Book Reviews

Performance of Reinforced Soil Structures. A. McGown, K. C. Yeo, K. Z. Andrawes. Thomas Telford, London, 1991. £95 hardback; 494 pp. ISBN 0-7277-1637-9.

Performance of Reinforced Soil Structures presents the Proceedings of the International Reinforced Soil Conference organized by the British Geotechnical Society and held in Glasgow during September, 1990. In the main, the papers are concerned with the theory, design and practical construction of reinforced soil structures, ranging from embankments and walls to in situ slope reinforcement and highway applications.

Quite often collections of papers give a pot pourri of styles and standards which can detract from the content. Here, a high standard of presentation has been achieved by each author, which is given full justice by the reproduction quality of the book.

The Conference papers fall into the following groupings: theory and design, construction, in situ techniques, and highway applications.

The cost is disappointing, as the curiosity of most individuals will seldom stretch to £95. This probably confines the book to the company library, for which it represents an excellent and thoroughly recommended acquisition. It is the presentation of a wealth of practical experience which makes this collection of papers extremely valuable work of reference.

E. A. Lacey

Mechanics of Jointed and Faulted Rock. Hans Peter Rossmanith (ed.) Balkema, Rotterdam, 1990. £59 hb; 994 pp. ISBN 90-6191-155-9.

This proceedings volume of the Conference on the Mechanics of Jointed and Faulted Rock, held at the Technical University of Vienna in April 1990, contains over 130 papers and runs to almost 1000 pages. The production is good, the volume hardback and in terms of cost per page the book must be considered reasonably priced.

There has been a proliferation of conferences on rock discontinuities recently (Sweden, Norway and Lake Tahoe in the USA) together with numerous other conferences touching on the same theme. The continuing and even growing interest relates partly to increasing work on underground waste disposal and use of underground space but also to changing concepts and possibilities as more powerful numerical tools become available and new tools such as fractal geometry find application.

Certain aspects of the subject are advancing very rapidly and it is significant that all six of nine plenary lectures which are published in the proceedings as papers relate to numerical modelling. This might be considered rather ill-balanced. State-of-the-art papers on, for example, advances in relevant structural geological analysis or laboratory versus field characterization would not have been out of place.

The papers themselves are grouped in a rather arbitrary and overlapping way as follows: geology (18), faulting (7), applied fracture mechanics (11), testing (20), numerical modelling (19), hydraulics (12), mining (15) and applications (22). As is inevitable in a volume of this size the quality of papers is variable but there is something of interest for everyone, be they academics or working in industry. It is clearly a volume that should be on most technical library shelves but I doubt that it warrants purchase by individuals or small companies.

S. R. Hencher

Geology of Construction Materials. J. E. Prentice (Topics in the Earth Sciences 4) Chapman and Hall, London, 1990. £16.50 paperback; 202 pp. ISBN 0-412-29740-X.

This book sets out to describe the important and increasing role of the geologist in the provision of minerals and rocks for the construction industry, from initial prospecting through exploration, evaluation and exploitation to final restoration. The book is intended as an introduction to the subject for undergraduates in geology and related disciplines and graduates embarking on a career in the extractive industry. The author states that the book is not intended to be a working handbook or reference source for those actively engaged in the industry.

The introductory chapter briefly describes the history of construction materials from the use of undressed stone in walls around 6000 BC, to the invention of portland cement in 1824 and the consequent dominant role played by concrete. Chapter 1 continues with a description of the prospecting, exploration and assess-
ment of mineral sources and finishes with a section on quarry design and management.

The book proceeds by discussing the various construction materials in turn. Chapter 2 is concerned with construction stone, dealing with dimension stone, slate, armour stone and rock fill. Chapters 3 and 4 cover respectively coarse aggregate and fine aggregate. Structural clay products are described in chapter 5, including bricks, vitrified clay pipes, floor and wall tiles and expanded clay aggregate. Chapter 6 is concerned with cement and concrete, making brief reference also to concrete blocks, reconstituted stone and soil stabilization. The final chapter is headed 'Minor Construction Materials' and includes brief sections on glass, gypsum and insulators and lightweight aggregates.

