

BOOK REVIEW

Expansive Soils: Recent Advances in Characterization and Treatment

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This book provides a comprehensive overview of recent advances in the field of expansive soils, which constitutes a large worldwide problem for construction particularly in arid and semi-arid regions. Damages relating to expansive soils account for a very high economic loss; in the USA this loss exceeds \$15 billion annually. Although important advances have been achieved in the characterisation and treatment of expansive soils they still cause considerable damage to buildings and infrastructures, ranging from minor cracks in pavements and buildings to the irreparable displacement of buildings and structural elements.

The book includes contributions from 52 experts from 22 countries giving a worldwide perspective on problems relating to expansive soils. It is composed of nine parts dealing with the following topics:

- (a) nature, identification and classification of expansive soils
- (b) volume change characteristics
- (c) swelling-potential measurement
- (d) advanced techniques for swelling-potential assessment
- (e) site characterisation
- (f) lime stabilisation
- (g) cement stabilisation
- (h) other treatment methods and
- (i) construction techniques and remedial measures.

The first part includes five contributions: the classification and distribution of expansive soils and rocks (illustrated by a case study on the Arabian Gulf); laboratory identification and classification of expansive soils; prediction of the swelling properties of clays using statistical analysis; mineralogy and chemistry of bentonites; and swelling phenomena in non-vertisolic soils encountered in the Pampas region of Argentina.

The second part is composed of three contributions: the use of an environmental scanning electron microscope (ESEM) for the study of the structural modification of argillite during hydration-dehydration cycles; the use of a large scale oedometer for the study of the swelling of a clay; and the use of water sorption and dilatation measurements for predicting the swelling behaviour of soils.

The third part includes five contributions dealing successively with: the use of an ESEM coupled with a digital image analysis (DIA) for the estimation of the swelling-shrinkage of bentonites; the study of the influence of remoulding methods on soil swelling; the estimation of swelling rate of clays; swelling behaviour of Ankara clay;

and prediction of swelling characteristics using free swell index (FSI).

The fourth part includes five contributions: the use of hyperspectral remote sensing technology to detect and map expansive clays; the use of the spectroscopy for the characterisation of expansive soils; the use of the finite element method for analysis of pier foundation in swelling soils; the prediction of swelling pressure using the neural networks approach; and the use of digital imaging technology for the measurement of shrinkage strain.

The fifth part includes three contributions: a case study from the middle region of Saudi Arabia; the volume change of compacted Ankara clay; and the influence of trees on soil expansion in southern Australia.

The sixth part is composed of three contributions: a case study with Ankara clay; an experimental study of the performance of lime in the reduction of the swelling pressure of clay; and the use of combined lime-polypropylene fibres for reduction of swelling and shrinkage of expansive clays.

The seventh part includes three contributions concerning: an assessment of swelling soil behaviour on constructions; stabilisation of problematic soils using cement and lime; and an experimental study of the influence of cement-acrylic resin on the physical and engineering characteristics of clay-sand mixtures.

The eighth part presents different treatments employed for the reduction of soil swelling, mainly: pozzolanic stabilisation; rice husk ash; fly ash; sulphate resistant type V cement; low calcium class F fly ash; and lime mixed with polypropylene fibre.

The last part presents the use of pile-anchors as a foundation technique for constructions in expansive soils.

In summary, this book provides an interesting overview on recent advances in the fields of: the characterisation of expansive soils using both laboratory and field methods; the prediction of the behaviour of expansive soils using numerical methods such as the finite element method and the neural network approach; the stabilisation of expansive soils using different treatments (cement, lime, fly ash, rice ash, polypropylene fibre); and the use of pile-anchors as foundation for constructions in expansive soils. Analyses are supported by interesting case studies. This book constitutes a valuable reference for engineers, researchers and graduate students working in the field of geotechnical engineering in expansive soils.

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