

Preface

Geotechnical failures, specially the catastrophic ones, are an excellent experience and a source of inspiration to improve our current understanding of phenomena and our procedures and tools for analysis and prediction.

This unconventional manner to learn Geomechanics is the essence of this book. In general, Soil Mechanics and Geotechnical text books describe first the concepts and the theoretical developments and then apply them to interpret or solve a particular application. This book has a different approach. The case (a failure) is first described and then an explanation is sought. This approach is developed through a set of steps which can be summarized as follows.

1. Identify the nature of the problem
2. Develop a dedicated and specific formulation of the case, based on established basic concepts. In general, no single existing theory or procedure is available to solve the case at hand.
3. Provide a solution within an acceptable degree of complexity.
4. Extract the fundamental aspects of the problem and highlight its relevance.

The cases selected have been grouped into three main topics: Landslides, Embankments and Dams and Dynamics of Failures. No attempt to provide a comprehensive account of known catastrophic failures has been done. But the cases selected (Vaiont, Aznalcóllar, Brattas-St. Moritz) are rather unique and illustrate a number of relevant and to some extent controversial issues which are of wide interest.

Finite element methods have not been used. In the landslides analysed (Vaiont and Brattas-St. Moritz) currently available commercial programs are of limited utility. In the remaining cases the analysis performed provides a sufficient insight and interpretation of the field behaviour.

The book teaches how to build the necessary models to understand the failures. Balance and equilibrium equations are formulated at different scales which are selected having in mind the abstract representation of the key concepts of each case. In some of the Chapters calculation tools, included in well known and widely available programs (Excel, Maple, etc.) have been used. Some details of the “ad hoc” programs developed have also been included in Appendices to help the readers to follow the details of the calculation.

Chapters include also a short description of the changes in the original design and the mitigation measures which could have prevented the failure. Also a summary section of lessons learned is provided. Finally, selected topics and more advanced reading are suggested.

The book is associated with a Master/Doctorate courses being offered at the Department of Geotechnical Engineering and Geosciences of UPC, Barcelona and at the Institute of Geotechnical Engineering, ETH Zurich. Potential readers for the book include graduate students, faculty and professionals in the fields of Civil and Geotechnical Engineering.

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