

Preface

Groundwater-related problems are common in rock engineering. Rock tunnels, rock slopes and dams built on rock are typical constructions that are exposed to the adverse effects of water flow and changes in water pressure, both during excavation and in the subsequent operation of the facilities.

When tunnelling below the groundwater table in Scandinavia, grouting is frequently used to seal rock mass fractures and thus reduce water influx and its impact on the surrounding environment. Reduced water influx also has a beneficial effect on tunnel construction. Grouting of dam foundations built on rock prevents excess leakage through rock fractures under the dam.

Grouting is a multidisciplinary engineering science that covers several fields, including geology, geohydrology, material science, rheology and production technology. Theories and mechanisms behind grout spread in rock fractures have been developed in Sweden by researchers at the Royal Institute of Technology and Chalmers University of Technology under the leadership of Professor Håkan Stille and Professor Gunnar Gustafson. Research has been based mainly on a programme run jointly by industry and the two universities with support from BeFo, the Rock Engineering Research Foundation. To date, it has resulted in some 50 papers in peer-reviewed international journals and 16 PhD theses.

This book describes the theoretical background to cement-based grouting of fractures in rock using grouting technology that has emerged

from academic research conducted in Sweden since the 1980s. It is our hope that this summary of the theories that have been developed in recent decades will provide the international geotechnical community with a better understanding of the basis for rock grouting and the parameters that control the spread of grout in rock fractures. This book will be of considerable value to students at undergraduate and master's level as well as researchers.

Many people, especially PhD students, have contributed over the years to the underlying research and development and we extend a collective 'thank you' to all of them. We would like to mention in particular our colleague Professor Gunnar Gustafson, who as an extraordinary researcher added greatly to knowledge in this field but is sadly no longer with us. We would also like to thank Dr Lars Hässler, Dr Magnus Eriksson and Dr Mats Holmberg for their critical reviews and valuable comments. Special thanks to Mr Shinji Kobayashi and Mr Masakuni Tsuji from the Shimizu Corporation in Japan, and Mr Björn Stille, all of whom played a very active part in the practical application of the theories that have evolved.

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