



Research & Development Highlights

93-214 Technical Series

Moisture in Canadian Wood-Frame House Construction Problems, Research and Practise from 1975-1991

Introduction

Standards, materials, building technology and codes, as used in wood-frame construction, have changed dramatically in the past 15 years. The move towards improved energy efficiency in housing has led to the increased airtightness of the building envelope which, in turn, has impacted on indoor air quality and moisture control.

A number of agencies, working independently and together, have been involved in various aspects of wood-frame construction and moisture control - giving rise to a significant body of research and development in the field.

This publication provides a detailed review of issues related to moisture in wood-frame construction over the last 15 years. This includes the identification of:

- moisture problems;
- research and development into causes and solutions;
- changes in housing materials, practices, codes and standards; and
- current moisture-related issues.

The document will give the reader a good working knowledge of the "state of the art", key developments, trends, and areas of future studies.

Description of the Publication

The report provides a brief review of the evolution of wood-frame construction in Canada to 1975, and the development of building science and practice with respect to moisture control.

Key advances include the concept of bulk air flow instead of diffusion as the prime vehicle for vapour transfer. This has placed a greater emphasis on air leakage control and stack effect.

Moisture performance is influenced by changes in and choices of materials, components and construction practises. Control technologies generally address existing moisture problems. The energy crisis of 1974 catalyzed the movement towards increased energy efficiency in the home, the use of alternative energy sources and, possibly, the use of continuous ventilation systems. The report provides a summary of energy conservation programs that had a significant impact on new house construction and renovation practice. A summary of developments in new materials and equipment, as well as changes in codes and standards is provided.

A number of Canadian organizations have been involved in the study area. Canada Mortgage and Housing Corporation (CMHC), Natural Resources Canada (NRCan), the National Research Council

(NRC), Forintek Canada Corporation and other public sector and private sector agencies have contributed to the current state of moisture-related building technology. A survey of this research is covered in the appendices.

Current moisture issues are summarized in the context of science and technology, construction and retrofit practice, training and education needs, and driving forces for change.

Findings

Research carried out during this period revealed a number of results, as presented in the report. A few key findings are given here:

- building practices used in southern parts of Canada may result in serious moisture problems when applied to Canadian northern and coastal regions.

moisture troubled houses usually experience high indoor relative humidity.
- energy conservation technologies, which result in the reduction or elimination of flues, lead to a reduction in natural ventilation rates and thus, to higher indoor humidity.
- certain insulation practices (i.e. low permeability insulation sheathing) can reduce the potential for the reduction of moisture in wall framing.
- the materials properties and the driving forces and transport mechanisms affecting moisture content in wood-frame walls, as a function of time, are very complex. Accurate

predictions of moisture content throughout the annual weather cycle are very difficult to assess.

There are a number of unresolved moisture-related issues which are documented in the report. Many of these pertain to the problems of wood-frame construction in the Atlantic region. The following are typical examples where more research is needed;

- alternative practices to deal effectively with moisture in wood-frame housing from both indoor and outdoor sources as well as construction moisture.
- alternative, practical approaches for reducing the frequency of failure of paint on wood siding.
- improvements to current practices for the use of low permeance insulating sheathings.
- examination of current sheathing system practices as they pertain to inhibiting air leakage into and out of insulation systems due to wind action.

Implications for the Housing Industry

This document provides an in-depth review of:

- developments pertaining to all aspects of moisture in wood-frame construction for the last 15 years;
- the contributions of various agencies; and
- current directions which research groups are pursuing to achieve energy efficient, problem-free wood-frame housing in Canada.

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*Research Report: Moisture in Canadian Woodframe
House Construction: Problems, Research and
Practice from 1975-1991.*

*Research Consultant: Morrison Hershfield Limited
Consulting Engineers*

*A full report on this research project is available from the Canadian
Housing Information Centre at the address below.*

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