Book reviews

GEOTECHNICS FOR ROADS, RAIL TRACKS AND EARTH STRUCTURES.

Edited by A. Gomes Correia & H. Brandl. Balkema, 2001.
ISBN 90 2651 844 7, 289 pp.

This is a collection of papers by several authors associated with European Technical Committee 11 (ETC 11) of the International Society of Soil Mechanics and Geotechnical Engineering. The general remit of ETC 11 is the design and construction of pavements and rail tracks, with specific attention being paid to moving away from empirical approaches. The papers are grouped under three headings

- (a) compaction
- (b) properties of geomaterials relevant for design and construction
- (c) embankments for high-speed trains.

The first and third sections, in particular, gather together material that is likely to be of practical value to engineers working in these fields. Among the topics addressed are the use of high embankments, developments in compaction drum design, dynamic behaviour of embankments beneath high-speed trains (several papers tackle this subject), road and rail embankments on soft soil, and frost heave in rail embankments. In keeping with the theme of ETC 11, the papers attempt to bridge the gap between theory and practice. As such, this volume would be a useful addition to the office libraries of those for whom the geotechnical performance of road or rail infrastructure is of concern.

V. S. HOPE

INFRASTRUCTURE EMBANKMENTS: CONDITION APPRAISAL AND REMEDIAL TREATMENT.

J. Perry, M. Pedley and M. Reid. CIRIA Publication no. C550. Construction Industry Research and Information Association, 2001. ISBN 0 86017 550 2, 233 pp.

This document does not set out to give design guidance. As noted in the title, it deals with condition appraisal and remedial treatment. It aims to present best practice, provide guidance for routine use, recommend maintenance strategies for best value for money, and facilitate knowledge sharing.

The main infrastructure owners have developed strategies for

appraisal and remedial treatment over recent years. The document presents best practice guidance, using examples from the four main infrastructure owners of embankments and cuttings: Railtrack, London Underground Limited, the Highways Agency and British Waterways, together responsible for an estimated 10 000 km of embankments. It is noted that the total amount spent on earth structure maintenance in the year 1998/99 was at least £50m, so considerable savings are possible if this amount of money is spent more efficiently.

Although the document does not specifically address design guidance, the examples and photographs included give a good background on the construction methods and the potential problems.

I am sure that all the infrastructure owners who contributed to this document have benefited already from the sharing of the information. Now that it has been published, this information on best practice is available to the wider geotechnical community.

D. BEADMAN

BUILDING RESPONSE TO TUNNELLING. Case studies from construction of the Jubilee Line Extension, London. Volume 1: Projects and methods.

J. B. Burland, J. R. Standing and F. M. Jardine (eds). CIRIA/Thomas Telford, 2001. ISBN 0 7277 301 77, 344 pp.

The Jubilee Line Extension Project allowed the measurement of the effect of tunnelling beneath a wide range of buildings. A large research team seized the opportunity to record the details and this document forms part of their report.

This first volume introduces the Jubilee Line Extension Project and outlines the methods of settlement prediction and building damage assessment used during the works. The historic development of the various areas along the route is described, allowing the reader an understanding of the rich variety of buildings to be protected during the tunnelling work. The ground conditions, tunnelling methods, methods of analysis and measures adopted for protection of the buildings are included such that the document provides a good summary of the practical and analytical techniques used on this project. The volume will prove a useful source of reference for engineers engaged in tunnelling work.

I look forward to Volume 2 being published, which includes the details of the case studies to allow practitioners to study the data behind the overall findings.

D. BEADMAN

UNBOUND GRANULAR MATERIALS.

G. Correia. A. A. Balkema, 1999. ISBN 9 0541 04910.

The conference proceedings are presented as four special lectures and four sessions. The special lectures cover a review of models and modelling, stress behaviour at small strains, a study of the resilient modulus and in situ stiffness and density measurement of thick lift unbound aggregate layers. The four sessions were: advanced laboratory testing (2 papers), advanced in situ testing (4 papers), modelling of unbound granular materials under cyclic loading (5 papers) and pavement modelling design (2 papers).

D. RUSSELL

PRE-FAILURE DEFORMATION CHARACTERISTICS OF GEOMATERIALS, VOLUME 2.

M. Jamiolkowski, R. Lancellotta and D. Lo Presti (eds).
A. A. Balkema, 1999, ISBN 90 5809 075 2, €135, 470pp.

This publication (Volume 2) presents a collection of some 25 invited papers by internationally distinguished researchers and practitioners, presented at the Second International Symposium on Pre-failure Deformation Characteristics of Geomaterials in 1999 at Turin, Italy. The topics covered in this volume include laboratory testing, *in situ* testing, modelling stress-strain behaviour, and applications and case histories of soil deformation problems. Theme and keynote lectures provide an excellent review of the current state of knowledge and understanding of the mechanics of soil deformation, testing and modelling methods, as well as an enlightened overview of the needs of practising geotechnical engineers, in relation to the understanding of pre-deformation failure, for the benefits of society.

