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Book Review

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Ground Improvement

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Book review

Principles and Practice of Ground Improvement

J. Han, John Wiley & Sons, Inc., Hoboken, NJ, USA, 2015,
ISBN 978-1-118-25991-7, E-book: \$128.99; Hardcover: \$160, 432 pp.

This book collates a suite of conventional and modern ground improvement techniques such as soil densification, replacement, drainage and consolidation, chemical stabilisation and in situ ground and fill reinforcement. The book can be used as a guide for practising engineers and as a textbook for undergraduate and postgraduate students. Each chapter contains step-by-step design examples that outline typical calculations which, in my view, are the best way of introducing the subject, and problems for homework assignments or exercises. The important sustainability aspects of design for individual ground improvement techniques are also covered in detail. Powerpoint presentations and problem-solving manuals are available from the publisher to assist faculty members who teach ground improvement by using this book.

Chapter 1 describes unfavourable ground conditions. The historical development of various ground improvement methods is described, including their classifications. Guidance is provided on how to select the most appropriate ground improvement techniques; trends for future development are also discussed.

Chapter 2 describes the geomaterials in relation to their properties, testing methods and analysis. Geomaterials are separated into three groups including (a) natural geomaterials, (b) manufactured geomaterials and (c) improved geomaterials. Physical and mechanical properties are used to classify the natural materials. Compaction in association with water content and compressibility is described using the testing methods. The properties and testing methods of geosynthetics are explained with worked examples. At the end of the chapter, the design procedures behind shallow foundations, slopes, earth retaining walls and potential liquefaction are focused upon, with real-life examples.

Chapter 3 covers shallow and deep compaction with the relevant design and construction approaches. The shallow compaction technique consists of conventional compaction and intelligent compaction, and the deep compaction methods include deep dynamic compaction, impact compaction and vibro-compaction, all of which are discussed, together with the implementation of quality control and assurance.

Chapter 4 concentrates on the over-excavation and replacement of unsuitable foundation soils. The principles for shallow foundation design include stress distribution, failure modes and associated settlement.

Chapter 5 addresses the concepts of deep replacement, such as the function of densification, and the load-transfer mechanism and failure modes. Design approaches are included for sand compaction piles, stone columns, rammed aggregate columns, controlled modulus columns and geosynthetics encased stone columns.

Methods to control groundwater in soil are explained in chapter 6; this chapter begins with the principles of seepage flow and filtration and then various methods of regulating the flow of water in soils are described, including drainage and dewatering, with the concepts complemented by design procedures.

Chapter 7 deals with the use of preloading to increase the shear strength of soil and reduce the long-term deformation of soft clays. The use of vertical drains with conventional fill and vacuum pressure is elucidated using consolidation theory. Associated design guides with design parameters are provided, with practical examples. Construction techniques such as the installation of vertical drains, drainage layers, vacuum systems and field instrumentation are explained in this chapter.

In chapter 8, the concepts and design factors related to deep mixing and grouting using chemical additives such as quicklime, cement and slag and fly ash are described and explained in the first part. Design considerations include the types of stabilised soils, the shapes and dimensions of columns, bearing capacity, elastic and consolidation settlements and stability and seepage. In the second part, the concepts of grouting, including its advantages and limitations, are presented with associated fundamentals such as the theory of grout injection, hydro-fracturing and the mechanism of jet flow. Design approaches are included with example problems at the end of the chapter.

In situ ground reinforcement consisting of ground anchors and soil nailing is encapsulated in chapter 9. The principles, design considerations, related parameters and construction practices for both techniques are discussed.

In chapter 10, the application of geosynthetic reinforcement for slopes, embankments, column-supported embankments, shallow foundations and roads and railways is explained and, as in the other chapters, their principles, design considerations and design parameters and procedures are discussed.

I enjoyed reading this book because it covers a wide range of topics and is easy to follow. It is therefore highly recommended for students and practitioners who work in this field.

Cholachat Rujikiatkamjorn