

Preface

In order to develop and improve their living space and to get resources from the earth, ever since human entered a civilized society, surface and deep excavations have become an important part of civil engineering and mining, from the early simple manual excavations to modern sophisticated blasting and mechanical excavation mankind has experienced a long history of thousands of years, has accumulated a lot of knowledge. A variety of theories have been developed to explain the diversified issues appeared during the process of excavation with the development of the science and technology.

This book summarizes the technical progress and various theories on excavation in recent decades, developed by scholars of various countries, including the author of this book, major focus on rock excavation, which is more difficult and challenging compared to excavation of other material. Taking into account that mining engineering has more complex features, this book covers essentially the scope of civil engineering, while majority of the content is also applicable to mining engineering. As rock blasting is still the most important means of rock excavation, theories and technologies of rock blasting are particularly expounded in more detail than other excavation methods.

The author used to work in an underground mine for 11 years on various technical and management roles, worked in the field of research for another 11 years as well. During this period he got a chance to have a short term of study on mining and visit Sweden in 1984. Later he came to work in Hong Kong for over 25 years. A wealth of practical experience and knowledge has been accumulated during his long-term on-site technical work. Dedication to the research further developed and raised the author's theoretical level. His professional career in Hong Kong enables the author to have more accesses to the worldwide advanced technologies and theories in the field of rock excavation. The 50 years professional experience and accumulated knowledge has laid a solid foundation for this book.

In reading various publications in the field of rock excavation it is noted that the authors of the Europe and United States, including India, Japan and South Africa, rarely introduce the works and valuable theoretical contributions, which are still in application, made by Chinese and Russia (former Soviet Union) scholars.

By striking a balance, while introducing Europe and United States scholars' works, Chinese and Russia scholars' are mentioned as well.

The book is divided into three parts.

The first part is the basis. It includes basic knowledge and relevant theories on the rock and rock mass—the objectives of the excavation engineering, the basic knowledge, techniques and basic theories on the drilling and blasting and explosive materials.

The second part is on surface rock excavation. After introducing various methods of non-blast techniques, highlights of surface blasting, the application of computer simulation and CAD technique are illustrated in detail.

The third part is on underground rock excavation. Before comprehensively illustrating technology and theories on the drilling and blasting, ventilation, loading and haulage, ground reinforcement and support, computer application for underground excavation, varieties on mechanical excavation methods including tunneling, shaft and TBM technique are also described in detail.

Due to the complex working environment for rock excavation, especially when explosives are used for rock blasting, the comprehensive description of varieties on safety issues during excavation and necessary safety precautions and security measures are provided as much as possible in the book.

To be more practical, a variety of technical methods and data from various sources are provided in the book, making it a reference book covering both theoretical and practical applications.

The targeted audience of this book are engineers, researchers and academics engaged in rock excavation, but is equally applicable as a teaching reference for teachers and students in civil and mining engineering. The author sincerely hopes that this book could be of some help to readers.

At the age of seventy, the author spent three years to finish this book. It could be the last and one of the most important achievements in his whole life. It is hoped that the younger generation would share his experience and knowledge from this book.

The author received strong support and encouragement from the friends and colleagues during the writing process.

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encouragement and strong support starting from the outset of the planning period of this book.

In the book the author shows his affection to his alma mater—Northeastern University in China. Some important achievements of the author's predecessors, which are yet glorious so far, are introduced in this book. Professor Xiaohe Xu, the supervisor of the author and a respected scholar, wrote the Second Foreword of the book, even at the age of over 80 years, which also greatly encouraged and inspired author.

The author is especially honored that the respectable academician, China Academy of Engineering, President of China Society of Explosives and Blasting, Prof. Xuguang Wang wrote the First Foreword for the book. The author would like to take this opportunity to express his sincere appreciation.

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