

RESEARCH REPORT



Studies on Indoor Air Quality in Canadian Homes: Legislation, Regulations and Standards



CMHC—HOME TO CANADIANS

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**STUDIES ON
INDOOR AIR QUALITY IN CANADIAN HOMES**

Legislation, Regulations and Standards

Prepared for
the Research Division
Canada Mortgage and Housing Corporation
Montreal Rd., Ottawa K1A 0P7

by
Bruce M. Small and Associates Limited
R.R.#1, Goodwood, Ontario L0C 1A0

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Principal Consultant:	Bruce M. Small, P.Eng. Small and Associates
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CMHC Project Officer:	Jim H. White
CMHC Scientific Authority:	Judy Lorimer
CMHC Technical Advisor:	Peter Russell

This study was conducted by Bruce M. Small and Associates Limited for Canada Mortgage and Housing Corporation under Part V of the National Housing Act. The analysis, interpretations and recommendations are those of the consultant and do not necessarily reflect the views of Canada Mortgage and Housing Corporation or those divisions of the Corporation that assisted in the study and its publication.

FOREWORD

This paper deals with legislation, regulations and standards in Canada which are relevant to the study of indoor air quality in Canadian housing. Its purpose is to provide background information for discussions between Canada Mortgage and Housing Corporation and many other interested parties, regarding the best means for researching and addressing potential problems of indoor air quality in Canadian housing.

The 'Legislation, Regulation and Standards' study is part of a four-point project for the Canada Mortgage and Housing Corporation, to assist in defining the extent of any existing or potential indoor air quality problems in Canadian homes, and in defining effective means of addressing such problems. The studies were divided into four areas, with purposes as follows:

- o the legislative framework - to understand the existing and potential future role of the various governmental jurisdictions and regulatory powers in addressing indoor air pollution problems in Canadian housing,
- o the research base - to identify Canada's research interests in the indoor air quality field, and recommend a means of making information more accessible to all interested persons,
- o The people affected - to understand the extent of the Canadian population adversely affected by hazardous contaminants in indoor air,
- o the solutions - to understand what building techniques and other practical measures can be incorporated into constructing, rehabilitating and operating Canadian homes in order to achieve low pollution indoor environments.

The study results have been consolidated into three reports:

Legislation, Regulations and Standards
Research and Information Base
Exploring Low-Pollution Design

Inquiries concerning these reports may be directed to the Research Division, Canada Mortgage and Housing Corporation, Ottawa K1A 0P7.

The authors of this report are grateful for the advice and assistance received from many individuals, both in Canada Mortgage and Housing Corporation, and in many other federal departments and agencies, who participated in an extensive consultation and review process during this study program.

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1. INTRODUCTION

Many agencies, in both the public and private sector, are presently investigating the nature and extent of potential indoor air quality problems in Canadian buildings. Canada Mortgage and Housing Corporation has undertaken a series of studies investigating potential problems and solutions with regard to indoor air pollution in Canadian homes.

The terms of reference of the 'Legislation' component of the CMHC studies raise a number of questions, as follows:

"One of the key questions, that must ultimately be addressed by all concerned with such investigations, is whether or not the passing of laws or the promulgation of regulations should be part of the solution.

"Another key question that must be answered, by each government body with an interest in the field, is the type of mandate that has been conferred by existing departmental or other legislation. All researchers seem to be unanimous in their recommendation that more research must be done toward solutions and more time spent even in understanding the exact nature of the problem. Not as clear, however, is the question as to which agencies or departments should or can, by law, take a lead role."

Canada Mortgage and Housing Corporation has a primary responsibility to promote improved housing conditions in Canada, and has direct regulatory powers in respect of the construction standards for a large number of dwellings for which mortgages are insured or loans are extended under the National Housing Act. Indoor air quality is one factor among many about which CMHC must be knowledgeable and which it must take into account when providing its services to Canadian consumers.

The purpose of this report is to present a clear and concise summary of the legislation, regulations and standards which have a bearing on indoor air quality in Canadian Homes. It will be used as background information for discussions between CMHC and other interested parties, concerning their relative roles in a network of government and non-government bodies addressing this field.

The longer term purpose of such discussions is to determine, with the help of all interested parties, the extent to which federal and provincial legislative powers can be used effectively to address or prevent indoor air pollution problems in Canadian homes. It is acknowledged that this latter question may not be resolved easily or quickly.

2. Lists of Federal and Provincial Legislation

2. LISTS OF FEDERAL AND PROVINCIAL LEGISLATION

Appendix A describes, in detail, existing legislation in Canada which may have some relevance, directly or indirectly, to residential indoor air quality. Summary lists of this legislation are given in the next two pages. Several observations may be noted concerning the present framework:

- a) Residential indoor air quality is only rarely addressed, in so many words, in existing legislation, regulations, codes and standards.
- b) Notwithstanding, there are numerous pieces of legislation, both federally and provincially, under which many departments and agencies could, or already have, become involved in residential indoor air quality issues.
- c) The National Housing Act provides the Canada Mortgage and Housing Corporation with ample authority to become involved in residential indoor air quality issues.
- d) It is not clear, in most cases, whether existing federal and provincial environmental legislation may turn out to have some application to, or some effects upon, residential indoor air quality. Most of these Acts contain definitions which appear to restrict their intent and direct application to outdoor air and the natural environment.

Some comments are presented in Section 3 "Conclusions", regarding the adequacy of the present legislative and regulatory network, at the present stage of investigation of indoor air quality in Canadian homes.

Department or Agency	Federal Legislation Which May Have Some Effect on Residential Indoor Air Quality
Canada Mortgage and Housing Corporation	Central Mortgage and Housing Act National Housing Act
Consumer and Corporate Affairs	Department of Consumer and Corporate Affairs Act Hazardous Products Act
Energy, Mines and Resources Canada	Department of Energy, Mines and Resources Act
Environment Canada	Department of the Environment Act* The Clean Air Act* Environmental Contaminants Act
Health and Welfare Canada	Department of National Health and Welfare Act Hazardous Products Act Environmental Contaminants Act Medical Research Council Act
Indian and Northern Affairs Canada	Department of Indian Affairs and Northern Development Act
National Research Council of Canada	National Research Council Act Government Organization (Scientific Activities) Act

* Acts which may turn out to have some application to or some effects upon residential indoor air quality, but which contain definitions which appear to restrict their intent and direct application to outdoor air and the natural environment.

Province	Provincial Legislation Which May Have Some Effect on Residential Indoor Air Quality	
Alberta	Public Health Act Municipal Government Act Agricultural Chemicals Act	Clean Air Act* Dept. of Environment Act* Environment Council Act* Hazardous Chemicals Act*
British Columbia	British Columbia Health Act Pesticide Control Act	Environment and Land Use Act* Ministry of the Environment Act*
Manitoba	Public Health Act of Manitoba The Pesticides and Fertilizers Control Act	The Clean Environment Act*
New Brunswick	The Health Act of New Brunswick The Pesticides Control Act	The Clean Environment Act*
Newfoundland	Department of Health Act Pesticides Control Act	Department of Environment Act* Environmental Assessment Act*
Nova Scotia	The Health Act of Nova Scotia	Environmental Protection Act*
Ontario	Ministry of Health Act Ministry of Housing Act Ontario Health Protection and Promotion Act	Environmental Assessment Act* Environmental Protection Act* The Pesticides Act
Prince Edward Island	The Public Health Act The Agricultural Chemicals Act	Environmental Protection Act*
Quebec	Public Health Protection Act Act Respecting the Ministère des Affaires Sociales	Environment Quality Act*
Saskatchewan	Public Health Act Pest Control Products Act	Air Pollution Control Act* Dept. of the Environment Act*
Yukon	Area Development Ordinance Public Health Ordinance	
Northwest Territories	Area Development Ordinance Environmental Protection Ordinance Pesticide Ordinance Public Health Ordinance Science Advisory Board Ordinance	

* Acts which may turn out to have some application to or some effects upon residential indoor air quality, but which contain definitions which appear to restrict their intent and direct application to outdoor air and the natural environment.

3. CONCLUSIONS

The terms of reference of this portion of the CMHC study program call for comment on the adequacy of the legislation, regulations and standards discussed:

"Of specific interest are the present legislation authorities and relevant regulations at all levels of government. Key areas either overlapping or not covered by the three governmental levels will be identified and documented. Potential areas where jurisdiction or regulative authority could be extended, or more fully exercised, will be identified, if this is possible at this stage, and where this is relevant to the consideration of CMHC's role.

The following are the conclusions of the author. (They do not necessarily reflect the conclusions of the Canada Mortgage and Housing Corporation):

A. Existing Legislation Appears Adequate for Research and Discussion

The existing legislation, for all the key federal departments and agencies listed and discussed in Appendix A of this report, is sufficiently broad to allow participation of these bodies in ongoing research and discussions concerning potential indoor air quality problems in Canadian homes. The same is true for provincial governmental bodies.

There is some question, however, as to whether legislation for the federal and provincial environment departments may, in some cases, restrict the focus of such bodies to the outdoor environment.

It is clear that the consideration of indoor air quality in Canadian homes is at a very early stage. The nature of the potential problems, their incidence in the housing stock, and the extent and nature of their effects on people in Canada, remain to be adequately determined. This author sees no impediments in the existing legislation, other than the question of possible restrictions for environment departments, which would prevent appropriate preliminary research and discussion among governments at all levels taking place.

B. Additional Legislation Would be Premature at this Time

Many fundamental questions, both about the nature and effects of potential indoor air quality problems and about the most effective form that solutions to such problems might take, must be answered before any additional legislation should be considered.

The present legislative and regulatory powers with respect to hazardous products, would appear, in the interim, to provide sufficient authority to intervene, when public health is at stake on a broad scale.

3. Conclusions (continued)

It is not clear to this author that regulatory powers alone can adequately address a topic such as indoor air quality, since the potential problems now known are diverse in nature (e.g. incomplete exhaustion of furnace combustion gases vs. tobacco smoking), and the number of compounding factors are also many and varied (e.g. householder behaviour, ventilation, nature of building structure, etc.). Additional legislation would therefore require considerable research, discussion and experiment before government at all levels could support such a move, with confidence of good results.

A discussion of the pros and cons of the use of regulatory powers was presented by this author in a paper prepared jointly with CMHC and delivered to the 3rd International Conference on Indoor Air Quality and Climate in Stockholm, Sweden in August, 1984. This paper is included as Appendix B of this report.

C. Discussions on regulation are needed among all parties

Sufficient research has been done to provide a basis for discussions among all levels of government as well as non-government bodies, as to whether or how government regulatory powers could be used effectively to assist in solving or avoiding potential indoor air quality problems. Topics such as furnace design, chimney backdrafting, and emissions from sealing compounds could be used as examples to focus such discussion on real rather than theoretical issues.

There are many questions and issues, some as yet unanswered, that might be raised by one or more parties during such discussions. Appendix C presents a sample list of the kinds of questions that are, in this author's opinion, of sufficient concern at this time to warrant inclusion.

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1. Summary of Federal Legislation

1.1 Introduction

Those federal governmental bodies having a major interest in indoor air pollution are as follows (in alphabetical order):

<u>Department or Agency</u>	<u>Area of Interest</u>
Canada Mortgage and Housing Corporation	- national housing agency
Consumer and Corporate Affairs Canada	- consumer interests
Department of National Defence	- housing and workplaces
Energy, Mines and Resources	- effects of energy conservation
Environment Canada	- environmental contamination
Health and Welfare Canada	- public health
Indian and Northern Affairs Canada	- housing and workplaces
Labour Canada	- workplace environment
National Research Council of Canada	- basic research
Parks Canada	- housing and workplaces
Public Works Canada	- housing and workplaces
Transport Canada	- housing and workplaces
Treasury Board	- workplace environment

Of these, the following federal departments and agencies have the most direct influence on indoor air quality in Canadian housing and will be discussed in more detail in the subsequent sections:

Canada Mortgage and Housing Corporation
Consumer and Corporate Affairs Canada
Energy, Mines and Resources
Environment Canada
Health and Welfare Canada
Indian and Northern Affairs Canada
National Research Council of Canada

Although their roles are not further discussed here, such departments as National Defence, Parks Canada, Public Works Canada, and Transport Canada own and operate a total of approximately 25,000 residential units at defence bases, weather stations, transport facilities, and national parks (National Energy Program, 1980, p. 71). These buildings, though numerous, represent a small fraction of the total number and volume of federal buildings across Canada operated by these departments. These four departments do, however, have a major interest and lead role in the investigation and solution of indoor air quality problems in the workplace, which is beyond the scope of this report. Research undertaken by these departments, which may be relevant to CMHC's interest in residential air quality, will be presented in subsequent reports summarizing research activity in Canada. A number of other departments or agencies may also have direct and indirect interests.

