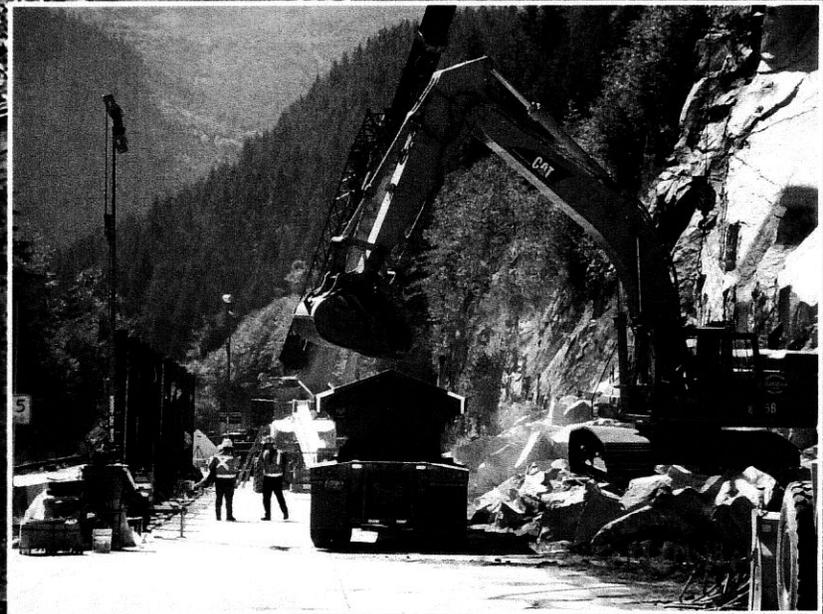


TRB



ROCKFALL

CHARACTERIZATION AND CONTROL

PREFACE

In 1958 the Highway Research Board, the predecessor of the Transportation Research Board (TRB), produced Special Report 29, *Landslides and Engineering Practice*, the first in a series of comprehensive reports that synthesize information related to landslides and rockfall. In 1972 a task force was organized with members drawn from several of the standing committees within the Geology and Properties of Earth Materials Section to revise Special Report 29. It took 6 years to prepare and publish TRB Special Report 176, *Landslides: Analysis and Control*. By 1989, members of the TRB standing committees within the Soil Mechanics and the Geology and Properties of Earth Materials sections clearly identified the need for a revised and expanded report to address the latest advances in the methods for investigation and mitigation of landslides. Thus, a study committee was established in 1990 under the chairmanship of A. Keith Turner of the Colorado School of Mines, and TRB Special Report 247, *Landslides: Investigation and Mitigation*, was published in 1996.

These reports have been widely used in the geotechnical engineering community as comprehensive, practical sources of information on all aspects of landslide investigations and measures that may be used to mitigate the hazards posed by landslides. Among the most widely distributed of TRB publications, these reports have enjoyed wide international appeal and have been translated into

several languages. The scope and content of this series of reports illustrate the remarkable growth in knowledge of and experience with landslide phenomena over the past half-century, as well as the expanded capabilities of new technologies that may be used to assist in their investigation, characterization, and mitigation.

TRB Special Report 247 featured an expanded treatment of several topics, including risk analysis, rock strength properties, and the stability of rock slopes, that are important in evaluating rockfall. In the decade following the 1996 publication of Special Report 247, however, several factors contributed to a greatly expanded interest in rockfall on the part of the transportation community. Thus, in May 2005 TRB organized a task force (see box on page viii), once again under the chairmanship of A. Keith Turner, to develop an entirely new TRB report that would address all aspects of rockfall while complementing TRB Special Report 247.

Rockfall: Characterization and Control provides a comprehensive review of rockfall research and of methods for investigating, characterizing, predicting, and mitigating rockfall events. Considerable information is based on unpublished sources and the experiences of individual task force members. No accessible comprehensive source of rockfall information existed, so the authors of individual chapters have compiled information from many and diverse locations.

Task Force on Rockfall Characterization and Control

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The report contains 18 chapters prepared by internationally recognized experts. Approximately 30% of the report (five chapters) describes the fundamentals of rockfall phenomena, with special emphasis on the methods used to assess rockfall hazard and risk. An additional 40% of the report (five chapters) discusses the scientific and technical aspects of rockfall investigation, including rockfall site characterization, instrumentation and new investigation technologies, rockfall kinematic principles, rockfall prediction and modeling options, and field-test operations. The final eight chapters (about 30% of the report) describe rockfall mitigation and management options, with special reference to rockfall protection provided along transportation routes. A DVD contains original color versions of illustrations, video clips of individual rockfall field tests, video records of selected rock slope mitigation activities, and a reproduction of the original 16-mm movie on rockfall field tests conducted by Arthur Ritchie in 1963 for the Washington State Highway Commission (now the Washington State Department of Transportation).

The rockfall task force first met in July 2005 to begin the process of developing this report. Individual task force members undertook the preparation of specific chapters. Responsibilities included developing chapter outlines, identifying expertise outside the task force to provide specific material or assist in writing chapters, writing material, coordinating the efforts of multiple

authors, and reviewing chapter drafts before submittal for review by the entire task force membership. In addition to holding meetings in Washington, D.C., during the TRB annual meetings throughout the period from 2006 to 2010, the task force held additional formal meetings in 2006 and 2007. These discussions greatly improved the quality of the individual chapters.

Although the material contained in each chapter is solely attributed to the author(s) of the chapter, each chapter underwent a rigorous peer review process by task force members and by Robert L. Schuster, who conducted an independent review of the whole report. A. Keith Turner, Robert Schuster, and G. P. Jayaprakash provided a technical and editorial review of all the draft materials. The final product incorporates numerous revisions made throughout the iterative review process.

The International System of Units (SI) is used to define all measurements in this report; an equivalent value specified in U.S. customary units is also provided. A table of conversion factors for SI and inch-pound (U.S. customary) units of measurement is included for reference.

ACKNOWLEDGMENTS

Coordination and technical editing of the efforts of multiple authors are not easy tasks. TRB and the future users of this report worldwide are indebted to the members of the task force for their efforts.

Sincere appreciation is expressed to all those who contributed information in the form of data and photographs, ideas, and advice, without which this volume could not have been completed. To list all contributors would be impossible; to list the most important would be unfair to the others.

This report was produced by busy individuals who volunteered their time and talents to its creation. The task force members were aided by several individuals who agreed to write, review, and supervise the development of particular chapters or portions of chapters. Brief biographies of all members of the task force and the chapter authors are provided at the end of the report. The editors wish to thank this dedicated group for their encouragement, unfailing goodwill, and patience during the lengthy editorial process.

Special thanks go to TRB staff members G. P. Jayaprakash, Senior Program Officer—Soils, Geology, and Foundations Engineer; Mark R. Norman, Director, Technical Activities; and Michael DeCarmine, Program Officer. In the TRB Publications Office, Senior Editor (retired) Norman Solomon, Cay Butler, and Naomi Kassabian edited the text; Senior Editor Janet M. McNaughton managed the editorial production; Paul R. Burley compiled the index; Mary McLaughlin proofread the pages; Jennifer J. Weeks prepared the manuscript for editing; and Juanita Green managed the production and printing, under the supervision of Javy Awan, Director of Publications.

—A. Keith Turner and Robert L. Schuster
Editors

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