Each of the above chapters describes the essential properties of the respective materials, the occurrence, extraction and processing of the material and testing and evaluation. Throughout, the book makes reference to the role of the geologist based on the premise that the essential properties of a rock are related to its mineralogy and texture, a consequence of its geological occurrence and origin. In developing this point the author has provided many useful references on the sources of materials and whilst these refer predominantly to the UK some information is given on other parts of the world, particularly Europe.

The book undoubtedly succeeds in its stated objective of showing how a geological approach can bring 'coherence and logic to an otherwise chaotic and undisciplined subject'. As well as its intended readership amongst undergraduate or recent graduate geologists the book should also be of interest to non-geologists involved with construction materials.

The only significant criticism is the limited number of references given. In a conscious decision the author restricted references to the text-figures, but there are many areas within the text where the reader who seeks further information is provided with no guidance, a particular case being in relation to the important subject of rock weathering classification. The same is also true of the various test methods described, where no reference is given to the appropriate British or other national standards.

In conclusion this book fills a significant gap in the available literature, is very readable and highly recommended.

Guy Hammersley

Seismic Well Surveying. J.-L. Mari & F. Coppens. Éditions Technip, Paris, 1991. FF228 paperback; 117 pp. ISBN 2-7108-0605-3

Seismic Well Surveying is a very apt title for this book, which describes the broader scope of the subject rather than the more usual and restricted 'Vertical Seismic Profiling' (VSP). Seismic well surveying covers a very valuable and widely used set of procedures, including VSP, which are being used increasingly (and rightly so) not only in the hydrocarbon industry but also for engineering applications.

This book provides a well structured and concise introduction to the whole topic of well (borehole) surveying using seismic methods. It does not deal with geophysical borehole logging which is a totally separate but related topic.

The book comprises an introduction and only three chapters. The introduction deals, perhaps too briefly, with the principle of seismic reflection and VSPs and sets out the structure of the book. For readers already familiar with the concepts of surface seismic exploration, this should present no difficulty. For those new to exploration seismology, reference to an introductory text such as McQuillin et al. (1984) An Introduction to Seismic Interpretation would probably help.

Chapter 1 deals with the basic principles, application and implementation of VSPs. The text contains a minimum of mathematical equations, with more detailed analytical treatment being described in an appendix within the chapter.

Chapter 2 describes VSP data processing and special applications to reservoir studies. In a section on attenuation measurement the authors name two methods by which values of attenuation can be derived and give several references. However, there is no explanation of the methods and the differences between them. This lack of more detailed pedagogic information exemplifies the authors' style throughout the book. Readers should already be exploration seismologists or much of the book will be incomprehensible through the use of unexplained jargon.

The final chapter deals with offset VSP and well-to-well surveying. It should be of particular interest to non-hydrocarbon geophysicists who wish to improve their understanding of the basic concepts and geometrical relationships of seismic well surveying.

Despite the considerable importance of seismic tomography only one brief section is devoted to it. Readers wanting to learn more about this would do better to digest 'Exploration Seismic Tomography: Fundamentals' by Robert R. Stewart (Course Notes Series, Vol. 3, S.E.G., 1991) or 'An Introduction to Geophysical Tomography' by M. H. Worthington (1984, First Break Vol. 2, No 2). A bibliography, in which references from the early to mid-1980s predominate, completes the book. The lack of references makes the book somewhat dated in areas in which considerable developments have occurred.

For practising geophysicists who are new to seismic well surveying, this book provides a very readable, concise introduction. For intending readers who are not geophysicists, it provides insufficient technical explanatory material for a stand-alone text. In this context
additional introductory books should be at hand to complement the book reviewed here.