1.2 Federal Departments, Agencies and Crown Corporations

There are two basic types of legislation which provide for a federal interest in indoor air pollution in Canadian housing. The first type defines the mandate of specific federal departments, agencies or Crown corporations (example: The National Research Council Act). The second type defines specific physical issues or problems in Canadian society (example: The Hazardous Products Act, the Environmental Contaminants Act), and assigns the administrative power to specific existing departments or agencies, to carry out actions prescribed in the legislation.

Relevant federal legislation will be reviewed in the following sections, categorized by the agency of administration in alphabetical order. The summary chart given in section 2 is repeated here for convenience:

Department or Agency	Federal Legislation Which May Have Some Effect on Residential Indoor Air Quality
Canada Mortgage and Housing Corporation	Central Mortgage and Housing Act National Housing Act
Consumer and Corporate Affairs	Department of Consumer and Corporate Affairs Act Hazardous Products Act
Energy, Mines and Resources Canada	Department of Energy, Mines and Resources Act
Environment Canada	Department of the Environment Act* The Clean Air Act* Environmental Contaminants Act
Health and Welfare Canada	Department of National Health and Welfare Act Hazardous Products Act Environmental Contaminants Act Medical Research Council Act
Indian and Northern Affairs Canada	Department of Indian Affairs and Northern Development Act
National Research Council of Canada	National Research Council Act Government Organization (Scientific Activities) Act

* Acts which may turn out to have some application to or some effects upon residential indoor air quality, but which contain definitions which appear to restrict their intent and direct application to outdoor air and the natural environment.

Canada Mortgage and Housing Corporation

The Central Mortgage and Housing Act, 1976, describes the business and powers of the Corporation. Part II, Section 18, summarizes its powers as follows:

"The Corporation shall, on behalf of Her Majesty, and in the place of the Minister, have, exercise and perform all rights, powers, duties, liabilities and functions of the Minister under the Housing Acts or under any contract entered into under those Acts, except the authority of the Minister under those Acts to pay moneys out of the Consolidated Revenue Fund."

Administration of the National Housing Act, now revised up to 1982, is the primary business of CMHC. In support of this responsibility, the Central Mortgage and Housing Act also notes that CMHC has a responsibility to conduct research into the business of lending money on the security of mortgages (section 26), and may request the provision of services from the various departments or branches of the Government of Canada to aid in carrying out the Corporation's business (section 3). The National Housing Act itself also outlines a broad mandate to investigate housing conditions and undertake technical research in housing design, construction and other matters (see sections 35,36, and 37, described in more detail in the following pages).

The full title of the National Housing Act is described as:

"An Act to promote the construction of new houses, the repair and modernization of existing houses, and the improvement of housing and living conditions."

The National Housing Act is divided into nine major parts, dealing with the following areas:

PART I	Insured Mortgage Loans
PART II	Housing for Rental Purposes and Land Assembly (inactive)
PART III	Urban Renewal (inactive)
PART IV	Home Improvement Loans and Home Extension Loans
PART V	Housing Research and Community Planning
PART VI	Public Housing
PART VII	Loans for Student Housing Projects (inactive)
PART VIII	Water and Sewerage Projects (inactive)
PART IX	General

A full review of the content of the Act is beyond the scope of this report. Part V is the most relevant part of the Act, insofar as CMHC's role in indoor air quality issues is concerned. Whether other parts of the Act can be used to influence residential indoor air quality has yet to be determined. For completeness, each part of the Act will be discussed in turn, so that the reader can gain a better perspective of CMHC's full mandate.

The reader is referred to the National Housing Act, R.S., chapter N-10, Office Consolidation, July 1982, available from the National Library, Canada Mortgage and Housing Corporation, Ottawa for the full text of the Act. Excerpts quoted below are intended to illustrate points made in the text and may not include all detailed provisions of the Act or any section of it.

PART I

Part I of the National Housing Act describes, in detail, the Corporation's role in assisting the funding of Canadian housing, by acting as an insurer of mortgage loans. Under this section, CMHC may issue insurance policies on loans made by lenders approved by CMHC, or the Government of Canada, for the purposes of providing or improving housing in Canada.

Section 5 of the Act enables the insurance of loans:

"5.(1) The Corporation may issue an insurance policy in respect of a loan that is insurable under this Act. "

Section 6 of the Act describes the conditions that must be met before a loan is insurable. The general purposes for which loans can be insured include (subsection 6(1)(a)):

- "(i) for the purpose of assisting in the construction of a house, a cooperative housing project, a rental housing project or a condominium unit,
- (ii) for the alteration of an existing residential structure to add one or more family housing units thereto,
- (iii) for the purpose of assisting in the purchase, repair, rehabilitation, conversion or improvement of an existing house, a rental housing project or a condominium unit by any person or of any housing project by a cooperative association incorporated under the laws of Canada or of any province,
- (iv) for the purpose of discharging a loan secured by a mortgage on a house, rental housing project, cooperative housing project or condominium unit,
- (v) for the purpose of assisting in the purchase and conversion of an existing non-residential building into a housing project,..."

Subsection 6(a) goes on to specify that the construction activity for which money is lent must conform to standards approved by CMHC:

" ... such construction, alteration, repair, rehabilitation, conversion or improvement to be in accordance with sound standards approved by the Corporation; ..."

This basic role as an insurer of mortgages requires that CMHC take an active and detailed interest in the nature of the building activity that is being funded by approved lenders. In addition to its social responsibility to promote improved housing conditions that meet minimum standards, CMHC has a responsibility to the Government of Canada to ensure that buildings insured under the National Housing Act do not lose value because of inadequate building design or inferior construction methods and materials.

Part I of the National Housing Act provides full and exclusive authority to CMHC to set down the building standards which will govern the approval of mortgage insurance under the Act. This is confirmed more specifically by relevant portions of section 11(2) of the Act:

"(2) The Corporation may

- (a) prescribe sound standards of construction;
- (b) prescribe the procedures to be followed in authorizing advances by an approved lender to a borrower; ..."

PARTS IV, VI, and IX of the National Housing Act

Parts II, III, VII and VIII of the Act are presently inactive.

Parts IV, VI and IX of the National Housing Act allow CMHC to become involved in loans and loan guarantees related to a number of other housing situations, including:

(Part IV)	Home Improvement Loans and Home Extension Loans
(Part IV.1)	Rehabilitation and Conversion of Existing Residential Buildings
(Part IV.2)	Loans to Facilitate Home Ownership
(Part IV.3)	Interest Deferment Plans
(Part VI)	Public Housing
(Part VI.1)	New Communities
(Part IX)	General (other situations).

In all these sections, there are general provisions similar to those already described in detail, with respect to the power of the Governor in Council to make regulations on "any other matter deemed necessary or advisable to carry out the purposes of provisions of this section". This power is sufficient to impose construction standards wherever applicable.

PART V

Part V of the National Housing Act provides CMHC with broad powers to investigate housing conditions and to distribute information which will promote improved housing conditions in Canada. Section 35 describes this mandate as follows:

"35. It is the responsibility of the Corporation to cause investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and to cause steps to be taken for the distribution of information leading to the construction or provision of more adequate and improved housing accommodation and the understanding and adoption of community plans in Canada."

Section 36 details a number of general and special powers (only those sections relevant to issues of residential indoor air quality have been excerpted) :

- "36. For the purpose of carrying out its responsibility under this Part, the Corporation may cause
- (a) investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and into measures that may be taken for the improvement thereof;
 - (b) studies to be made of investigations into housing conditions and housing accommodation made elsewhere than in Canada and into measures and plans or proposals taken or adopted or proposed elsewhere than in Canada for the improvement thereof;
 - (c) investigations to be made into the factors affecting the cost of construction of housing accommodation and measures that may be taken to secure economies and increased efficiency in the said construction;
 - (d) plans and designs to be prepared for houses that have a low cost of construction and in the opinion of the Corporation will provide suitable accommodation and arrangements to be made for the sale and distribution of the plans and designs in such manner as it sees fit; ...
 - (g) generally such steps to be taken as it may deem necessary or advisable to promote the construction of housing accommodation that in its opinion is sound and economical and to encourage the development of better housing and sound community planning."

Section 37 of the Act details powers of the Corporation with respect to technical research and investigation. Although the excerpts are extensive, they are directly relevant to CMHC's role in the study of indoor air quality issues, as one factor that must be taken into account in overall design and construction procedures:

"37.(1) Subject to subsection (1.1), the Corporation may

- (a) cause to be prepared and undertaken, directly or in cooperation with other departments or agencies of the Government of Canada or the government of any province or with any municipality, university, educational institution or person, programs of technical research and investigation into the improvement and development of methods of construction, standards, materials, equipment, fabrication, planning, designing and other factors involved in the construction or provision of improved housing accommodation in Canada and coordinate the said programs or measures with other similar programs or measures undertaken in Canada;
- (b) enter into contracts for the production or development of materials, equipment or component parts for houses through the pilot plant stages of production or development and for the testing of such materials, equipment or component parts;
- (c) undertake the publication, and the distribution of publications, coordinating the results of said technical research, investigations, programs and testing in such forms as may be most useful to the public or to the building industry;
- (d) conduct competitions to secure plans, designs and specifications that in its opinion are suitable for housing to be constructed at low cost, and purchase the said plans or otherwise compensate persons taking part in the said competitions;
- (e) make available or cause to be made available, in such manner as it deems advisable or in cooperation with any other department or agency of the Government of Canada, with the government of any province or with any university, educational institution or person, any training program or educational facility that in its opinion will assist in the construction or designing of family housing units, in land planning or community planning, in the management or operation of housing projects or in the formulation and implementation of housing policy;
- (f) enter into a contract with a manufacturer of plumbing or heating equipment or other component parts of houses for the experimental production of the said equipment or component parts in accordance with standardized designs that, in the opinion of the Corporation, may be manufactured or produced at low cost;

-
- (g) construct housing units for experimental purposes upon land owned or to be acquired by the Corporation for such purpose;
 - (h) make arrangements with a province or a municipality, with the approval of the government of the province, to conduct special studies relating to the condition of urban areas, to means of improving housing, to the need for additional housing or for urban redevelopment; and
 - (i) undertake or cause to be undertaken projects of an experimental or developmental nature that may assist the Corporation in the formulation and implementation of a housing policy designed to meet the needs of the various communities in Canada.

(1.1) No power of the Corporation is exercisable

- (a) pursuant to any of paragraphs (1)(a) to (f) or paragraph (1)(h), except with the approval of the Minister; or
- (b) pursuant to paragraph (1)(g) or (i), except with the approval of the Governor in Council. "

Paragraphs 37 (1) (a) and (c) above are the most relevant to the question of residential indoor air quality. They state that CMHC may undertake research into all aspects of housing design and construction, including materials and standards, to promote improved housing accommodation in Canada. CMHC may take the results of these investigations and publish them for the benefit of the public and the building industry.

Such actions support the Part V mandate described under section 35 of the Act, quoted above, which makes CMHC responsible for investigating the adequacy of existing Canadian housing and making information available which will lead to improvements in that housing. Section 37 makes it clear that CMHC may undertake research directly, and/or may cooperate with other departments or agencies of the federal government, or any other body or individual in Canada, in undertaking such research.

Builder's Requirements for Obtaining NHA-Insured Mortgages

CMHC Publication NHA 5062 3/81 informs builders and other applicants under the National Housing Act of the technical standards for building construction required by CMHC.

With respect to new housing, CMHC prescribes Residential Standards (1980), issued by the Associate Committee on the National Building Code, National Research Council of Canada. Where municipal by-laws or provincial legislation requires higher standards than those contained in NHA 5062,

the higher standards govern. When newly built housing is more than 3 storeys in height and has a building area exceeding 600 square meters, the National Building Code of Canada (1980), also issued by National Research Council, applies.

Residential Standards (1980) contains the requirements for buildings of residential occupancy from Part 9 of the National Building Code, as well as those requirements that go beyond those of the National Building Code which are considered necessary to regulate residential construction under the National Housing Act.

For information governing standards relating to existing residential accommodation, CMHC prescribes 'Minimum Property Standards for Existing Residential Buildings'. CMHC's publication 'Acceptable Building Materials, Systems and Equipment' lists certain materials, systems and equipment which are acceptable for use in NHA construction. Materials which are not listed in this publication, or which are not referred to in 'Residential Standards Canada 1980' may be used only when it can be established to CMHC's satisfaction that their performance will be at least equal to those required by 'Residential Standards Canada 1980'. Construction that is not generally conventional requires special consideration and approval in writing from CMHC, dependent upon the proposed system providing a quality and performance at least equal to that required by 'Residential Standards 1980'.

