Book reviews

Disturbed soil properties and geotechnical design. *A. Schofield. London: Thomas Telford, 2005. 142 pp. ISBN 0-7277-2982-9. £45*

This is a retrospective book. Its aim is to focus on fundamentals of shearing of soils, moving from simple planar sliding towards plastic distortion, in order to understand the basis of geotechnical design. The format is rather unconventional because of the many historical cross-references frequently dipping into the roots of modern soil mechanics. It is a slim volume (142 pages) but the pages are very densely printed and there is a lot there, reflecting the author's personality and enthusiasm for soil mechanics as well as his deep understanding. The many anecdotes ('Terzaghi prevented and delayed the publication of Taylor's book'; 'the Rede Lecture of Reynolds in the Senate House of the Cambridge University' and many others), give this book its special flavour. However, what is covered in the details?

Chapter 1 draws a map of soil behavior by showing how Coulomb questioned the 18th century theories (i.e. Amontons' asperity theory of friction and Musschenbroek's cohesion theory) focusing on what should really be a Coulomb's law: cohesion is zero in the case of newly disturbed soils.

Chapter 2 addresses the problem of interlocking, critical state and liquefaction. Amontons had proposed that interlocking caused friction. Taylor found experimentally that steady friction and interlocking (Taylor gave the name 'interlocking' to the rate of dilation) must be summed to give peak strength and the existence of a peak strength shows failure of interlocked materials to be instable. The original Cam-Clay model was generated using Taylor's expression for dissipation of work.

Chapter 3 debates how, at an early stage in the development of critical state concepts in 1955, soil classification tests were thought to be only empirical. The plasticity index is the range of water contents over which soil paste shows a plastic behavior; that is it can be moulded into different forms. In 1964 the author introduced a different form of plasticity testing, measuring depths of penetration of cones of 80 g and 240 g into the surface of soil paste of increasing water content. The liquid limit had a similar story: based on the falling bowl and the grooving tool, it remained the most frequently performed and the least understood of all soil mechanics tests. The rest of the chapter explains how tests performed by Hvorslev on soils on the dry side of critical state in a shear box led Terzaghi to claim that Hvorslev had found a true friction angle and a true cohesion. Terzaghi and Hvorslev thought this true cohesion derived from surface chemistry of fine clay mineral particles and dissolved salts in pore water and did not realise that apparent cohesion could result from a change of volume as water content changes. This was also a topic for discussion at the conference held at ICE in 1950, published in *Géotechnique*, which provides an opportunity for the author to enrich the flavour of his book by recounting the dispute between Bishop, Gibson, Roscoe and Haefeli.

Chapter 4 reconsiders limiting stress states and critical states. The author shows how Rankine considered the limiting stress states for an aggregate of soil grains, following Cauchy's method of dealing with a solid body as a continuum, but introducing the concept of a frictional limit to the shear stress on any plane. Rankine realised he could solve the plane problem of the stability of earth by using a feature of conjugate planes that he had noticed. And here again there is enough room for the author to debate Terzaghi's opinion that 'the use of this theory should be discontinued'.

Chapter 5 describes the lesson learned from Baker's research on the significance of structural ductility and on Thurairajah's and Calladine's contributions to the original Cam Clay yield locus.

Finally, Chapter 6 shows how geotechnical engineers can study ductile or brittle failures by model tests with soil under appropriate stress in a centrifuge. The story is enriched by references to studies by Pokrovsky and Feodorov in Russia and by the author, first with the British Aerospace centrifuge in Luton and later with centrifuges in UMIST and Cambridge.

This book raises two fundamental questions: how to represent peak strength of soils and whether ultimate limit state design should be based on critical state strength or peak strength. In this context, the book invites readers to revisit most of the original contributions and to read these seminal papers with a different perspective. No one interested in soil mechanics can have an alibi for avoiding this book. It is a refreshing approach to the roots of modern soil mechanics.

R. Lancellotta

Muds and mudstones. *P. E. Potter, J. B. Maynard and P. J. Depetris. Heidelberg: Springer-Verlag, 2004. 297 pp. ISBN 3-540-22157-3. £61·50*

There is much within this book that can be understood by engineers even though it is written by geologists for geologists. The reason for this is two-fold; its style of writing, which is both technical yet user-friendly, and its content. The authors have gone out of their way to communicate and succeed in achieving this time and time again.

