

HANDBOOK OF SNOW

PRINCIPLES, PROCESSES,
MANAGEMENT & USE

Edited by

D.M. Gray
D.H. Male



PERGAMON
PRESS

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**D. M. Gray
D. H. Male**

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PERGAMON PRESS

Toronto • Oxford • New York • Sydney • Paris • Frankfurt

Pergamon Press Offices:

Canada	Pergamon Press Canada Ltd., Suite 104, 150 Consumers Road, Willowdale, Ontario, Canada M2J 1P9
U.K.	Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, England
U.S.A.	Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York, 10523, U.S.A.
Australia	Pergamon Press (Aust.) Pty. Ltd., P.O. Box 544, Potts Point, N.S.W. 2011, Australia
France	Pergamon Press SARL, 24 rue des Ecoles, 75240 Paris, Cedex 05, France
Federal Republic of Germany	Pergamon Press GmbH, Hammerweg 6, Postfach 1305, 6242 Kronberg-Taunus, Federal Republic of Germany

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CANADIAN CATALOGUING IN PUBLICATION DATA

Main entry under title:

Handbook of snow

Includes bibliographical references and index.

ISBN 0-08-025375-X (bound). — ISBN 0-08-025374-1 (pbk.)

I. Snow. 2. Snow mechanics. I. Gray, D. M. (Donald Maurice), 1929- II. Male, D. H. (David Harold), 1939-

QC929.S7H36

551.57'84

C81-094438-3

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Printed in Canada

56.421522
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HANDBOOK OF SNOW

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MANAGEMENT & USE**

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PREFACE

Snow is central to activities in temperate and polar latitudes over a very significant part of each year. With the arrival of snow, modes of travel, working and living are transformed. The snow environment makes obsolete the technologies, tactics and most outdoor activities of the snow-free season and imposes new challenges and opportunities. This book is dedicated to the enhancement of life in a snow environment. It was planned in recognition of the need for an introductory text on snow to serve those who must work with the practical aspects of snow management and to stimulate further interest, careers, research and the development of educational programs concerning this precious, though frequently demeaned, resource.

The initial concept and planning of the book was undertaken by a Working Group on Snow Engineering of the Snow and Ice Subcommittee of the Associate Committee on Geotechnical Research, National Research Council of Canada. The objective of the project was to provide to practicing engineers and educators information concerning snow and snow problems. During preparation its scope was enlarged to make its contents of interest to disciplines other than engineering, e.g., agriculture, geography, life sciences, meteorology and others. Scientists and engineers working on snow problems in Canada and the United States have contributed to its writing.

The material has been organized into four parts - Snow and the Environment, Snowfall and Snowcover, Snow and Engineering and Snow and Recreation. In Part I, on the environment, the material stresses the impact and interaction of snow with living things, climate and agriculture. In Part II, on snowfall and snowcover, a comprehensive review of the phenomenological aspects of snow during its formation, drifting and ablation is given, as well as a compilation of physics and physical properties. This Part, although probably of most interest to academics in the natural sciences, provides the background material on which snow management principles are founded. In addition, Part II presents information on snow measurement and the special cases of Avalanches and Snow and Ice on Lakes. Part III on engineering emphasizes practical applications in which design criteria and procedures relevant to the calculation of loads, the construction of snow roads and methods of snow and ice control are presented. In Part IV, the recreational aspects of snow are discussed, in particular, skiing and the mechanics of snow skis.

The scope of the book does not allow detailed discussions of all the aspects of snow that are presented. Certain chapters, for example; Physics and Properties of Snowcover, Snowcover Ablation and Runoff, Avalanches and others, could easily be enlarged to form separate books. An effort has been made to compensate in part for this deficiency by including a reasonably

complete list of references with each chapter. In review of these references it is worthy to note the wide range in sources of books, journals, technical and research reports, and other papers cited, indicating the interdisciplinary nature of snow research.

ACKNOWLEDGEMENTS: As mentioned above, the impetus for this manuscript originated in 1974 when a small group of scientists and engineers, comprising the Working Group on Snow Engineering, proposed a general reference text on snow covering its formation, properties, problems and control. Their continued encouragement, assistance and support of the manuscript during its preparation has been unflinching.

During preparation the style, philosophy, scope and content of the book has changed considerably. These changes often made the coordination of contributions difficult and it has only been through the enthusiastic participation of the contributors, whose cooperation was voluntary, that this book is possible.

We are particularly indebted to the financial and physical resources made available by the Atmospheric Environment Service (AES) and the University of Saskatchewan (Univ. Sask.). Special acknowledgements are due: Mr. G.A. McKay, Canadian Climate Centre, AES, for his encouragement, dedication and unflinching support to the project; Mr. M. Berry, Canadian Climate Centre, AES, for his assistance in coordinating activities and material during the initial stages of preparation; Mr. E. Truhlar, Training Branch, AES, for the thorough, comprehensive review of the final copy and Mr. G.W. Young and other personnel, Administration Branch Staff, AES, for drafting and production of the figures; Mrs. Elaine Wigham, Division of Hydrology, Univ. Sask., for the meticulous typing and retyping of drafts, her direct assistance with many other aspects of the book and her commitment to its successful completion; Mrs. Edna Wilson, Librarian, College of Engineering, Univ. Sask., for the many hours spent in searching and verifying references and to Dr. L.F. Kristjanson, President, and Dr. P.N. Nikiforuk, Dean, College of Engineering, Univ. Sask. for their encouragement, financial assistance, and making available many resources of the University to the project.

Special attempt has been made throughout the text to make specific acknowledgements regarding the source of material used and any failure to do so is unintentional.

D.M. Gray
D.H. Male

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