At present, reference in 'Residential Standards Canada 1980' to indoor air quality for residential buildings is limited to Section 33 B(4), which states as follows:

" Air contaminants released within buildings shall be removed insofar as possible at their points of origin and shall not be permitted to accumulate in unsafe concentrations."

The standards do specify minimum unobstructed areas for natural ventilation, by room type, and require that where rooms or spaces are mechanically ventilated, the system shall be capable of providing at least 1 air change per hour.

The provisions of Residential Standards and the National Building Code relating to ventilation will be discussed further in section 5.3 of this report.

Summary of Powers under the National Housing Act

In the foregoing, those responsibilities of the Canada Mortgage and Housing Corporation under the National Housing Act, that are relevant to the issue of residential indoor air quality, have been presented. From this review, it is clear that CMHC has authority to address residential indoor air quality issues.

CMHC has a role under Parts I, IV, VI and IX of the Act, to promote the construction of new housing, the repair and upgrading of existing housing, and the provision of low-cost housing, by providing mortgage insurance, loans and grants in respect to housing. CMHC also has a research responsibility, under Part V of the Act, to investigate the adequacy of housing in Canada, determine methods of improving it, and to promote its improvement through the dissemination of information.

Under the Act, CMHC has the power to specify that all buildings with which CMHC is involved in a financial capacity, are constructed according to standards acceptable to the Corporation. These standards help to provide a minimum standard of housing quality for Canadians in NHA-insured homes, while, at the same time, they serve to protect the financial interests of the Government of Canada. Since CMHC standards involve construction methods and materials, they can materially affect potential indoor air pollution levels, which represent one factor among many that may be taken into account when determining standards.

Consumer and Corporate Affairs Canada

The Department of Consumer and Corporate Affairs Act empowers the Minister of Consumer and Corporate Affairs in matters relating to consumer goods (including products used within a home and in the construction of a home), as follows (section 5):

"5. The duties, powers and functions of the Minister extend to and include all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada, relating to:

- a) consumer affairs;
- b) corporations and corporate securities;
- c) combines, mergers, monopolies and restraint of trade;
- d) bankruptcy and insolvency;
- e) patents, copyrights and trade marks;
- f) standards of identity and performance in relation to
consumer goods; and
- g) legal metrology."

The Act clearly empowers the Minister to carry out programs and research that will be in the interest of the Canadian consumer (sections 6(1) and 6(2)):

"6(1) In exercising his powers and carrying out his duties and functions in relation to consumer affairs under this Act, the Minister shall

- a) initiate, recommend, or undertake programs designed to promote the interests of the Canadian consumer;
- b) coordinate programs of the Government of Canada that are designed to promote the interests of the Canadian consumer;
- c) promote and encourage the institution of practices or conduct tending to the better protection of the Canadian consumer and cooperate with provincial governments or agencies thereof, or any bodies, organizations or persons, in any programs having similar objects;
- d) undertake, recommend or assist in programs to assist the Canadian consumer to be more fully informed about goods and services offered to the consumer; and
- e) provide such inspection services for the protection of the Canadian consumer as
 - i) he considers necessary for the enforcement of any Act under his Administration, or
 - ii) the Governor in Council may direct him to provide.

(2) For the purpose of carrying out his duties and functions under this Act, the Minister may undertake research into matters to which the powers, duties and functions of the Minister extend, cooperate with any or all provinces or with any department or agency of the Government of Canada or any organization or person undertaking such research and publish or cause to be published, or assist in the publication of, so much of the results of any such research as the Minister deems appropriate and in the public interest."

The Minister of Consumer and Corporate Affairs is also charged with administration of the Hazardous Products Act, and in the case of certain sections of the Act, the Minister shares this responsibility with the Minister of National Health and Welfare. The Hazardous Products Act allows the listing of hazardous products under two schedules. Products listed under the first schedule may not be advertised, sold in or imported into Canada. Products in the second list are subject to regulation:

- "3. (1) No person shall advertise, sell or import into Canada a hazardous product included in Part I of the schedule.
(2) No person shall advertise, sell or import into Canada a hazardous product included in Part II of the schedule except as authorized by the regulations. ..."

Products in both categories may affect indoor air quality. For example, carbon tetrachloride, extremely flammable paint removers, and urea-formaldehyde foam insulation are listed in the first schedule, and may not be sold in Canada. Household products, such as chlorine bleaches, fire extinguishing fluids and adhesives containing toluene or acetone, are in the second schedule and are regulated.

Section 7 of the Act empowers the Cabinet to regulate hazardous products:

"7. The Governor in Council may make regulations

- a) authorizing the advertising, sale or importation into Canada of any hazardous product included in Part II of the schedule and prescribing the circumstances and conditions under which and the persons by whom such hazardous product may be sold, advertised or imported into Canada;
- b) respecting the powers and duties of inspectors and analysts and the taking of samples and the seizure, detention, forfeiture and disposition of products, substances and other things;
- c) prescribing the procedures to be followed by a Hazardous Products Board of Review established pursuant to section 9 in conducting an inquiry; and
- d) generally, for carrying out the purposes and provisions of this Act."

The kinds of products that may be added to Parts I and II of the schedules are described in Section 8 of the Act. This section also notes that an order to amend Part I of the Schedule to the Act may be made by the Governor in Council on the recommendation of either the Minister of Consumer and Corporate Affairs or the Minister of National Health and Welfare, and that Parliament has the power to revoke an order if both Houses of Parliament are in agreement:

"8. (1) The Governor in Council may by order amend Part I or Part II of the schedule by adding thereto

- a) any product or substance that is or contains a poisonous, toxic, inflammable, explosive or corrosive product or substance or other product or substance of a similar nature that he is satisfied is or is likely to be a danger to the health or safety of the public, or
- b) any product designed for household, garden or personal use, for use in sports or recreational activities, as life-saving equipment or as a toy, plaything or equipment for use by children that he is satisfied is or is likely to be a danger to the health or safety of the public because of its design, construction or contents,

or by deleting therefrom any product or substance the inclusion of which therein he is satisfied is no longer necessary.

(2) An order amending Part I of the schedule may be made by the Governor in Council on the recommendation of the Minister or the Minister of National Health and Welfare.

(3) Every order adding a product or substance to Part I or Part II of the schedule shall be laid before the Senate and the House of Commons not later than fifteen days after it is made or, if Parliament is not then sitting, on any of the first fifteen days next thereafter that Parliament is sitting.

(4) If both Houses of Parliament resolve that an order or any part thereof should be revoked, the order or that part thereof is thereupon revoked. "

Section 9 allows for objections on the part of manufacturers or vendors of the hazardous product, and requires the Minister who is approached (either the Minister of Consumer and Corporate Affairs or the Minister of National Health and Welfare) to establish a Hazardous Products Board of Review. The Board established by the Minister is required to inquire into the nature and characteristics of the product in question and give all persons affected by the order an opportunity to appear before the Board and make representations. The Board must report their evidence and recommendations to the Minister, and the report is made public, unless the Minister decides that withholding publication would better serve the public interest.

Section 10 requires manufacturers to disclose any information required by either Minister to investigate products suspected of being hazardous.

Energy Mines and Resources Canada

Energy Mines and Resources Canada has taken a lead role in promoting the application of energy conservation techniques in Canadian housing.

The Minister's general mandate is defined in the Department of Energy, Mines and Resources Act (section 4) as extending to and including:

"all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada, relating to

a) energy, mines and minerals, water and other resources ..."

For some time, Energy, Mines and Resources Canada has been encouraging Canadians to conserve energy generally. Because space heating in homes consumes a considerable amount of energy, the Canadian Home Insulation Program (CHIP) was established to provide incentives for people to reduce heat loss from their residences. One objective of the CHIP Program was to upgrade 70% of Canadian homes by 1987.

The National Energy Program, 1980 re-emphasized this commitment to conservation:

"Conservation provides the cleanest, most enduring, and, in many instances, cheapest part of the solution to the oil problem of the 1980s, and to an improvement of the basic energy balance.

There is scope in every area, in every household, to reduce our demand for energy. While a special concern about oil means a shift toward other fuels, the answer does not lie in wasteful use of other energy sources, however plentiful they may now seem to be. Most of our energy sources are non-renewable. This generation has a responsibility to husband these, as well as to develop other, more enduring solutions."

(National Energy Program, 1980 p. 69)

The National Energy Program also called upon the use of the National Housing Act as a vehicle for encouraging energy conservation in new housing stock:

"Under present constitutional arrangements, the federal government's role in housing is limited. It does not have the power to regulate housing standards; this is a provincial responsibility. The federal role is, for the most part, limited to the provision of financial assistance. One of these federal measures is the provision or insurance of residential mortgages under the National Housing Act.

The Government of Canada has decided that this measure should be

used in support of national energy objectives. Therefore, any new residential unit for which federal financial support or backing (e.g., under the National Housing Act) is sought after July 1, 1981, must meet federal energy efficiency standards. Where possible, these standards will be as agreed with provincial governments."

(National Energy Program, 1980 p. 69)

It is becoming apparent that in some cases where homeowners or builders have applied energy conservation techniques, such as making a dwelling more airtight, indoor air quality may have suffered. This is often simply a result of the reduction of the rate of change of the inside air. Indoor air pollution, from existing sources which previously may not have presented a health problem, becomes more concentrated and can thereby become, under some circumstances, a potential health risk

The Department of Energy, Mines and Resources has a strong interest in ensuring that energy conservation measures are implemented in a way which conforms to health and ventilation standards, and thereby do not create air quality problems.

Environment Canada

Environment Canada has a clearly stated interest in the quality of the natural environment in Canada. Its role in the determination of the quality of the indoor environment, as defined in existing legislation, is much less clear.

The Department of the Environment Act includes in the duties, powers and functions of the Minister of the Environment:

"5a) all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, board or agency of the Government of Canada, relating to

- i) the preservation and enhancement of the quality of the natural environment, including water, air and soil quality, ...
 - vi) the coordination of the policies and programs of the Government of Canada respecting the preservation and enhancement of the quality of the natural environment; and
- b) such other matters over which the Parliament of Canada has jurisdiction relating to the environment as are by law assigned to the Minister."

(Government Organization Act, 1979, section 5)

The terms 'natural environment' and 'air quality' are not defined in the Act or its amendments.

Section 6(1) of the Government Organization Act 1979 further defines the scope of the Minister's duties as follows:

"The Minister of the Environment, in exercising his powers and carrying out his duties and functions under section 5, shall

- a) initiate, recommend and undertake programs of the Government of Canada, that are designed
 - i) to promote the establishment of objectives or standards relating to environmental quality, or to control pollution
 - ii) to ensure that new federal projects, programs and activities are assessed early in the planning process for potential adverse effects on the quality of the natural environment and that a further review is carried out of those projects, programs, and activities that are found to have probable

significant adverse effects, and the results thereof taken into account, and

- iii) to provide to Canadians environmental information in the public interest.
- b) promote and encourage the institution of practices and conduct leading to the better preservation and enhancement of environmental quality, and cooperate with provincial governments or agencies thereof, or any bodies, organizations or persons, in any programs having similar objects; and
- c) advise the heads of departments, boards and agencies of the Government of Canada on all matters pertaining to the preservation and enhancement of the quality of the natural environment."

The Clean Air Act 1971, as amended 1980, is more specific and gives the Minister broad powers with respect to analysis and abatement of pollution of 'ambient air'. The following series of definitions clarifies the meaning of the term 'ambient' (section 2(1) a) to c)):

- "a) "air contaminant" means a solid, liquid, gas or odour or a combination of any of them that, if emitted into the ambient air, would create or contribute to the creation of air pollution;
- b) "air pollution" means a condition of the ambient air, arising wholly or partly from the presence therein of one or more air contaminants, that endangers the health, safety or welfare of persons, that interferes with normal enjoyment of life and property, that endangers the health of animal life or that causes damage to plant life or to property;
- c) "ambient air" means the atmosphere surrounding the earth but does not include the atmosphere within a structure or within any underground space ..."

Section 4 of the Clean Air Act empowers the Minister to formulate ambient air quality objectives representing tolerable, acceptable and desirable ranges of concentration of air contaminants, taken singly or in combinations, and for either short term conditions or long term conditions or both. The Governor in Council is empowered to prescribe these objectives as national ambient air quality objectives.

While the consideration of indoor air quality objectives does not appear to lie directly within the scope of the Clean Air Act, it is interesting to note that some of the air contaminants present in outdoor ambient air are also present in indoor air, sometimes in quantities significant enough to affect health (e.g. carbon monoxide). The procedure by which the Minister determines appropriate ambient air quality standards could therefore be of value to others having more direct responsibility or interest.

