowledge, and it would be valuable for students (and their lecturers) in what should be a part of a degree course on structural concrete. The author has tried hard to present intricate material in a sensible way but, as a postscript, I would look for even greater clarity through the use of more charts and a more distinct format for the numerical calculations.

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Concrete pavements

Editor: A. F. Stock

Elsevier Applied Science, Barking, 1988. 234 mm × 152 mm. 444 pp. Illustrated, hardback. ISBN 1 85166 168 9. £65.00.

Tony Stock is to be congratulated on bringing together some of the best paving engineers, from home and abroad, as contributors to this book. Authors and publishers have for many years avoided the subject of concrete pavements, despite their common use for highways, airfields and industrial areas.

The chapter dealing with concrete as a material considers the physical requirements of the concrete and its fresh and hardened states, and clearly explains the pros and cons of using different cementitious materials, admixtures and additives. The design of the concrete to satisfy all the specification requirements is succinctly covered.

The mechanistic design of pavements presents some interesting approaches and indicates lines of progress; however it also shows that the strengths and weaknesses of slabs, demonstrated in 1926 by Westergaard, still provide the basis for design, although the concept of fatigue factors is introduced.

Contractors undertaking the construction of major concrete pavements will find sound advice from an author with many years of contractual experience of building concrete pavements, with both form mounted and slip-form plant. The batching and mixing problems are studied, as are the relative benefits of different forms of construction in different types and sizes of jobs.

The concept of a jointless concrete pavement is attractive to engineers: a joint is a weakness, causing both construction and maintenance problems. Prestressed and continuously reinforced concrete pavements (CRCPs) are described in detail. Although pre-

stressed pavements are claimed to be successful, their use has not been common, CRCPs now being the more popular form of jointless pavement. The mechanics of CRCPs and causes of potential defects are clearly explained, greatly aiding the understanding of the design philosophy which follows. The need to design for an optimum crack spacing is well justified, and obviously if these criteria are met the risk of corrosion of the reinforcement at the planned cracks will be slight. This may account for the author making no mention of the use of protective coatings on the reinforcement.

The chapter concerned with concrete block paving is welcome. This form of paving is widely used for residential roads, city streets and industrial areas. The author has covered the subject succinctly, dealing with terminology, applications, design, specification and construction.

Chapters 5, 6, 7 and 9 (from a total of 11) I have grouped together, as they all relate to the construction and retention of safe, structurally sound pavements. The importance of micro and macro texture in providing skid resistance is explained, together with ways of accelerating surface wear, allowing different mixes to be compared. Included are descriptions of methods of measuring, creating and restoring textures in concrete pavements. It is not possible to rationalize if local repairs or overlays should be employed to repair an ailing pavement. Evaluation methods for concrete pavements are well described, allowing decisions on repair methods to be based on factual data rather than opinion. Different repair methods are well described,