The work starts with an overview that will be of value to engineers; it pitches straight in with a direct and simple discussion of what is meant by clay and mudstone; this is typical of the tone of the text, which leaves the reader informed and clearly appreciating the components of what is a confusing subject. However, the 'milestones' recorded at the end of the chapter reflect the focus of the work which is essentially sedimentary geology with a bias to petroleum geology; no mention here of Terzaghi, Peck, Casagrande, Taylor, Skempton, Bjerrum and others whose names are associated with engineering in these materials, nor could I find them referred to elsewhere in the text. The work moves on to consider, as chapters, 'Production of mud and silt', 'Role of oxygen', 'Muddy depositional systems', 'Burial', 'Provenance of mudstones', 'Muddy basins', 'Practicalities' and appendices. A substantial glossary of geological terms used in the text is also added which many readers will find helpful.

Engineers are likely to find the chapters on burial and practicalities of primary interest. Here, burial is concerned with the journey from mud to mudstone; the concept of 'compaction' is used throughout rather than the theory of 'consolidation'; it is surprising how two disciplines studying the same material are still travelling on parallel paths. The chapter on practicalities comes nearer to the engineer's heart and will alert any inexperienced geotechnical engineers to the range of problems these materials can provide, but the

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information is of a general nature; good for design but of little help with analysis.

Despite these shortcomings for the geotechnical reader the book is still an attractive and valuable text because of the frankness and honesty with which the topics are covered; chapters conclude with an airing of the awkward questions that remain unanswered. References are plentiful and comprehensively cover the subject from a sedimentological point of view; an endearing feature of them is the addition of further references for those who want to 'dig deeper' with comments from the authors concerning the subject of such works—a consideration much appreciated by the busy reader. Readers will soon be made aware that a considerable amount of basic work remains to be completed before the distribution, content and behaviour of muds and mudstones can be predicted with better accuracy; here the book contains valuable insights to petrology, fabric and origin for any researcher working with these sedimentary materials. Further, there is much in this book that is of value to the general knowledge practising engineers require when designing structures in clays and their stronger equivalents, and for analysing their stability. In this respect it is an excellent companion to the chapters on mudstones in Legget and Kerrow's *Handbook of Engineering Geology*, to which the authors refer. It is certainly a book for college libraries to purchase and one that could soon pay for itself if purchased by practising engineers.

M. H. de Freitas

Expansive soils: Recent advances in characterisation and treatment. *A. Ali-Rawas and M. F. A. Goosen. London: Taylor & Francis, 2006. 544 pp. ISBN 9780-415-39681-6. £99·00*

This 526-page document is described as a book; in fact, it is a collection of papers. It claims to 'provide a broad coverage of recent advances in the characteristics [sic] and treatment of expansive soils'. The subject matter covered certainly is broad, and the authorship likewise: 34 papers are presented with authorship from 19 countries. Quite what is the provenance of the papers is not made clear; but they appear to have been invited by the editors. All the authors work in academia, universities and research institutes.

The material is gathered into nine parts, subdivided into what are called chapters, which are in fact individual papers, as follows

Part 1: Nature, identification and classification of expansive soils (five papers)
Part 2: Volume change characteristics (three papers)
Part 3: Swelling potential measurement (five papers)
Part 4: Advanced techniques for swelling potential assessment (five papers)
Part 5: Site characterisation (three papers)
Part 6: Lime stabilisation (three papers)
Part 7: Cement stabilisation (four papers)
Part 8: Other treatment methods (five papers)
Part 9: Construction techniques and remedial measures (1 paper).

It is unfortunate in a collection of papers such as this, covering the principal issues in the determination of expansive soils, that no one has attempted to provide state-of-the-art reviews, except for an Australian paper dealing with the desiccating effects of trees; there is therefore a lack of criticism in the material provided.

Geographically, the volume is biased towards the Middle East, Turkey and India. The material has too much emphasis on determining volume change *potential* rather than amounts of volume change; for the former, it would seem that the state of the art has not progressed much in the past 30–40 years (or it would appear that some of the authors are unaware of more recent advances in the study of expansive soils), while for the latter, there is too much uncritical reliance on oedometer swell testing of disturbed samples, albeit that one paper acknowledges the important influence of different compactive efforts and methodologies, leading to considerable overprediction in the laboratory of field swell. There is a surprising lack of mention of suction measurement (such as filter paper and suction probe) and, as is altogether too common, too little new information on field behaviour.

The studies described in the 14 papers on the stabilisation of expansive soil very largely repeat work already reported and are, again, heavily biased to laboratory work.

In short, this is a volume that will have only limited value for the researcher and very little for the practitioner.

R. Driscoll

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