The Minister of the Environment also has a joint responsibility with the Minister of National Health and Welfare, under the Environmental Contaminants Act, for investigating substances that are suspected of entering the environment and causing either danger to human health or to the environment:

"3.(3) Where the Minister (of the Environment) and the Minister of National Health and Welfare suspects that a substance is entering or is likely to enter the environment in a quantity or concentration or under conditions that may constitute a danger to human health or the environment, the Minister or the Minister of National Health and Welfare may

- a) collect data and conduct investigations respecting
 - i) the nature of the substance or of any class of substances of which it is a member,
 - ii) the presence in the environment of the substance or of any class of substances of which it is a member and the effect of such presence on human health or the environment,
 - iii) the extent to which the substance or any class of substances of which it is a member can become dispersed and will persist in the environment
 - iv) the ability of the substance or of any class of substances of which it is a member to become incorporated and to accumulate in biological tissues and to cause biological change,
 - v) methods of controlling the presence in the environment of the substance or of any class of substances of which it is a member, and
 - vi) methods for testing the effects of the presence in the environment of the substance or of any class of substances of which it is a member;
- b) correlate and evaluate any data collected pursuant to paragraph (b) and publish the results of any investigations carried out pursuant to that paragraph; and
- c) provide information and consultative services and make recommendations respecting measures to control the presence in the environment of the substance or of any class of substances of which it is a member.

Section 3.(6) of the Act specifies that wherever reasonably possible, the Minister of the Environment and the Minister of National Health and Welfare should "act jointly and make use of the services and facilities of other departments of the Government of Canada or of any agencies thereof."

The term "environment" is not defined in the Environmental Contaminants Act.

In cases where the two Ministers are satisfied that a significant danger exists and will not be eliminated by action under any other law, they may recommend to the Governor in Council that an order be made to include that substance or class of substances in a schedule of restricted environmental contaminants (under section 7), and that regulations be made relating to the use of the substance in commercial, manufacturing or processing activities (under section 18).

Section 8 of the Act prescribes penalties for persons who use such designated substances in contravention of the regulations. Relevant sections are included below to show how the wording relates to commercial, manufacturing and processing activities, and products.

While the Act does not specify 'indoor' environment, it is clear that imposing partial or total restrictions on hazardous substances at the source - e.g. importing, use in manufacturing, release during manufacturing, etc. will have the effect of limiting the presence of those same substances in the residential indoor environment. For example, such substances might otherwise have been emitted from products within buildings, brought into a home as a contaminant of outdoor air, or brought in on shoes, clothing, etc. from contact either outdoors or in an industrial setting. Once in the home, they constitute 'indoor pollution'.

"8.(1) No person shall, in the course of a commercial, manufacturing or processing activity, wilfully release, or permit the release of, a substance specified in the schedule or any substance that is a member of a class of substances specified in the schedule into the environment in any geographical area prescribed in respect of that substance or class of substances or, if no geographical area is so prescribed, in Canada,

- a) in a quantity or concentration that exceeds the maximum quantity or concentration prescribed in respect of that substance or class of substances for the purpose of this paragraph; or
- b) under conditions prescribed in respect of such substance or class of substance or class of substances for the purpose of this paragraph.

(2) Subject to subsection (3), no person shall, for a commercial, manufacturing, or processing use prescribed for the purpose of this subsection, import, manufacture, process, offer for sale or knowingly use a substance specified in the schedule or any substance that is a member of a class of substances specified in the schedule in any geographical area prescribed in respect of such substance or class of substances or, if no geographical area is so prescribed, in Canada.

(3) Subsection (2) does not apply to any commercial, manufacturing or processing use prescribed for the purpose of that subsection involving a material that includes a substance specified in the schedule or any

substance that is a member of a class of substances specified in the schedule if such substance is adventitiously present in the material and does not exceed a quantity or concentration consistent with good manufacturing practice.

(4) No person shall import, manufacture or knowingly offer for sale a product that contains a substance specified in the schedule or any substance that is a member of a class of substances specified in the schedule in a quantity or concentration that exceeds the maximum quantity or concentration prescribed in respect of that substance or class of substances in relation to such product for the purpose of this subsection. ..."

It would appear from the foregoing that the Environmental Contaminants Act provides power to limit, by curtailing the source, the presence of certain types of hazardous substances within the environment in general, including the indoor environment. This Act is complementary to the Hazardous Products Act, and the two together appear to allow some control of contamination of indoor environments both by regulation of substances within products (Environmental Contaminants Act), or by regulation of products themselves (Hazardous Products Act).

Notwithstanding the apparent focus of the Department of the Environment's legislation on the natural environment, or environment in general terms, the Minister's role in joint administration of the Environmental Contaminants Act may be sufficiently general to influence the presence of environmental contaminants under any circumstances, including indoor air, which could affect human health and/or accumulate in biological tissues and cause biological changes.

Health and Welfare Canada

Health and Welfare Canada has a direct and extensive interest in the effects of indoor air quality on the health of Canadians.

The Department of National Health and Welfare Act describes the duties of the Minister of National Health and Welfare in general terms as follows (section 5):

"5. The duties, powers and functions of the Minister extend to and include all matters relating to the promotion or preservation of the health, social security and social welfare of the people of Canada over which the Parliament of Canada has jurisdiction..."

Section 5 of the Act goes on to describe more particularly that the Minister's duties, powers and functions include the administration of certain Acts of Parliament and Orders or Regulations of the Government if these relate in any way to the health, social security and welfare of the people of Canada (section 5(a)). Other relevant subclauses specify that the Minister may undertake investigation and research into public health and welfare (section 5(b)), and is responsible, subject to the Statistics Act, for:

"(g) the collection, publication and distribution of information relating to the public health, improved sanitation and social and industrial conditions affecting the health and lives of the people..." (section 5(g))

The Minister is also charged with cooperating with provincial authorities (section 5(h):

"(h) with a view to the coordination of efforts made or proposed for preserving and improving the public health and providing for the social security and welfare of the people of Canada."

However, section 11 of the Act also makes it clear that the Minister does not exercise jurisdiction or control over Provincial or municipal boards of health:

"11. Nothing in this Act or in any regulations made hereunder authorizes the Minister or any officer of the Department to exercise any jurisdiction or control over any provincial or municipal board of health or other health authority operating under the laws of any province."

Notwithstanding her more general duties, the Minister of National Health and Welfare is also responsible for the promotion and conservation of the health of the civil servants and other Government employees (section 5(e)).

Health and Welfare Canada plays a key role in the administration of the Hazardous Products Act, jointly with the Department of Consumer and Corporate Affairs (already described in some detail earlier in this report). For example, in the case of Urea-formaldehyde Foam Insulation, an expert committee, formed by Health and Welfare Canada, made recommendations to the Ministers of Health and Welfare and Consumer and Corporate Affairs regarding the possible health hazard associated with that product.

The Ministers were also responsible, under section 9 of the Hazardous Products Act, for forming a Hazardous Products Board of Review to allow persons affected by the order to ban Urea-Formaldehyde Foam Insulation to present evidence and make representations.

Under Part 10 of the same Act, the Minister of National Health and Welfare has the power to order a manufacturer of a product or substance, that may be considered a possible hazard, to disclose to Departmental officials the formula, composition or chemical ingredients, to allow the Minister to determine whether the product or substance is or is likely to be a danger to the health or safety of the public.

The Minister's joint responsibility, with the Minister of the Environment, to administer the Environmental Contaminants Act has been described in some detail earlier in this section. As stated there, the Environmental Contaminants Act appears to complement the Hazardous Products Act, the two together allowing control of health hazards, both by regulation of substances within products (Environmental Contaminants Act), and by regulation of products themselves (Hazardous Products Act). Both activities are important tools for reducing the sources of pollution to which people are exposed.

The Minister also receives advice from a body known as the Medical Research Council, established under the Medical Research Council Act, the function of which is described in section 4.(1)(a) of that Act as to:

"(a) promote, assist and undertake basic, applied and clinical research in Canada in the health sciences, other than public health research; and

(b) advise the Minister in respect of such matters relating to such research as the Minister may refer to the Council for its consideration."

Health and Welfare's annual report, 1981/82, describes the aims of its Health Protection Branch as including the elimination of those health hazards in the physical environment that lead to illness and the untimely deaths of Canadians. Activities of the Environmental Health Directorate (within the Health Protection Branch) are described as including the identification,

assessment, and reduction of health hazards in the environment, in consumer products, and in medical devices. The Bureau of Chemical Hazards, and the Radiation Protection Bureau within the Environmental Health Directorate, have been active in investigating health problems associated with a variety of indoor pollutants and pollutant sources, including Urea-Formaldehyde Foam Insulation.

In the same annual report, the Health Services and Promotion Branch, within Health and Welfare Canada, lists among its objectives:

"to encourage and assist Canadians to adopt a way of life which enhances their physical and mental well-being..."

One of the programs of this Branch, and the Health Promotion Directorate within it, is to raise the level of awareness of the Canadian population concerning the hazards of tobacco smoking. Tobacco smoke represents a significant, preventable indoor air pollutant, in both the residential and non-residential setting.

Indian and Northern Affairs Canada

Sections 4 and 5 of the Department of Indian Affairs and Northern Development Act prescribe the role of the Minister as follows:

"4. The duties, powers and functions of the Minister of Indian Affairs and Northern Development extend to and include all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada, relating to

- a) Indian affairs
- b) the Northwest Territories and the Yukon Territory and their resources and affairs;
- c) Inuit affairs. "

"5. The Minister of Indian Affairs and Northern Development shall be responsible for

- a) coordinating the activities in the Northwest Territories and the Yukon Territory of the several departments, branches and agencies of the Government of Canada;
- b) undertaking, promoting and recommending policies and programs for the further economic and political development of the Northwest Territories and the Yukon Territory; and
- c) fostering, through scientific investigation and technology, knowledge of the Canadian north and of the means of dealing with the conditions related to its further development."

In this role, the Department of Indian and Northern Affairs Canada has a direct interest in the availability of quality housing for native people in Canada and in housing issues and problems peculiar to Canada's northern areas.

The potential for residential indoor air quality problems can be compounded in northern areas, because of the extreme winter climate, with a greater heating demand and a correspondingly greater need for stringent energy conserving measures than is common in more southerly areas. The combination can in some cases lead to high indoor air pollution levels.

As with the Department of Energy Mines and Resources, Indian and Northern Affairs has a strong interest in promoting research which will lead to a successful marriage of energy conservation and pollution reduction techniques for extreme climates.

The National Research Council of Canada

The National Research Council Act, as amended by the Government Organization (Scientific Activities) Act, 1976, confers upon the National Research Council of Canada a broad mandate to undertake scientific and industrial research in Canada. Section 7 (revised) states:

"7. The Council has charge of all matters affecting scientific and industrial research in Canada that may be assigned to it by the Governor in Council."

Sections 13 c),d),k) and l) of the Act describe general powers to "undertake, assist or provide scientific and industrial research", including carrying on "work and manufacturing of an experimental or developmental nature". These powers have been used to involve the Council in building research generally, and in the analysis of residential indoor air quality problems specifically.

The Division of Building Research (DBR) within the National Research Council was established in 1947 to provide a research service to Canada's construction industry (DBR Research Program 1983/84, p. 4). Since this is a fragmented industry, private sector research is generally limited to the larger manufacturers of building materials and components.

The Division's ultimate objective is to provide information needed by the construction industry where and when it is required, and this information is drawn from as many sources as possible, including the Division's own research. DBR therefore provides, to a great extent, an information-gathering function, and maintains contacts with a wide range of sources, through participation in national and international technical activities and with almost all other building research institutes in the world.

DBR's research officers serve a dual function, carrying out research and at the same time responding directly to the needs of corporations and individuals requiring information on building problems and techniques. The Division was for some time actively engaged in residential air quality studies and also contained a special group in charge of urea-formaldehyde foam insulation studies. (Editor's note: this group has since been disbanded.)

The Division of Building Research has also been responsible for the preparation and updating of the National Building Code, the National Fire Code, and the Canadian Plumbing Code, through a series of Associate Committees. The idea of a National Building Code, which could be voluntarily adopted as the basis for all municipal bylaws, was developed when the first National Housing Act was introduced in the mid 1930's, and was completed in 1941. A large percentage of building in Canada is constructed in accordance with local building codes that are wholly or substantially in agreement with one or another of the editions of the National Building Code. Division staff also participate actively in standards committees, to promote improvement of the network of materials and products standards on which the codes are based.

An Associate Committee on Scientific Criteria for Environmental Quality was established by the National Research Council of Canada, in response to a mandate provided by the Federal government, to develop scientific guidelines for defining the quality of the environment. The concern of the NRC Associate Committee is strictly with scientific criteria, whereas pollution standards and objectives are the responsibility of regulatory authorities and are set for the purposes of pollution control, taking into account not only scientific criteria but the optimal socio-economic impact of proposed measures, as well as the state of existing technology.

