

Book review

ICE Manual of Geotechnical Engineering

John Burland, Tim Chapman, Hilary D. Skinner and Michael Brown, ICE Publishing, London, UK, 2012, ISBN 978-0-7277-3652-9, Ebook ISBN 978-0-7277-4194-3, £210.00 (hardbound)

This two-volume encyclopaedia could be entitled 'All You Need to Know about Geotechnical Engineering'. The two volumes contain 1477 pages of informative text written by specialists in the fields of geotechnical engineering. Each volume is divided into sections to help the reader in finding their way through the pages to the material needed to solve their current problem. The manual is not a book that anyone will read from cover to cover but it will be dipped into from time to time or may become used as a reference for planning investigations, designs and construction of works.

In section 1, chapters 1 to 5, John Burland reminds the reader that geotechnical engineering is a young science and includes a chapter to put the work of Karl von Terzaghi into context as the founder of modern geotechnical engineering. We then move on to an introduction to modern numerical analysis using computers, with examples of the decisions we need to make about the types of foundations, the health and safety implications and sustainability of the works.

Section 2 deals with the fundamental principles used in describing soil behaviour, the nature of soils, shear strength, stress distribution, water pressures, foundation bearing capacity, single pile capacity, slope stability and ground improvement. The chapter on ground improvement in section 2 is only a short introduction; the subject is covered in more detail in sections 7 and 8 in volume 2.

Section 4 edited by Ian Jefferson introduces 'Problem Soils' in three groups; behavioural – collapse or swelling; climatic – arid, tropical and glacial; formation – fills, organic, mudrocks, sulfate acid soils and soluble ground. Each of the problem soils are described with the mechanisms which have led to their formation and the geographic extents. The engineering issues are described and suggestions for overcoming the problems for basic engineering situations are given.

Section 4 leads into the practicalities of site investigation. Anthony Bracegirdle describes the differences between site investigation and ground investigation with, as a background, the ground as a 'hazard'. The section leads the reader through the planning process needed to make sure that the investigations adequately investigate all aspects of the ground beneath the site. The chapter describing investigation methods starts with non-intrusive methods of investigation using geophysics, leads into the conventional drilling and probing methods of investigating the ground and measuring the physical characteristics for design. The last chapters deal with sampling soils and the laboratory testing of the samples. The missing section is how to treat the results of the investigations and tests to derive the design characteristics which are needed when moving to volume 2 in which the geotechnical design processes are considered.

Anthony O'Brian introduces section 5, the 'Design of Foundations'. The section is a very comprehensive section with ten chapters covering all types of foundation: shallow foundations (strips and rafts), deep foundations (piles – single, groups and rafts), special problems (on fills and hybrid

foundations) and finally a chapter on ground improvement. The chapter on ground improvement is a very short but concise section, only 27 pages long, giving brief details of the commonly used processes.

Section 6 moves on to the 'Design of Retaining Structures'; this is a very short section which, considering the complexity of the subject, should contain more information. The last part of the section is devoted to the design of ground anchors, useful but more detail should be provided for the design of the walls. The design of reinforced soil-retaining walls is included in section 7 with earthworks, slopes and pavements, but this chapter should be moved to section 6.

Paul Novak is the editor for section 7, the 'Design of Earthworks, Slopes and Pavements'. The text follows on from the principles in section 2 with a good description of the application of EuroCode 7 to the analysis of earth slopes. There is a section on the derivation of design parameters for slope stability analysis with a discussion on how to review the different strength parameters and the risks of failure of a slope in service. The examples of slope failures and the repair methods used draw heavily on experiences in the railway sector; some examples from the water and roads sectors would have balanced the chapter. The short chapter on the design of soil-nailed slopes missed the fact that the current reference is BS8006–2 20011. The final chapter deals with the specification, compaction and control of earthworks, includes some illustrations of methods of compaction and the plant normally used, but otherwise is a reproduction of sections of the Highways Agency Specification for Highway Works (SHW). The inclusion of how to specify and use relationship tests – dry density (2.5 kg/4.5 kg or vibrating hammer) versus moisture content with measurement of California bearing ratio values and MCV versus moisture content with measurement of undrained shear strength would have been very useful.

In section 8 'Construction Process', Tony Suckling describes the process used by contractors when constructing foundations (piled), ground improvements, dewatering, soil reinforcement and underpinning. Good descriptions of the methods are included with advice about some of the common problems which are encountered on sites.

The final section of the two volumes deals with construction verification, the testing of the geotechnical designs, and their construction. The testing of works constructed underground is very important as many parts of the work are never seen. Descriptions of the process and methods of testing for defects and load-bearing capability are described. The last chapter deals with the 'Observational Method' of monitoring construction, dealing with the risks, setting the trigger values, monitoring the works and feeding back to the design as the works take place.

The *ICE Manual of Geotechnical Engineering* is a large, very comprehensive reference on the vast subject of geotechnical engineering; some areas are dealt with very well but some require the reader to move to other references for more detail. Where a move to another reference is required, the manual includes a good number of references such that the reader should have no problem in finding the information.

Stephen P. Corbet