The book presents a well-balanced mix of technical papers that require knowledge of numerical modelling techniques and those that present useful case studies of practical design applications. There are various papers concerned with ground movements around large excavations or tunnel construction that UK designers will find useful, particularly small strain stiffness and ground movement predictions. Some authors concerned with the back-analysis or future predictions of ground movement describe the development of appropriate soil models. The use of various methods of *in situ* testing of soil to determine stress-strain behaviour, and their interpretation, are also well covered in review papers.

The papers are well presented and in readable form. The collection of papers in one volume will be of interest both to researchers and to design engineers wanting to increase their understanding of soil deformation behaviour, prediction and appropriate soil testing. In summary there, is something for everyone.

ASPECTS OF TECTONIC FAULTING.

F. K. Lehner and J. L. Urai (eds). Springer, 2000, ISBN 3 540 65708 8, 226 pp.

This book presents a selection of twelve papers on aspects of tectonic faulting, presented at a symposium at the University of Graz, Austria in 1995. Topics include experimental and numerical modelling of shear and normal forces in rough rock joints and faults, numerical modelling of shear forces at tectonic plate boundaries, particle flow, development and modelling of folding and faulting, as well as fault movement triggered by seismic activity. Useful descriptions are given of fault geometry and propagation based on field investigations. This book is clearly aimed at researchers in tectonics or rock mechanic modellers wishing to expand their knowledge of tectonic behaviour and numerical techniques. It is well written with clear and numerous illustrations, photographs and diagrams that aid the comprehension of the book.

PERFORMANCE UNDER CYCLIC LOADING OF THE FOUNDATIONS OF INTEGRAL BRIDGES.

D. R. Carder and J. P. Hayes. Transport Research Laboratory
TRL Report 433, ISSN 0968 4107, 58 pp.

This report reviews the behaviour of integral bridge abutment foundations under cyclic loading. Integral bridges are increasingly being used in the UK because of their reduced maintenance requirements and low lifetime costs compared to conventional jointed bridges. This arises principally from the elimination of expansion joints and bearings, which can suffer corrosion and immobilisation. Continuous deck construction with integral abutments eliminates the need for such movement joints resulting in increased durability. This, however, requires the integral abutment to resist the cyclic lateral loading from bridge deck diurnal and seasonal temperature movements. Depending on geometry and stiffness of the abutment lateral loading can result in sliding or rocking of the foundation.

There is little published information on the design and performance of integral abutments and the effects of low frequency cyclic loading of soils. This report reviews available data on monotonic and low frequency cyclic loading of granular and cohesive soils and identifies important parameters appropriate to foundation design, such as abutment geometry and stiffness, soil condition, cyclic stress levels and soil drainage conditions. The report is clear, concise and well illustrated. It will assist designers in assessing the suitability of different soils for integral bridge foundations.

DESIGN APPLICATIONS OF RAFT FOUNDATIONS.

J. A. Hemsley (ed.). Thomas Telford, 2000. ISBN 0 7277 2765 6, £85, 608 pp.

This book presents a collection of 18 papers from contributing authors on design aspects of plain and piled raft foundations. The design and analysis of raft foundations presents one of the more difficult aspects of civil engineering practice requiring a knowledge of both geotechnical and structural engineering issues. The development of computer-based methods of analysis now enables the reaction between ground and

structure to be modelled more realistically, allowing more economic structures to be designed than previously.

The book presents a wealth of information on the design of raft foundations from the very simplest ground-bearing plain slabs to complex shaped settlement-reducing piled rafts. There are a number of case studies covering both design and construction aspects as well as post-settlement performance monitoring. The use of finite-element techniques to model raft behaviour is well-covered in simple descriptive text with numerous well-illustrated diagrams. Many examples are presented of project applications covering a wide range of ground conditions and structural forms.

Although many of the examples are UK-based, there are several interesting and useful papers from overseas contributors highlighting international practices.

This book is an excellent reference source for design engineers wishing to learn and advance their knowledge of raft design. It is able to present a complex subject in readable format and will also appeal to students and researchers.

G. CARD

DRAINAGE OF EARTHWORK SLOPES: A REVIEW.

D. M. Farrar and K. C. Brady. TRL Report 454, 2000.

This report reviews the information and advice available on the drainage of earthworks, identifies the limitations of current knowledge and provides recommendations on how these might be addressed. In view of the inclement weather experienced by the UK in the autumn of 2000 and the problems experienced by many infrastructure owners I think that the publication of this document will prove to be well timed.