The Associate Committee's program includes the evaluation of available information on the probability of effects of contaminants on receptors, together with the related fundamental principles and scientific knowledge. A great deal of research relevant to indoor air quality issues has been compiled, and a Subcommittee on Air has been established which includes indoor air quality in its list of priority topics.

The National Research Council of Canada also plays a role in making scientific information in many areas accessible to other researchers and to the general public. Sections 13 (i) and (j) of the National Research Council Act states that the Council may exercise the power:

- "(i) to establish, operate and maintain a national science library;
- (j) subject to the approval of the Minister, to publish and sell or otherwise distribute such scientific and technical information as the Council deems necessary."

2. Summary of Provincial Legislation

2.1 Introduction

There are three areas of existing legislation in the provinces that appear to provide for involvement of provincial and municipal officials in issues of residential indoor air quality:

- 1) powers with respect to property (e.g. building codes);
- 2) powers with respect to promoting public health; and
- 3) powers with respect to preserving environmental quality.

In some provinces, definitions are sufficiently general that all three areas would appear to provide for involvement. In other provinces, some or all of the areas are more restricted. For example, in some environmental legislation, the definition of 'environment' specifically excludes air within buildings. Since it is not clear whether parts of these acts might nonetheless be applicable to indoor air quality, they have been included in the discussion, for the sake of completeness.

In most of the provinces, provisions for preservation of public health allow the ministers of health and public health officials wide powers to investigate, inspect, and order remedies to conditions adversely affecting people's health. Phrasing of most of the public health acts emphasizes controlling the spread of communicable diseases. However, provisions for these purposes have allowed inspectors to specify, for example, whether ventilation in private dwellings should be increased. General clauses authorize power to investigate 'nuisances' that adversely affect health.

The powers of specification and enforcement of building standards rests with the provinces, and where delegated, with the municipalities. This area appears to allow considerable scope for addressing those indoor quality problems that might be ameliorated through altered building materials or construction methods.

The following summary of relevant provincial legislation is meant to be representative, but not necessarily comprehensive. Suggestions from readers, as to other items of legislation that should be included and discussed, will be welcomed.

Province **Provincial Legislation Which May Have Some
Effect on Residential Indoor Air Quality**

Alberta	Public Health Act Municipal Government Act Agricultural Chemicals Act	Clean Air Act* Dept. of Environment Act* Environment Council Act* Hazardous Chemicals Act*
British Columbia	British Columbia Health Act Pesticide Control Act	Environment and Land Use Act* Ministry of the Environment Act*
Manitoba	Public Health Act of Manitoba The Pesticides and Fertilizers Control Act	The Clean Environment Act*
New Brunswick	The Health Act of New Brunswick The Pesticides Control Act	The Clean Environment Act*
Newfoundland	Department of Health Act Pesticides Control Act	Department of Environment Act* Environmental Assessment Act*
Nova Scotia	The Health Act of Nova Scotia	Environmental Protection Act*
Ontario	Ministry of Health Act Ministry of Housing Act Ontario Health Protection and Promotion Act	Environmental Assessment Act* Environmental Protection Act* The Pesticides Act
Prince Edward Island	The Public Health Act The Agricultural Chemicals Act	Environmental Protection Act*
Quebec	Public Health Protection Act Act Respecting the Ministère des Affaires Sociales	Environment Quality Act*
Saskatchewan	Public Health Act Pest Control Products Act	Air Pollution Control Act* Dept. of the Environment Act*
Yukon	Area Development Ordinance Public Health Ordinance	
Northwest Territories	Area Development Ordinance Environmental Protection Ordinance Pesticide Ordinance Public Health Ordinance Science Advisory Board Ordinance	

* Acts which may turn out to have some application to or some effects upon residential indoor air quality, but which contain definitions which appear to restrict their intent and direct application to outdoor air and the natural environment.

2.2 Provincial and Municipal Governmental Legislation*

Alberta

Alberta's Clean Air Act (R.S.A. 1980, c. C-12) defines "air pollution" to mean (section 1(b)):

- "(i) the presence in the atmosphere of an air contaminant in excess of the permissible concentration prescribed in the regulations for that air contaminant, or
- (ii) the presence of any air contaminant having an offensive odour in the atmosphere, regardless of its concentration in the atmosphere; ..."

Under the Act, Alberta's Minister of the Environment has considerable power to regulate maximum permissible concentrations of air contaminants and to enter and inspect premises suspected to contain an air pollution source. The word "atmosphere" is not defined in the legislation, though its context in many sections implies 'outdoor air'. It is not clear whether the Act could have any application to indoor air quality problems.

The Department of Environment Act (R.S.A. 1980, c. D-19) refers to the conservation, management and utilization of "natural resources", which are defined in section 1(e) as follows:

- "(e) 'natural resources' means land, plant life, animal life, water and air. "

Similarly, the Environmental Council Act (R.S.A. 1980, c. E-13), and various regulations under the Department of the Environment Act (e.g. Environment Grant Regulations (Alta. Reg. 51/76)) focus on "natural resources".

Although this focus on natural environment would appear to exclude any effective powers with respect to indoor air quality, section 18 of the Department of Environment Act includes power to make certain regulations:

- "(g) prohibiting or restricting the manufacture, sale or use of any substance that is or may be detrimental to the quality of the environment by reason of its toxicity or otherwise. ..."

It is not clear whether this power could be used to affect indoor as well as outdoor pollution, by particularly toxic and persistent contaminants.

*Arranged Alphabetically

The Hazardous Chemicals Act (R.S.A. 1980, c. H-3) utilizes somewhat broader definitions and allows the Minister of the Environment considerable scope to regulate the use of chemicals that enter the environment under conditions that may constitute a danger to the natural environment, plant or animal life, or human health. In this Act, "natural environment" is defined in section 1(i) as follows:

- "(i) 'natural environment' means all or any part or combination of the air, land and water of Alberta."

It is not clear whether this power could be used to affect the indoor as well as the outdoor environment. The Minister may, under section 4, establish a schedule of restricted hazardous chemicals and, under Section 6 of the Act, the Director of Pollution Control of the Department may issue chemical control orders to persons responsible for a hazardous chemical, when:

- "(1) ... in the opinion of the Director, the use, handling, storage, sale, manufacture, disposal, display or method of application or of transportation of a hazardous chemical or of a substance or thing containing a hazardous chemical
- (a) causes or is likely to cause impairment of the quality of the natural environment for any use that is being or is likely to be made of it,
 - (b) causes or is likely to cause injury or damage to property or to plant or animal life,
 - (c) adversely affects or is likely to adversely affect the health or safety of any person,
 - (d) impairs or is likely to impair the safety of any person, or
 - (e) renders or is likely to render, directly or indirectly, any property or plant or animal life unfit for use by man ..."

Similarly, the Agricultural Chemicals Act (R.S.A. 1980, s.A-16) provides certain powers of inspection and control of the use of pesticide chemicals, including, in section 23, the power of a justice of the peace to issue a warrant authorizing a peace officer to enter a private dwelling to search for suspected pesticide contamination. Section 2(2) of The Pesticide Sales, Use and Handling Regulation (Alta. Reg. 213/80 under the Agricultural Chemicals Act) also prohibits unsafe use of pesticides, without restriction as to whether they are applied indoors or outdoors:

- "2.(2) No person shall use, apply, handle, or transport an agricultural chemical, or operate any machine, equipment or

vehicle in connection with the use, application, handling or transportation of an agricultural chemical, in a manner or at a time or place that;

...

- (c) adversely affects or is likely to adversely affect the health or safety of any person, ..."

Alberta's Public Health Act (R.S.A. 1980, c. P-27) is more clear than the foregoing environmental legislation, with respect to power over unhealthy indoor conditions. The definitions in the Act are very broad, for example:

"1. Definitions. - In this Act,

...

- (1) "nuisance" means any condition existing in any locality and that is or that might become injurious or dangerous to health or that might hinder in any manner the prevention or suppression of disease; ..."

Sections 5 (a) and (b) of the Act gives the Provincial Board of Health a broad mandate as follows:

"5. Duties of the Provincial Board. - (1) The Board shall take cognizance of the interests of health and life among the people of Alberta, and in particular it shall

- (a) classify, tabulate and study the vital statistics of Alberta and endeavour to make an intelligent and profitable use of the collected records of death and sickness among the people,
- (b) make investigations and inquiries respecting sanitation, the causes of disease, epidemics and mortality, and the effects of localities, employments, conditions, habits and other circumstances on the health of the people, ..."

Section 5 (3)(b) allows the Provincial Board to direct local Boards:

"with regard to the means to be adopted to safeguard the public health, including directions as to the location, drainage and water supply of any houses or public places, the disposal of excreta from them, and the methods of heating, lighting and ventilation to be adopted in them."

Section 6 allows the Provincial Board to make regulations "for the protection and improvement of health and the prevention, mitigation and suppression of disease ..." including:

- "(b) the cleansing, purifying, lighting, heating, ventilating, plumbing and disinfecting of houses ...
- (g) ... the disposition ... of persons who are living in unhealthful houses or congested, unhealthful or infected localities; ...
- (j.1) the prescribing of maximum permissible levels of density of air contaminants in the atmosphere in all or any part of Alberta ..."

(The word "atmosphere" is not defined in the Public Health Act.)

Section 10 of the Act also allows the Provincial Board:

"to enquire into and hear and determine any complaint made by or on behalf of any person in respect of a nuisance..."

The Provincial Board of Health Regulations Respecting Nuisances and General Sanitation (Alta. Reg. 95/73) prohibits people from causing a nuisance:

"34-3-1 No person shall create, commit or maintain any nuisance."

"34-3-2 ... no person shall create, establish or maintain:

- (a) any premises or part thereof so constructed or in such a state as to be or which may become injurious or dangerous to health, or which may hinder in any manner the prevention or suppression of disease; ..."
- (g) any school or other educational institution or factory, shop or other building which is injurious or dangerous to health of persons employed or being therein, or may hinder in any manner the prevention or suppression of disease due to:
 - (i) not being in a clean state, or
 - (ii) the presence of noxious vapors or odors arising from any drain, water or earth closet or urinal, or
 - (iii) lack of ventilation sufficient to render harmless any gases, vapors, dust or other impurities generated in the premises, or
 - (iv) overcrowding

..."

Provincial Board of Health Regulations Respecting Housing, promulgated under the Public Health Act (Alta. Reg. 33/72 as amended by Alta. Reg. 75/73) specify certain regulations for all housing, other than owner-occupied single family homes, which affect indoor air quality. These are administered by local boards of health, and include:

- "27-13-9 (1) Every gas-fired space heater which is or has been installed in any location referred to in subsection (2) shall be:
- (a) of the fully enclosed and vented type, and
 - (b) equipped with pressure regulators and one hundred percent safety shutoff controls.
- (2) Subsection (1) shall apply to any gas-fired space heater which is or has been installed in:
- (a) any room intended for sleeping in any housing premises, or
 - (b) any area not let to a tenant but accessible to the tenants or the public in any apartment house, hotel or motel, institution or lodging house.
- (3) Notwithstanding subsections (1) and (2), any cooking appliance which is or has been installed in any room intended for sleeping and also for cooking shall be of the electric type.
- 27-13-10 Every habitable room shall be provided with:
- (a) a window or windows to the outside having a total glass area of not less than 10 percent of the floor area of the room, and
 - (b) ventilation consisting of window openings totalling not less than five percent of the floor area of the room, or other ventilation capable of providing at least the equivalent of one change of outside air per hour. "

The regulations go on to specify air space and floor area required per person, and the maximum number of people sleeping in housing premises of different sizes. Section 27-21-2 states that houses may be declared unfit for reasons of overcrowding or

"disrepair or sanitary defects, or omissions or combinations thereof, which are or may become injurious to health or which may permit danger to life and limb."

Among many conditions of disrepair specified in section 27-21-9 are the following that could affect indoor air quality:

- "(b) any condition causing persistent dampness or permitting the entry of rain, underground water or emanations from the soil;

- (c) defective plumbing systems including drains, stacks, wastes, traps and fixtures;
- (d) absence or disrepair of approved flues to carry off smoke and gases of combustion from stoves or other heating appliances;
- (e) absence of adequate means for storage of food, fuel and refuse; ...
- (i) absence of a window capable of being opened to the outside in any habitable room;
- (j) the use of a cellar or a room in a cellar for sleeping purposes subject to consideration of ventilation, heating, lighting and safety."

In the Municipal Government Act (R.S.A. 1980, c.M-26) the Province of Alberta established wide powers for municipal councils in the province. Section 112 following confirms that the municipalities have been delegated considerable power for dealing with matters affecting public health:

"112. A council may pass by-laws that are considered expedient and are not contrary to this or any other Act,

- (a) for the peace, order and good government of the municipality,
- (b) for promoting the health, safety, morality and welfare thereof, and
- (c) for governing the proceedings of the council, the conduct of its members and the calling of meetings."