The illustrations in the book are of a very high standard, clearly annotated and well designed to assist with the explanation of a particular concept presented in the text. As with other Éditions Technip publications there is no index which, for reference books, is a major limitation. The detailed Table of Contents goes someway to assisting with this problem, facilitated by each sub-section being numbered. There is a three-fold subdivision of the sections in each chapter.

In summary, the book is neatly packaged, well presented and readable. As a concise introduction to seismic well surveying it provides a useful overview and can be recommended.

D. I. Taylor

The Embankment Dam. British Dam Society, Thomas Telford, London, 1991. 205 pp paperback, £45. ISBN 0-7277-1647-6.

The volume presents the proceedings of the Sixth Conference of the British Dam Society held in Nottingham on 12–15 September, 1990. It includes 26 papers which cover four topics: the state of the art; tailings dams; risk, hazard and safety; and environment and research. The publication endeavours to link the design, construction, monitoring and legislation aspects of water retaining and tailings dams. In addition, comparisons are made between US and UK practice on the assessment of downstream hazards. The fourth section presents papers on monitoring of movements and environmental issues.

The volume is prefaced by the 'First Geoffrey Binne Lecture' which lists ten criteria for the construction of the ideal dam. The first section on the state of the art includes a good case study from Canada describing the construction of a 28 m high dam on an up to 60 m of highly plastic soft clays. High pore pressures exceeding predictions were recorded despite the benefit of a test fill and conservative design assumptions. The design was modified during construction to allow for better representation of the stress distribution within the soft foundation soils.

The next three papers in this section deal with dam construction materials comprising highly weathered rock, where no suitable clayey materials were available for the clay core. A 103.8 m rockfill dam in the Republic of China was built with a clay core comprising highly weathered shale and sandstone, special precautions being taken for the filters to allow for possible cracking of the relatively inflexible core. Another 178 m high rockfill dam has been designed with an upstream concrete facing. The use of low-grade rockfill for a UK dam is described, which had an upstream asphaltic membrane.

The problem of potential acid generation within the shell of the dam due to the presence of pyrites is discussed. Observed settlement of the rockfill agreed very well with predictions, but the paper does not include commentary on the performance of the asphaltic membrane nor on piezometric pressures under the dam. Other dams in SE Asia are described, up to 70 m in height formed of residual soil on weathered rock foundations. Low pore pressures and settlements have been observed.

The final paper in this section deals with severe problems encountered with instrumentation in a 110 m rockfill dam with a clay core built in Java. The lesson to be learned perhaps is that the installation of instruments should not be left to the suppliers' technician only, but should be supervised closely by an experienced geotechnical engineer who would have been involved with the design of the dam!

The second section of the volume comprises nine papers on tailing dams. The first paper presents an excellent review on the safety of tailing dams and lagoons in the UK. It stresses that although some of these structures come under the Mines and Quarries Act they are not covered by the reservoir safety legislation. The paper gives examples of lagoon failures and poor design and supervision for some of these structures. Experience on a 'downstream method' of construction is given in a paper from Bulgaria where the design acceleration is 0.1 g for the 1:1000 years event. Comments on dusting problems from the exposed surface are included. A third paper gives a useful case record of a trial embankment for waste retention on soft clay in Malaysia where instrumentation seems to have worked well, although failure of the read out unit at such a remote place meant loss of considerable data. A similar problem was reported for the rockfill dam in Java discussed earlier and perhaps the lesson is to include a second standby unit on such remote sites! Other papers in this section describe useful tailings deposition predictive computer modelling technique, depositories modes and good practice for spillway systems for tailings dams, to avoid overtopping and spillage of tailings. The section ends with two papers on an ash disposal scheme from a thermal power station in the UK, where the CEGB and successor companies have maintained a policy of having their ash lagoons designed and constructed according to the requirements of the Reservoir Act. The papers refer to problems with mining subsidence and dusting from the exposed surfaces.

