Book review

Mechanics of materials and interfaces: the disturbed state concept. C. S. Desai. Boca Raton: CRC Press, 2001, 698 pp. ISBN 0 8493 0248 X.

The title and the aim of the book are very ambitious—to review the present state of the art of the constitutive modelling of solid materials with respect to the unifying framework of the so-called *disturbed state concept* (DSC). The DSC was proposed by the author as a mathematical tool for the description of the material behaviour changing from the intact state into the state adjusted to particular loading processes. A basic interpretation of the DSC terminology is given in the second chapter followed by representations of disturbance functions for various deformation processes (including creep and rate-dependence).

From the overview of general equations in Chapter 4 it can be understood that the DSC provides a way to interpolate between intact and adjusted states without specifying constitutive tensors a priori. Thus particular formulations of elastoplastic, viscoplastic or thermal models can be incorporated.

The equations of the theory of elasticity are summarised in Chapter 5, and a few classical plasticity models (perfect plasticity and isotropic hardening) are briefly outlined in Chapter 6. Several worked-out examples illustrate the link between those constitutive models and the DSC.

Chapter 7 provides a description of some more advanced constitutive models. It is shown that various features of many different materials can be included in the so-called hierarchical single-surface plasticity. A very good agreement between measured and calculated stress–strain curves is presented for metal alloys, sands, clays, rockfill, rocks, silicon crystals and other materials in both monotonic and cyclic loadings. One wonders whether all the problems in constitutive modelling are already solved, since there is no reference to any limitations of the model. Even most creep- and rate-dependent effects in 3D seem to be captured (Chapter 8). A modification of the model for interfaces and joints appears, in this light, almost straightforward (Chapter 11).

Saturated, partially saturated and bonded (structured) materials are treated in Chapters 9 and 10. These topics are too complex to be discussed in detail in the book. The author limits his description to several selected effects, which may be difficult to understand for those who are not familiar with the particular items from other sources. Localisation and instability (Chapter 12) are outlined rather verbally with a few general equations.

The last chapter deals with the implementation of DSC in computer procedures. Additionally to FE equations and solution algorithms there are several examples of calculation results that include a complete list of input data. This can help potential users of the model to calibrate their computer codes, since no code listings can be found in the book.

This book offers a way to get acquainted with the DSC framework, leaving aside most of the other constitutive approaches. Details of the DSC, including many examples with values, are comprehensive and offer the possibility of checking this approach against experimental data. The editorial side of the book is not fully satisfactory: many figures are reprinted from other publications with sometimes unreadable captions, and reference to non-SI units is quite frequent.

I. Herle

Seismic design guidelines for port structures. Working Group No. 34 of the Maritime Navigation Commission, International Navigation Association. Swets & Zeitlinger B. V., Lisse, 2001, 474 pp. ISBN 90 2651 818 8. £58.

This is a very useful and informative book produced by Working Group No. 34 of the Maritime Navigation Commis-

sion, International Navigation Association, which included a lot of the leading authorities in academia and industry in this technical area. The book consists of two main sections: a main text of the design guidelines with five chapters, which is just over 70 pages, and eight technical commentaries totalling nearly 370 pages. The five chapters are:

1. Introduction
2. Earthquakes and port structures
3. Design philosophy
4. Damage criteria
5. Seismic analysis

The technical commentaries are:

1. Existing codes and guidelines
2. Case histories
3. Earthquake motion
4. Geotechnical characterisation
5. Structural design aspects of pile-deck systems
6. Remediation of liquefiable soils
7. Analysis methods
8. Examples of seismic performance evaluation

According to the introduction, the seismic design guidelines address the limitations inherent in conventional design, and establish the framework for a new design approach that is performance based, user-friendly, and general enough to be useful throughout the world.

Although the expected users of the guidelines are design engineers, port authorities and specialists in earthquake engineering, anyone who has an interest in the geotechnical aspects of earthquake engineering would find the design guidelines and technical commentaries very informative and useful. They can be readily applied to other types of geotechnical structure under seismic actions. There are over 50 pages of examples of seismic performance evaluation, thus allowing the book to be used both as a main textbook on the subject matter at postgraduate level and as a reference book at undergraduate level.

The book is very useful in many aspects. In particular, it covers both physical and computational methods in sufficient detail so that any reader can follow the references to understand these methods in more detail. Under the technical commentaries of geotechnical characterisation, the basic mechanical behaviour of soil under cyclic loads is introduced. A good list of field and laboratory investigation techniques and related parameters is given in a simple-to-use table. Field test types introduced include SPT, CPT, down-hole, cross-hole and the SASW geophysical test. Laboratory test types include cyclic triaxial and cyclic true triaxial, dynamic resonant column and bender element tests.

Many analysis methods are also introduced, including simplified analysis such as pseudostatic stability analysis (the Mononobe–Okabe equation, for example), equivalent seismic coefficient and displacement of walls using empirical formulae, simplified dynamic analysis such as the Newmark sliding block analysis, and pushover analysis. Dynamic analysis using finite element or finite difference techniques is also introduced, but the focus is on the application of these methods, rather than on the theory and the mechanisms behind the methods.

Lastly, the reviewer found it very useful that the book has included a table spanning nine pages on the input parameters for analysis concerning various different types of structures and geotechnical conditions.

With the detailed literature survey, evaluation of various experimental techniques and case studies noted, this is also a very valuable book for geotechnical researchers in earthquake engineering. The reviewer would recommend a copy of this book to be included in the collection of any engineer or researcher interested in the geotechnical aspects of earthquake engineering.

A. H. C. Chan