British Columbia

British Columbia's environmental legislation also appears to be aimed at the natural environment (the outdoors). However, certain definitions leave some doubt as to whether the indoor environment is necessarily excluded.

For example, the Environment and Land Use Act (R.S.B.C. 1979, c.110) refers to environment in section 1 as:

"... all the external conditions or influences under which man, animals and plants live or are developed."

The word "external" is not defined in the legislation.

However, the duties of an Environment and Land Use Committee established under the Act include establishing and recommending programs to foster increased public concern and awareness of the "environment", and ensuring that all aspects of preservation and maintenance of the "natural environment" are fully considered in administration of land use and resource development. Because of this focus on resources and 'natural' environment, it is assumed that, at least at the present, this Act and others with similar definitions are meant to deal with 'outdoors' rather than 'indoors'.

The Ministry of the Environment Act (S.B.C. 1980, c.30) includes a similar definition of environment:

"1. Interpretation. - In this Act "environment" includes air, land, water and all other external conditions or influences under which man, animals and plants live or are developed."

The ministry is empowered to administer matters relating to the environment generally, and among other duties:

- "(a) to encourage and maintain an optimum quality environment through specific objectives for the management and protection of land, water, air and living resources of the Province; ...
- (c) to manage, protect and conserve all water, land, air, plant life and animal life, having regard to the economic and social benefits they may confer on the Province; ...
- (e) to monitor environmental conditions of specific developments and to assess and report to the minister on general environmental conditions in the Province;
- (f) to undertake, commission and coordinate environmental studies; ...
- (h) to develop and sustain public information and education programs to enhance public appreciation of the environment; ..."

It is not clear whether or not these broad powers could be applied indoors, and this may in fact hinge on the interpretation of a single definition.

The Pesticide Control Act (S.B.C. 1980,c.35,s.39;1982,c.41,s.46) provides powers of inspection of all land and premises to determine the presence and manner of use and disposal of pesticides. When permits are granted to pesticide applicators are issued, the administrator under the Act must be satisfied that the pesticide application "will not cause an unreasonable adverse effect" (section 6(a)).

Under Section 12(2), the administrator is given powers, among others, to:

- "(a) determine in a particular instance what constitutes an unreasonable adverse effect;
- (b) suspend, amend, revoke or refuse to grant a licence, permit or certificate;
- (c) order a person to repair, clean or decontaminate premises ..."

When adverse effects result, or are likely to result from pesticide use, the Minister may exercise powers under Section 16, which include:

"16. Restrictions when contamination. - Where the minister is satisfied that an unreasonable adverse effect has resulted or may result from a pesticide use or the manner in which it is applied, stored, sold, transported or disposed of, and notwithstanding that this Act and regulations are being complied with, he may do either or both of the following:

- (a) order the restriction or prohibition of the pesticide's sale, application, transportation, storage or disposal on terms he considers appropriate;
- (b) order the seizure of contaminated food, equipment, animals or anything that he considers necessary to safeguard human and animal health or the environment or to prevent an unreasonable adverse effect, and may order the things seized to be destroyed, detained or treated in a manner that they will not cause an unreasonable adverse effect to human or animal health or to the environment ..."

Section 23 confers power on the Lieutenant Governor in Council to make regulations regarding the classification and restriction of pesticides, manner in which they may be used and disposed of, licencing of applicators, and specifying and defining what constitutes an unreasonable adverse effect in particular or general circumstances. All the foregoing powers could influence the extent and type of indoor residential pesticide exposure of the people of British Columbia and this legislation is therefore directly relevant to the issue of indoor air quality.

British Columbia's Health Act (R.S.B.C. 1979, c.161) contains provisions which are sufficiently broad to cover indoor environmental exposures. For example, Section 4 defines the functions of the Minister, and including that the Minister shall:

- "(a) take cognizance of the interests of health and life among the people of the Province;
- (b) especially study the vital statistics of the province, ...
- (c) endeavour to make an intelligent and profitable use of the collected records of death and of sickness among the people;
- (d) make sanitary investigations and inquiries about the cause of disease, and especially of an epidemic;
- (e) inquire into the causes of varying rates of mortality and the effect of locality, employment and other circumstances on health;...
- (h) ... advise officers of the Provincial government and local boards about public health, and of the means to be adopted to secure it, and of the location, drainage, water supply, disposal of excreta, heating and ventilation of any public institution or building."

The Lieutenant Governor in Council has power under Section 5 to make regulations "for the prevention, treatment, mitigation and suppression of disease", including:

- "(d) the prevention and removal of nuisances;
- (e) the cleansing, purifying, ventilating and disinfecting of houses ...;
- (f) the inspection of hospitals, ..., houses, ...
- (aa) the construction, with due regard to ventilation, natural light and general sanitary conditions and requirements, of all boarding houses, tenement houses and lodging houses, and the size of the dwelling rooms in boarding houses, tenement houses and lodging houses, and the number of persons who may dwell in them; ...
- (ff) generally all matters, acts and things necessary for the protection of public health and for ensuring the full and competent enforcement of this Act; ...
- (hh) the control of radiation sources and radiation hazards; ..."

The term 'nuisance' is not defined in the Act, and it is not clear whether its meaning can be taken to be similar to that defined in Alberta public health legislation ("any condition ... that is or that might become injurious or dangerous to health ..."). Section 64 of British Columbia's Act confers powers on local boards of health to enforce the abatement of nuisances, and Section 66 empowers them to enter and examine any premises. Under Section 68 health officers may order cleansing of premises or removal of matter which may endanger health.

Manitoba

Manitoba's environmental legislation also contains restrictive definitions that would make it appear that only outdoor air is of concern. However, it is not clear whether certain clauses within the legislation could nonetheless provide for involvement in indoor air quality issues without amendment to the legislation.

The Clean Environment Act (S.M. 1972, c.76; Continuing Consolidation c. C130 as amended S.M. 1974, c.41; 1975, c.42; 1976, c.17; 1977, c.57; 1978, c.17; 1980, c.59) contains the following definitions:

"1. Definitions. - In this Act,

- (a.1) "air" means the atmosphere but does not include the atmosphere within a mine or within a building other than any building designated by the Minister; ...
- (d) "contaminant" means any solid, liquid, gas, waste, odour, heat, sound, vibration, radiation, or a combination of any of them that
 - (i) is foreign to or in excess of the natural constituents of the environment; or
 - (ii) affects the natural physical, chemical, or biological quality of the environment; or
 - (iii) is or is likely to be injurious to the health or safety of a person;
- (e) "environment" means the air, water or soil; ..."

Under Section 5.2(1), the Minister has wide powers with respect to the use of hazardous materials:

"5.2 Minister orders re hazardous materials. - The minister may, by written order, require any person owning or having custody or control of any hazardous material in any location within the province

- (a) to remove the hazardous material from the location; or
- (b) to dispose of the hazardous material in accordance with the regulations or as prescribed in the order; or
- (c) to take special precautions in respect of the use, storage, handling or transportation of the hazardous material, notwithstanding any regulation respecting the use, storage, handling or transportation of the hazardous material;

or to do any of those things."

The powers of environment officers include those of entry and inspection of premises when release of contamination is suspected, but these powers specifically exclude entering a dwelling (section 16(2)(a)).

Section 18(1) of the Act allows the Lieutenant Governor in Council to make regulations to carry out the provisions of the Act, including regulations:

- "(i) respecting the use of pesticides or any other product or substance that may contaminate the environment;...
- (n) respecting the site, construction, plumbing, lighting, ventilation, heating, furnishings, equipment, and sanitary conditions of buildings and auto trailer houses used for human habitation or for business purposes and the inspection thereof;
- (o) respecting the control and abatement of insanitary conditions; ...
- (q) designating substances as hazardous materials;
- (r) respecting the classification, use, storage, handling, transportation and final disposal of hazardous materials; ..."

The Pesticides and Fertilizers Control Act (S.M. 1976, c.19) allows the Lieutenant Governor in Council to make regulations:

- "8.(p) prescribing the manner in which pesticides or fertilizers may be used or applied and the safety precautions which must be observed. ..."

The Public Health Act of Manitoba (R.S.M. 1970, c.P210) contains much broader provisions and appears to allow involvement in residential indoor air quality issues. For example, section 2(e) defines insanitary conditions as follows:

- "(e) "insanitary condition" means a condition or circumstance
 - (i) that is offensive; or
 - (ii) that is, or may be, or might become injurious to health; or
 - (iii) that prevents or hinders the suppression of disease; or
 - (iv) that contaminates or pollutes, or may contaminate or pollute food, air, or water; or
 - (v) that might render food, air, or water injurious to the health of any person;

and includes a nuisance and any circumstances or condition declared to be an insanitary condition under the regulations;"

Section 3(1) of the Act describes the minister's duties as including

"the supervision of all matters relating to the preservation of life and the health of the people of the province ..."

and that more specifically he shall among other things:

- "(a) make or cause to be made investigations and inquiries respecting the causes of disease, ill health, and death in the province, and the causes of injuries to life and limb, ... , and the steps that may be taken to reduce the causes of disease, ill health, death and such injuries;
- (b) advise the government and officers of the government on matters relating to public health and safety in matters not dealt with specifically under some other Act of the Legislature; ..."

A Provincial Board of Health is designated under the Act to support the minister and specifically to:

- "9(a) advise the minister in all matters relating to the preservation of health and the prevention of disease ...
- (d) make recommendations respecting the dissemination of information respecting public health, and safety and programs for informing and educating the public on matters relating to public health and safety; ..."

The powers of local medical officers of health are defined in section 18 of the Act. Among other things, they may:

- "(a) upon presentation of a certificate or other means of identification as prescribed in the regulations, at all reasonable times, enter any place or premises and inspect the same without the consent of the owner; ...
- (e) order an insanitary condition on, in, or in connection with any premises to be abated by the owner or occupant within such time as may be specified in the order; ... "

The power of the Lieutenant Governor in Council to make regulations under the Act is defined in section 34, and includes regulations:

- "(1) respecting the prevention, treatment, medication and suppression of disease; ...
- (12) declaring certain conditions or circumstances to be insanitary conditions and declaring that certain acts contribute to insanitary conditions;

-
- (13) respecting the prevention and removal or abatement of insanitary conditions on public or private property and the prevention of acts that contribute to insanitary conditions;
 - (14) respecting the cleaning, washing, scrubbing, lime washing, papering, painting, purifying, ventilating, disinfecting and disinfesting or any of them, of premises by the owners or occupiers thereof or at the expense of the owners or occupiers thereof; ..."

The Sanitation Regulation (R.R.M. 1971, P210-R3) pursuant to the Public Health Act further defines the term insanitary condition as follows:

- "1(a) "insanitary condition" in addition to the meaning given to that expression in the Act, means, subject to section 2,
 - (i) any nuisance; and
 - (ii) any condition, matter, or thing that, in the opinion of the medical officer of health, may be injurious to health or that, in his opinion, may result in the creation of a nuisance; ...

2. Without limiting the generality of the definition of "insanitary condition" set out in section 1,

- (a) overcrowding within the meaning of Division XII; or
- (b) insufficient light or ventilation in a room or other enclosed areas; ...

shall be deemed to be an insanitary condition."

Section 3 of the regulation states:

"No person shall create or maintain an insanitary condition, or permit the existence of an insanitary condition, in any place within or under his control or management."

Section 12 of the Regulations deals with atmospheric pollution escaping from buildings or premises. While this would not appear to be directly related to indoor air quality, the concentration of pollution discharged from one building can affect the level of indoor pollution in others nearby (e.g. infiltration of smoke from a fireplace).

"12. Notwithstanding sections 13, 14, 15 and 16 of this Part (which define smoke density and composition limits) no person shall cause, suffer or permit smoke, or dust, or cinders or fly ash, or fumes or gases, or offensive odours to discharge or escape from any building or premises to the detriment or annoyance of others; and the doing of any such act is a nuisance."

New Brunswick

In New Brunswick, the Clean Environment Act (R.S.N.B. 1973, c.C-6) specifically excludes indoor air in its definitions:

"1. In this Act

"air" means the atmosphere but does not include the atmosphere within a building or within the underground workings of a mine; ..."

"environment" means the air, water or soil; ..."

Within the definitions as shown above, the Minister has powers under section 5.(1) to issue control orders requiring people to limit, control or stop the discharge or emitting of any contaminant into the environment. Should the definitions be broadened, it is possible that the remaining provisions of the Act would provide considerable power over acceptable levels of emission of contaminants by materials and appliances indoors.