The third section of the volume deals with the assessment of risk, hazard and safety and gives good case records for dams in the USA and the UK. Changes in regulations regarding probable maximum flood (PMF) and maximum credible earthquake (MCE) have meant reassessment of the safety of existing dams and the adoption of remedial measures in response to the perceived risks to life and property downstream of the dams.
The fourth and last section of the volume includes seven papers on environment and research. This section includes a good case study of monitoring settlement of a puddle clay core during drawdown and refilling; details of the instrumentation data acquisition system for a water authority in the UK and a paper which emphasizes the secondary uses of water reservoirs in contributing to amenity benefits to the community.

Overall this is a valuable collection of papers linking the themes of water and tailings dams, with some papers presenting useful case records, review of safety, etc. It is recommended for all those with an interest in dam design, construction and monitoring for the impoundment of water or tailings.

Z. Al-Dhahir

Prefabricated Vertical Drains: Design and Performance. R. D. Holtz, M. B. Jamiołkowski, R. Lancellotta and R. Pedroni. Butterworth-Heinemann, Oxford, 1991. £30 hardback; 131 pp. ISBN 0-7506-1016-6.

Construction on soft alluvial deposits has become more common over the last 20 years and often some method of ground treatment/improvement is required. The use of pre-loading in conjunction with vertical drains is a common technique employed in particular circumstances. This book brings together much of the research carried out in the last 15 years relating to the design and performance of prefabricated vertical drains. The important criteria relevant to the design of these drains are identified and summaries of performance related research are included to provide an assessment of the influence particular parameters have on prefabricated vertical drains.

This is a relatively short book, split into seven chapters together with a short introduction. Most of the text deals with consolidation theories for vertical drains, relevant geotechnical parameters and drain characteristics.

Chapter 1 provides some advice on the use of the book and outlines an approach to the selection of pre-loading as a method of ground improvement and the design of vertical drains. It also mentions briefly the installation of the drains and evaluating a band drain system, but there are no details in the book.

Within Chapter 2 there is a brief history of the development of vertical drains and the differences between sand drains and pre-fabricated band drains are described.

Consolidation theories for prefabricated, band-shaped drains are described in Chapter 3. Amendments to the general theory are presented and these take into account the effect of smear (soil disturbance during installation), the influence of horizontal and vertical permeability, time dependent loading and drain capacity. In addition, the limitations of the theories are discussed.

Chapter 4 is very brief and merely identifies the information required for the design process, the detailed requirements being described in Chapters 5 and 6.

The consolidation and permeability characteristics of the soil are of primary importance in designing a vertical drain system and full descriptions are given of the methods used for determining the appropriate parameters in the laboratory, by in situ testing or by back analysis from field trials. The importance of soil stress history and macrofabric are also well covered in Chapter 5.

The influence of drain characteristics is assessed in Chapter 6 which deals with filter properties, drain capacity and durability. Much of the chapter is devoted to the discharge capacity of the many drains available on the market today, although it is concluded that, provided a drain with a minimum capacity of 150 m³/year is installed, the drain capacity has little influence on consolidation rates. A number of pages are devoted to the results of studies on the durability of paper filters although only one drain on the market has a paper filter. More importantly, perhaps it should be remembered that these drains are usually installed to accelerate dissipation of porewater pressures and are rarely required to function over a long period of time.

Chapter 7 is a very brief evaluation of the current knowledge on band drains and identifies areas where further research is required.

The text of the book is not particularly easy to read, with constant references to published papers, although this style probably reflects the academic backgrounds of the authors. However, it is a particularly useful book in that it clearly assesses all of the influences on the design and performance of prefabricated vertical drains and, more importantly, provides clear advice on the significance of each parameter (cf. drain discharge capacity). The book will be useful to those engineers required to design a vertical drain system, but it will also be necessary to seek out some of the many references listed in the book and to obtain more information on the installation and specification of prefabricated vertical drains to complete any design satisfactorily.

D. C. Mann