UNSATURATED SOILS FOR ASIA, PROCEEDINGS OF THE ASIAN CONFERENCE ON UNSATURATED SOILS.

H. Rahardjo, D. G. Toll and E. C. Leong (eds). A. A. Balkema, Rotterdam, 2000, ISBN 90580 9139 2.

This is the conference proceedings of the first conference on unsaturated soils that was specifically aimed at the Asian continent. Presented in 10 sections including keynote lectures, fundamentals, numerical modelling, suction measurement, soil-water characteristics, permeability, flow, strength, volume and engineering applications. The conference theme of 'From theory to practice' was chosen on the basis that the theoretical frameworks, equipment and measuring techniques used with unsaturated soils are now readily available. This is reinforced by the proceedings, which also demonstrate that interest in this subject is still very high from all parts of the world.

BS 5930: 1999 CODE OF PRACTICE FOR SITE INVESTIGATIONS.

British Standards Institution. BSI, London, 1999.

This is the updated standard that supersedes the 1981 version. Many of the changes are cosmetic or organisational and give the standard a better feel. However there have been significant expansions of the sections on geophysics and description/

classification of soils and rocks. There is also a new appendix on site investigation for contaminated land. Notable omissions from the earlier version are the often-useful standard data sheets for various tests and a section on safety issues.

A. M. RIDLEY

BIFURCATION AND LOCALISATION THEORY IN GEOMECHANICS. PROCEEDINGS OF THE FIFTH INTERNATIONAL WORKSHOP ON BIFURCATION AND LOCALISATION THEORY IN GEOMECHANICS.

H.-B. Mühlhaus, A. V. Dyskin and E. Pasternak (eds). A. A. Balkema, 2001, ISBN 90 2651 823 4, €95, 368 pp.

This series of workshops was initiated in 1998 as a forum for the application of results and techniques of bifurcation theory to limit load problems in geotechnical engineering. The current, fifth, proceedings mirror the session themes of the workshop. Research papers are categorised under six general headings: strain localisation, modelling and experiments; computational aspects; soil plasticity; granular and layered materials; patterning of cracks and interfaces; and geodynamics.

The workshop focuses on constitutive relations and their properties relevant to critical point phenomenon, numerical methods and the problems of overcoming singularities, generalised continuum methods and experimental techniques. The work is of a highly academic nature and is not for the uninitiated. However, all contributions have been reviewed to the standard of international scientific journals. This is reflected in the high quality of many of the articles featured. As a reference text, the book provides an excellent position statement for those working in this area.

S. W. REES

ROCK MASS CLASSIFICATION – A PRACTICAL APPROACH IN CIVIL ENGINEERING.

B. Singh and R. K. Goel. Amsterdam, Oxford, Elsevier, 1999, ISBN 0 0804 30139, 267 pp.

This book covers an important subject for all individuals practising in rock engineering. The book contains chapters on the main rock mass classification schemes, the strength and stiffness of rock masses and discontinuities, the design of tunnels, other underground openings, slopes and foundations using these classification schemes, and the assessment of the suitability of different excavation methods. It also covers other areas of rock engineering that are not normally linked to rock mass classification schemes, such as permeability and groutability, landslide hazard zoning, and rate of tunnelling. The introduction to the book explains that one of the fundamental advantages of a rock mass classification system is that it provides a quantitative description of a rock mass without resorting to the potential ambiguity of words. It also highlights the advantages and limitations of the use of rock mass classification schemes and states that there are some situations in which the use of more analytical design methods are not practical.

The book presents and summarises the latest work in the field updating and expanding on the standard text by Z. T. Bieniawski (1989) *Engineering Rock mass Classifications* (John Wiley: New York). Full coverage is given to important contributions on the latest developments in the use of rock mass classification schemes, although the authors have also drawn extensively on their own work and that of their colleagues. Of particular interest are the chapters on the use of rock mass classification systems in slope design.

Unfortunately the book suffers from a number of failings. It is poorly laid out without an obvious logical thread and therefore appears to be disjointed. The authors also describe various methods for determining design parameters without stating which they consider to be the best, although some may consider this to be a virtue. This book also suffers from poor

English and numerous spelling mistakes, which makes reading difficult and detracts from the otherwise high quality of the publication.

Despite its failings this publication provides a state of the art review of this important area of engineering rock mechanics and is recommended for practising rock mechanics engineers. It is hoped this book will inspire others to develop new methods of rock characterisation and new design approaches using the main rock classification schemes and the authors identify various circumstances where this is needed. The second edition, in which typographical mistakes and the English has been corrected, is awaited with interest.

C. POUND