As it is, the Air Quality Regulations under the Clean Environment Act (N.B. Reg. 79-43) deal primarily with the emission of smoke, and section 10 of the Regulations prohibits emissions of smoke greater than a specified density. It is not clear whether this regulation could be used to influence the concentration of exhaust contaminants from one building that may infiltrate another building nearby.

The Pesticides Control Act (R.S.N.B. 1973, c.P-8, amended S.N.B. 1976; c.45, 1979; c.54, 1982; c.33, s.55; 1982, c.48) allows an appointed Pesticides Advisory Board to "inquire into and consider any matters concerning pesticides and report thereon to the Minister" (section 6(1)(b)). Under section 8(1):

"8.(1) The Minister,

- (a) upon seeking the advice of the Board, or
- (b) upon the request of the Minister of Health,

may restrict or prohibit the sale, supplying or use of any pesticide and may impose such conditions with respect to the sale, supplying or use of the pesticides as he considers necessary."

Such control over the use of pesticides may affect the amount and type of indoor residential pesticide exposure of people in New Brunswick.

The Health Act of New Brunswick (R.S.N.B. 1973, c.H-2 as amended by S.N.B. 1974, c.19 (Supp.), 1975 c.27 and 1976, c.19) appears sufficiently broad in scope to allow involvement in residential indoor air quality issues.

Section 1 defines 'nuisance' as follows:

" "nuisance" includes and shall be deemed to include any condition, existing in any locality, which is or may become injurious or dangerous to health, or prevent or hinder in any manner the suppression of disease; and without restricting the generality of the foregoing, for greater particularity the following shall be deemed nuisances within the meaning of this Act, if in such a state, or so situated, as to be injurious or dangerous to health:

- (a) any premises improperly constructed or in a state of disrepair,
- (b) any house or part of a house so overcrowded as to be injurious or dangerous to the health of the inmates, or in which insufficient air space is allowed for each inmate as required by the regulations,

..."

Section 6(1) of the Act allows the Minister wide powers to make such rules, orders and regulations:

"not inconsistent with this Act, as he may deem necessary for the prevention, treatment, mitigation and suppression of disease and the conservation of human health and life, and he may by such rules, orders and regulations, among other things, provide for and regulate

- (a) ...
- (b) the inspection, cleansing, purifying, plumbing, drainage, ventilating and disinfecting of houses, ...
- (d) the prevention, abatement and removal of nuisances;
- (f.1) the summary abatement or prevention of any nuisance arising or likely to arise from, including danger of exposure to ionizing or non-ionizing radiations and the prevention of injury to the public health occurring or likely to occur thereby; ...
- (n) the prevention, control and reporting of communicable and other diseases; ...
- (r) the site, construction, ventilation, lighting, general sanitary condition and requirements, inspection and compulsory registration of lodging houses, the sizes of rooms and the number of persons who may dwell therein and the records to be kept by the owners thereof; ..."

Newfoundland

Although Newfoundland's Department of Environment Act (S. Nfld. 1981, c.10) contains a very broad definition of "pollution"; it is not clear whether this would provide for involvement in residential indoor air quality issues:

- "2(o) "pollution" means any alteration of the physical, chemical, biological or aesthetic properties of air, soil or waters of the province, including change of temperature, taste or odour, or the addition of any liquid, solid, radio-active, gaseous or other substance to the air, soil or waters, which will render or is likely to render the air, soil or waters of the province harmful to the public health, safety or welfare, or harmful or less useful for domestic, agricultural, industrial power, municipal, navigational, recreational or other lawful uses, or for animals, birds or aquatic life; ..."

Section 7 raises some doubt in its summary of the powers, functions and duties of the Minister, where the phrase 'natural environment' is introduced:

"(a) (The powers, functions and duties of the Minister extend to and include) the supervision, control and direction of all matters over which the Legislature of the province has jurisdiction relating to:

- (i) the protection and enhancement of the quality of the natural environment, including, without limitation of the generality of the foregoing, water, air and soil quality ..."

Broad regulatory powers are specified in section 32 of the Act:

"32. Regulations. - (1) Subject to this Act, the Lieutenant-Governor in council may make such regulations not inconsistent with this Act as he deems necessary or advisable for the more effective carrying out of the purposes of this Act according to its true spirit, intent and meaning and for dealing with any matters for which no express provision has been made or in respect of which only partial or imperfect provision has been made, and, without limiting the generality of the foregoing, may make regulations

- (a) providing for the inspection and testing of air, soil or bodies of water; ...
- (p) preventing or restricting the pollution of air;
- (q) providing for the investigation of complaints of air pollution;
- ..."

Newfoundland's Air Pollution Control Regulations (Nfld. Reg. 26/81; amendments Nfld. Reg. 279/82) address industrial emissions and define "air" as follows:

"2.(b) "air" means open air not enclosed within the industry's boundary, building, structure, machine, chimney, stack, flue or any underground area; ..."

This restriction, however, appears to refer to the buildings which are part of the source of an industrial contaminant, and not other buildings surrounding the source.

Section 17(1) empowers the Minister to make orders with regard to emissions of air contaminants. This section appears to have been designed to control industrial sources affecting outdoor air, and it is not clear whether a broad interpretation might allow its use with respect to emissions affecting indoor residential environments:

"17.(1) Where the Minister is satisfied that the emission of air contaminants from any source causes a condition which may adversely affect the health or impair the safety of any person or cause injury or damage to any property, plant or animal life, he may, without prejudice to section 50 of the Act (consequential amendments) and notwithstanding any other provision of these regulations or anything contained in any permit or Certificate of Approval, order the persons responsible for the emission to take such action as is specified in the order to contain the danger or harm resulting from the emission or to restore the environment to a condition satisfactory to the Minister within the time specified in the order."

The Pesticides Control Act (R.S. Nfld. 1970, c.292 and amendments S.Nfld. 1973, No 39; 1974, No 7; 1975-76, No 58; 1981, c.10) confers powers which could affect the type and extent of residential indoor pesticide exposures of the people of Newfoundland.

Section 17 allows inspectors to suspend the use or method of applying a pesticide or herbicide:

"17. Where an inspector is of the opinion that the use of or method of application of a pesticide or herbicide is or may be dangerous to the health of any person or persons or animal or animals or harmful to crops or plant life, he may, by order in writing, suspend or terminate the use of or the method of application of the pesticide or herbicide."

Section 22 empowers the Lieutenant-Governor in Council to make regulations, among other purposes:

"22(m) prescribing the use and method of application of pesticides and herbicides, including, without limitation of the generality of

the foregoing, the use and method of application thereof in residences, buildings and such other places as the Minister may deem advisable; ..."

The Environmental Assessment Act (S. Nfld. 1980, c.3, amended S.Nfld. 1981, c.10) ("An Act to Protect the Environment of the Province by Providing for Environmental Assessment") contains a restrictive definition of "air", but a broad definition of "environment":

"2. Definitions. - In this Act

- (a) "air" means open or outside air not enclosed in any building or other man-made structure; ...
- (e) "environment" includes
 - (i) air, land or water,
 - (ii) plant and animal life, including human life,
 - (iii) the social, economic, recreational, cultural and aesthetic conditions and factors that influence the life of humans or a community,
 - (iv) any building, structure, machine or other device or thing made by humans,
 - (v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of humans, or
 - (vi) any part or combination of the foregoing and the interrelationships between any two or more of them;
- (f) "environmental assessment" means a process by which the environmental impact of an undertaking is predicted and evaluated before the undertaking has begun or occurred:
- (g) "environmental impact" means any change in the present or future environment that would result from an undertaking; ..."
- (n) "undertaking" means any enterprise, activity, project, structure, work, policy, proposal, plan or program that may, in the opinion of the Minister, have a significant environmental impact and includes a modification, an extension, an abandonment, a demolition and a rehabilitation thereof; ..."

Section 3 of the Act defines the purpose broadly as follows:

"3. Purpose of Act. - The purpose of this Act is

- (a) to facilitate the wise management of the natural resources of the province; and
- (b) to protect the environment and quality of life of the people of the province,

through the institution of environmental assessment procedures prior to the commencement of any undertaking that may be potentially damaging to the environment."

Section 4 states that the Act applies:

"in respect of any undertaking carried out by any person, unless it is of a class of undertakings exempted by this Act or the regulations."

Section 37 allows the Lieutenant-Governor in Council to make regulations necessary for the purposes of the Act, and including regulations:

- "(j) exempting any person, class of persons, undertaking or class of undertakings from the provisions of this Act; and
- (k) designating any undertaking or class of undertakings as undertakings or classes of undertakings to which this Act applies, notwithstanding any exemption under paragraph (j)."

It is not clear whether such environmental impact legislation might be applied to enforce consideration of the consequences of programs such as energy conservation incentives, on levels of residential indoor air pollution.

Newfoundland's Department of Health Act (R.S.Nfld. 1970. c.83, amended S.Nfld. 1973, No.20; 1974, No. 99; 1979, c.33, Schedule C) provides general powers of the minister in respect of health matters:

"7.-(1) Duties and powers of Minister. - The Minister shall have the administration and control of all services, measures and institutions having to do with the preservation and promotion of the health of the people of the province (saving only such matters as shall be under the administration and control of the Government of Canada, in relation to which he shall have the power to cooperate with the Government of Canada in cases where the Governments of Canada and of the provinces think proper)."

Section 7(2) lists further more specific powers of the Minister, including:

- "(c) the taking of such measures as may seem necessary for the prevention and control of disease; ...

- (i) the collection of information and statistics relating to the public health;
- (j) the dissemination of information or propaganda such as may promote the health of the people; ..."

Section 19 empowers health officers and inspectors to:

"... enter into and go upon any premises in the exercise of any power or the performance of any duty under this Act or the regulations and may make such orders and give such directions with regard to the structural alteration of the premises, the elimination of existing or potential insanitary conditions, or with respect to any other matter as he may deem advisable in the interest of public health".

Section 23 authorizes the Minister to make regulations:

"not inconsistent with this Act as he deems advisable for the more effective carrying out of its purposes according to its true spirit, intent and meaning and for dealing with any matters for which no express provision has been made or in respect of which only partial or imperfect provision has been made, and in particular, but without limitation of the foregoing, may make regulations

...

- (d) providing for the prevention or removal or both of all matters, things and conditions on public or private property which, in the opinion of the Minister, constitute or are likely to constitute a menace to public health; ...
- (y) providing for the periodic inspection of districts by health officers or inspectors, and the removal and abatement of insanitary conditions or nuisances disclosed by such inspection;

..."

The Nuisances and Municipal Regulations Act (R.S.N. 1970, c.276) provides the police with authority to enter and inspect premises for noxious substances:

"5. Police authority to inspect nuisances in private places. - Any stipendiary magistrate may open and enter, or may direct the Chief of police or a constable to enter and inspect private places, where any noxious substance dangerous to the public health may be reasonably suspected to exist, and shall order all nuisance and filth to be removed therefrom or destroyed; ..."

Section 19 provides further that:

"19. ... the stipendiary magistrates in this province, within their jurisdiction, may make orders for the prevention of nuisances dangerous to personal safety or affecting public health, other than those mentioned in this Act; such orders to be confirmed and approved by the Lieutenant-Governor in Council and published in The Newfoundland Gazette."

Nova Scotia

Nova Scotia's Environmental Protection Act (S.N.S. 1973, c.6, amended by S.N.S. 1975, c.66) specifically excludes indoor air in its definitions:

"2. In this Act,

- (a) "air" means open air not enclosed in a building, structure, machine, chimney, stack, flue, tank or pipe; ...
- (g) "environment" means the air, land or water, or a combination or part thereof within the jurisdiction of the Province; ..."

Section 3 defines the purpose of the Act as "to provide for the preservation and protection of the environment. This would appear to provide little scope for involvement in indoor air quality issues.

The Health Act (R.S.N.S. 1967, c.247, amended S.N.S.1968,c.50; 1969, c.69; 1970,c.62; 1973,c.50; 1977,c.2; 1978,c.25; 1980,c.32) provides broader powers which may provide for involvement in residential indoor air quality issues.

Section 11 empowers the Minister to make regulations "with respect to any matter relevant to public health", and more specifically, regulations which may include the following purposes:

- "11(1) (g) for the prevention and abatement of nuisance; ...
- (n) for the prevention of unsanitary conditions and overcrowding of buildings used as dwelling places; ...
- (z) respecting any other matter relevant to the public health."

Section 11(2) also gives the Minister power to define his own terms:

- "(2) Definition of terms. - In any regulations made under this Section the Minister may define any of the terms used."

Local boards of health have broad powers to carry out provisions of the Act and regulations under it, including the right to enter and inspect premises (section 28(1)).

