Preface

Canada is blessed with a large and diverse natural forest resource. Wood from Canadian forests is manufactured into a multitude of products that are required to meet the needs of Canadians and people of the world.

Canada is the world's largest exporter of softwood lumber products. One of the major uses of these products is in housing, industrial and commercial structures. The efficient use of wood in structures requires accurate material property information for development of refined design procedures.

This book will provide engineers, architects, scientists and code developers with a source of information on the structural properties of Canadian softwood lumber derived from full-size tests ("in-grade tests") of products sampled from Canadian sawmills. The majority of the technical information was developed in the Canadian Wood Council (CWC) project known as the CWC Lumber Properties Research Project.

The book is a cooperative project undertaken by the University of British Columbia and the Canadian Wood Council to systematically evaluate and present results of the Lumber Properties Research Project and supporting studies conducted by Forintek Canada Corp. and others.

In-grade testing projects were initiated in the late 1970's to expand on knowledge developed from studies of structural properties of Canadian lumber undertaken by Professor Madsen at the University of British Columbia. Professor Madsen reported the results of his research on lumber properties in his book *Structural Behaviour of Timber.*

The Canadian lumber industry, through the Canadian Wood Council, commissioned the CWC Lumber Properties Research Project for visually graded and machine stress-rated lumber in the early 1980's. The CWC project was part of a coordinated US and Canadian in-grade testing program. An overview of the Canadian and U.S. studies was presented at the ASTM Workshop on the North American In-grade Testing Program and reported in *In-grade Testing of Structural Lumber* published by the Forest Products Society in 1989.

In-grade test results from the CWC project were used to derive design properties for the Canadian Code for Engineering Design in Wood (CAN/CSA-O86.1). The principles, analysis procedures and properties used to develop the specified strengths in CAN/CSA-086.1 for lumber strengths are reported by R. Foschi, B. Folz and F. Yao in their publication *Reliability-Based Design of Wood Structures.*

The main objective of this book is to present a systematic evaluation of the structural property data for Canadian softwood lumber developed in the CWC program. The book provides a ready source of lumber property information for those interested in background, testing procedures, statistical summaries of test data and results of the CWC Lumber Properties Research Program and supporting studies.

The book provides a discussion of sampling, testing and analysis procedures; a summary of statistical information for bending, tension, compression and modulus of elasticity of visually graded dimension lumber; detailed analysis of size effects, property relationships, moisture content and rate of loading effects for Canadian in-grade data; and an assessment of the tension and bending properties of machine graded dimension lumber.

This book could be considered as a companion to Professor Madsen's *Structural Behaviour of Timber* presenting additional, and in many cases more comprehensive studies, of bending, tension and compression strength properties of lumber in the major commercial species groups, grades and sizes produced by the Canadian forest products industry.

This handbook reflects the work of many people. Most of the experimental work was undertaken by past or present scientists and staff of Forintek Canada Corp. (Eastern and Western Divisions). Mr. Danny Liliefna contributed to project through his thesis work on property relationships. Mr. Erol Karacabeyli contributed through work on rate of loading behaviour.

This book represents the conclusion of a major Canadian research project, but it is the beginning of a new era of forest product information. The growing need to make efficient use of our most important (and renewable) natural resource, wood, as well as the need to assess product quality in response to changing resources and customer needs, will lead to new projects. The CWC Lumber Properties information provides a strong base on which to build.

About the authors:

Dr. J. David Barrett, Head of the Department of Wood Science at the University of British Columbia, began his career at the Canadian government's Western Forest Products Laboratory in Vancouver in 1971, as a research scientist specializing in wood physics, wood mechanics and timber engineering. He joined Forintek Canada Corp. in 1978 as Manager of Wood Engineering and became Associate Research Director in 1984. Dr. Barrett then joined the UBC Faculty of Forestry's Department of Harvesting and Wood Science in 1984. As a Professional Engineer and a Fellow of the International Academy of Wood Science, Dr Barrett continues to be actively involved in national and international wood research, and codes and standards.

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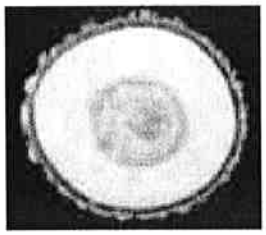

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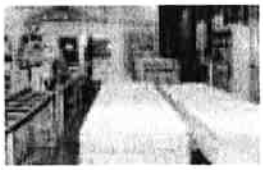

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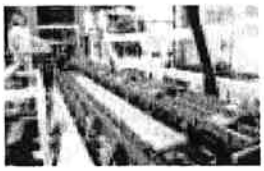

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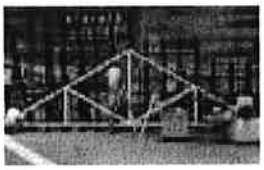

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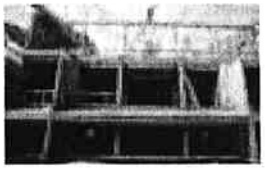

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