

1 Introduction

This book focuses on the fundamentals of rock mechanics as a basis for the safe and economical design and construction of tunnels, dam foundations and slopes in jointed and anisotropic rock. It is divided into four main parts:

- A Fundamentals and models
- B Analysis and design methods
- C Exploration, testing and monitoring
- D Applications and case histories.

The rock mechanical models presented account for the influence of discontinuities on the stress-strain behavior and the permeability of jointed rock masses. They are implemented in three-dimensional finite element analysis methods, which enable a realistic simulation of the load-carrying behavior of structures in rock. Also, advanced methods to describe squeezing, swelling and creeping rock masses are implemented. The corresponding computer programs developed and applied by the author and his colleagues will soon be available for sale.

In comparison to the rock mechanics book first published by the author in German in 1984 (Wittke 1984), this book has been completely revised and is now based on more than 40 years of experience in the design and construction of tunnels, dams and slopes in many kinds of rock.

The book is aimed at students taking advanced courses in geotechnics and rock mechanics, at postgraduate students (PhD) and at researchers as an introduction, as well as at civil engineers working as consultants, planners and designers, or in the construction industry and within public authorities. The required academic background for readers is a graduate degree (BEng or BSc) in civil engineering. However, interdisciplinary working professionals coming from geology, mining and natural sciences can also benefit from this book.

The practical examples and case histories presented in this book should facilitate the consideration of rock mechanics in the reader's own work.