Section 47 sets down restrictions as to the causing of 'nuisances'. The definition is broad, but it is not clear whether indoor air quality

problems could be dealt with under this section:

- "47(1) Nuisances. - No person shall put or cause to be put in any place, on land or water, any offensive matter or thing likely to endanger the public health or likely to become or cause a nuisance.
- (2) Removal of nuisances. - If any person suffers any such matter or thing to remain upon his premises after notice in writing from a board of health or an officer of a board requiring him to remove the same, an inspector may remove or cause to be removed the same under the direction of the board of health and at the charge of the owner of such place.
- (3) "Nuisance" defined. - Anything which is injurious to the health or indecent, or offensive to the senses, or an obstruction to the free use of property, shall be deemed a nuisance under this Act.
- (4) Abatement of nuisance. - Any provincial or stipendiary magistrate or a medical health officer on the oath of one witness may make an order in writing for the removal, burial or destruction of any substance being or likely to become a nuisance in any place ..."

Ontario

Ontario's Environmental Assessment Act (R.S.O. 1980, c.140) defines "environment" very broadly and includes enclosed air:

- "1. (a) "air" includes enclosed air; ...
 - (c) "environment" means,
 - (i) air, land or water,
 - (ii) plant and animal life, including man,
 - (iii) the social, economic and cultural conditons that influence the life of man or a community,
 - (iv) any building, structure, machine or other device or thing made by man,
 - (v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man, or
 - (vi) any part or combination of the foregoing and the interrelationships between any two or more of them,
- in or of Ontario; ..."

The Act is intended to cause environmental assessment to be a factor in decisions concerning other Ontario government and other public activities. It is not clear whether it could be used to encourage the consideration of indoor air quality during decisions about other programs. The Minister of Environment is able through section 11 to order proponents of an undertaking to carry out further research if the submitted environmental assessment is not satisfactory to enable a decision to be made.

In order to carry out the provisions of the Act, the Minister is empowered under section 32 to:

- "(a) conduct research with respect to the environment or environmental assessment;
- (b) conduct studies of the quality of the environment ...
- (d) convene conferences and conduct seminars ...
- (e) gather, publish and disseminate information with respect to the environment or environmental assessments; ...
- (h) make such investigations, surveys, examinations, tests and other arrangements as he considers necessary; ..."

The Ontario Environmental Protection Act embodies a much narrower definition of "air", excluding indoor air. A "contaminant", however, is defined in terms not only of damage to the natural environment but to health as well:

"1. - (1) Interpretation. - In this Act,

- (a) "air" means open air not enclosed in a building, structure, machine, chimney, stack or flue; ...
- (c) "contaminant" means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from the activities of man that may,
 - (i) impair the quality of the natural environment for any use that may be made of it,
 - (ii) cause injury or damage to property or to plant or animal life,
 - (iii) cause harm or material discomfort to any person,
 - (iv) adversely affect the health or impair the safety of any person, or
 - (v) render any property or plant or animal life unfit for use by man; ..."
- (k) "natural environment" means the air, land and water, or any combination or part thereof, of the Province of Ontario.

The purpose of the Act itself is "to provide for the protection and conservation of the natural environment". Within the definitions above, it would appear that indoor air quality issues would not be relevant.

Nonetheless, Section 13(1) of the Act prohibits discharge of contaminants that will cause harm. This power affects indoor air quality at least indirectly, since it will affect the total amount of contaminants likely to get into the natural environment, and by infiltration or importation, into dwellings:

"13. - (1) Prohibition. Notwithstanding any other provision of this Act or the regulations, no person shall deposit, add, emit or discharge a contaminant or cause or permit the deposit, addition, emission or discharge of a contaminant into the natural environment that,

- (a) causes or is likely to cause impairment of the quality of the natural environment for any use that can be made of it;

- (b) causes or is likely to cause injury or damage to property or to plant or animal life;
- (c) causes or is likely to cause harm or material discomfort to any person;
- (d) adversely affects or is likely to adversely affect the health of any person;
- (e) impairs or is likely to impair the safety of any person; or
- (f) renders or is likely to render any property or plant or animal life unfit for use by man.

The Motor Vehicles Regulation (R.R.O. 1980, Reg 311) under the Environmental Protection Act specifies emission standards and other rules pertaining to vehicle emissions and fuels. This power will indirectly affect residential indoor air pollution caused by infiltration of exhaust from attached and underground garages.

The Air Pollution Control Regulations (R.R.O. 1980, Reg. 308) under the Environmental Protection Act deal with outdoor air contaminant levels, but by general control will affect at least the outdoor 'background' component residential indoor pollution. The breadth of the powers of the regulations are illustrated by the provisions of section 6:

"6. No person shall cause or permit to be caused the emission of any air contaminant to such extent or degree as may,

- (a) cause discomfort to persons;
- (b) cause loss of enjoyment of normal use of property;
- (c) interfere with normal conduct of business;
- (d) cause damage to property. "

An example of an outdoor pollutant that becomes an indoor pollutant is concentrated wood smoke from the chimney of one dwelling that infiltrates through the wall and door cracks of a neighbouring dwelling. It is not clear whether the above provision could be used to limit smoke emissions from a wood-burning stove or fireplace and thereby alleviate an indoor air problem.

Ambient Air Quality Regulations (R.R.O. 1980, Reg 296) pursuant to the same Act set out desirable ambient air quality criteria for certain contaminants in outside air. Again, to this extent the criteria may have some application in limiting the infiltration component of indoor air pollution.

The definition of "air" in the Ontario Pesticides Act also excludes indoor air, but the definition of environment includes buildings:

- "(a) "air" means open air not enclosed in a building, structure, machine, chimney, stack, flue or vehicle; ...
- (d) "environment" means the natural environment, a building structure, machine and vehicle, or any of them; ..."

The Act empowers the Minister under Section 2 to administer the Act and regulations, and to, among other things:

- "(a) investigate problems relating to pesticides and the control of pests;
- (b) conduct research relating to pesticides and the control of pests;
- (c) conduct studies of the effect of pesticides and the control of pests on the quality of the environment;
- (d) convene conferences and conduct seminars ...
- (e) gather, publish and disseminate information ... "

The foregoing would appear to encompass possible pesticide hazards in the indoor environment.

Prohibition clauses in section 4 also refer to the environment as defined above, and may be presumed to apply to indoor as well as outdoor air. Section 4 prohibits a person from discharging a pesticide in a way that causes impairment of the environment, injury to property, harm or material discomfort to persons, adverse effects on health, etc. greater than would have been caused if the pesticide had been used properly.

Sections 20, 21 and 28 describe the powers of officials and of the Lieutenant Governor in Council respectively to make stop orders, control orders and regulations concerning the use of pesticides. The parts of section 28 most relevant to indoor air quality questions are as follows:

"28. Regulations. - The lieutenant Governor in Council may make regulations,

...

- 9. prescribing the procedures, conditions and notices for exterminations and for the airing out of buildings, structures or vehicles; ...

11. prescribing pesticides, classes of pesticides and conditions of use for the purpose of section 7 (licencing); ...
22. governing, regulating or prohibiting the use, handling, storage, display or disposal of pesticides;
23. classifying pesticides and prohibiting or regulating the sale, offering for sale or transfer of any pesticide or class of pesticides; ..."

The Ministry of Health Act (R.S.O. 1980. c. 280) empowers the Minister of Health to assume an extensive role with respect to the health of people in Ontario. Relevant functions and duties include:

"6. - (1) It is the function of the Minister and he has power to carry out the following duties:

- (a) to advise the Government in respect of the health of the people of Ontario;
- (b) to oversee and promote the health and the physical and mental well-being of the people of Ontario;

... "

The Ontario Health Protection and Promotion Act (S.O. 1983, c.10) also gives broad powers to the Minister of Health, that would appear to provide for extensive involvement in indoor air quality issues. The purpose of the Act is set out in Section 2:

"2. Purpose. - The purpose of this Act is to provide for the organization and delivery of public health programs and services, the prevention of the spread of disease and the promotion and protection of the health of the people of Ontario."

The Act provides that there are certain mandatory programs and services that must be provided by local boards of health. A number are relevant to this discussion:

"5. Mandatory health programs and services. - Every board of health shall superintend, provide or ensure the provision of health programs and services in the following areas:

1. Community sanitation, to ensure the maintenance of sanitary conditions and the prevention or elimination of health hazards. ...
7. Public health education, including education in the prevention and control of life-style diseases. "

"Health hazards" cited above are defined in the Act in very general terms as follows:

"1. 9. "health hazard" means,

- i. a condition of a premises,
 - ii. a substance, thing, plant or animal other than man, or
 - iii. a solid, liquid, gas or combination of any of them,
- that has or that is likely to have an adverse effect on the health of any person; ..."

Under section 11, the medical officer of health has a responsibility to investigate complaints about a health hazard related to environmental health, to determine whether the health hazard exists or not. Section 12 prescribes the duty of every medical officer of health to keep informed:

"12. (1) Every medical officer of health shall keep himself informed in respect of matters related to occupational and environmental health.

(2) The Ministry of the Environment, Ministry of Health, the Ministry of Labour or a municipality shall provide to a medical officer of health such information in respect of any matter related to occupational or environmental health as is requested by the medical officer of health, is in the possession of the ministry or municipality and the ministry or municipality is not prohibited by law from disclosing. "

Section 13 empowers a medical officer of health or a public health inspector to make orders regarding health hazards, and such orders may include the requirement to vacate premises. Section 40 clarifies that certain health officials have the right to enter premises to carry out duties under the Act.

Section 77 of the Act further empowers the Minister to make investigations respecting the causes of disease and mortality in any part of Ontario. Persons designated to carry out such investigations have the powers of a commission under the Inquiries Act. The Minister may also direct the Medical Officer of Health to investigate a problem and take action:

"83. Where the Minister is of the opinion that a situation exists anywhere in Ontario that constitutes or may constitute a risk to the health of persons, the Minister may direct the Chief Medical Officer of Health to investigate the situation and to take such action as the Chief Medical Officer of Health considers appropriate to prevent, eliminate and decrease the risk to health caused by the situation. "

Section 95 empowers the Lieutenant Governor in Council to make regulations to carry out the Act, including regulations:

- "95. (d) prescribing standards and requirements in respect of any matter in relation to which regulations may be made under this Act and requiring compliance with such standards and requirements; ..."

This latter power would appear to be particularly relevant to the control of indoor air quality problems that could be considered 'health hazards' as defined by this Act.

The Building Code Act of Ontario (R.S.O., 1980. c. 51) sets down the requirements and standards for construction of buildings in Ontario, including dwellings of all types. Section 3(1) of the Act states:

- "3.(1) The council of each municipality is responsible for the enforcement of this Act in the municipality. "

Both the province and the municipalities therefore play a role in determining how buildings are constructed, and may if desired influence whether the consequent level of indoor air contaminants is taken into account in the choice of construction methods and materials. The Municipal Act (R.S.O.1980, c.302, s.104) also gives the municipalities power to make by-laws with respect to health and safety matters.

The Ministry of Housing Act (R.S.O. 1980, c. 281) also gives the Minister of Municipal Affairs and Housing a broad mandate with respect to matters of housing policy in Ontario. Section 7 states:

- "7. "The Minister or the Deputy Minister, subject to the direction and control of the Minister, shall
- (a) make appropriate recommendations to the Government of Ontario on policies and objectives on housing and related matters with regard to the short-term and long-term housing needs of the people of Ontario;
 - (b) make recommendations for the effective coordination of all housing and related matters within the Government of Ontario, with a view to ensuring the consistent application of policy;
 - (c) advise and otherwise assist the Government of Ontario in its dealings with other governments regarding housing and related matters; and
 - (d) advise and otherwise assist local authorities and other persons involved in local planning and development of housing with regard to realizing the objectives of the Government of Ontario for housing and related matters."

Prince Edward Island

The Environmental Protection Act (S.P.E.I. 1975, c.9, amended S.P.E.I. 1976, c.9; S.P.E.I. 1977, c.9 and S.P.E.I. 1980, c.2) contains a broad definition of pollution. It is not clear whether this could be applied to indoor air as well as outdoor air:

"1. Definitions. - In this Act ...

- (d) "pollution" means any alteration or variation of the physical, chemical, biological, or aesthetic properties of land, air or water which results, or which may result from any act or omission over which the legislature of Prince Edward Island has jurisdiction; ..."

Section 4 empowers a Technical Coordinating Committee to:

- "(a) ...inquire into any matter pertaining to the environment
 - (i) referred to it by the Minister, or
 - (ii) on its own initiative; ...
- (b) may review any policies, programs, or projects of government departments and agencies as they relate to the environment; ..."

Because the term "environment" is not defined, it is not clear whether other clauses which are discussed below could have some application to questions of residential indoor air quality.

For example, under section 5(1) the Minister has certain powers in order to protect the environment:

- "(a) to investigate and inquire into any activity or situation that causes, or appears to be the cause of, or may cause, pollution;
- (b) to consider and prepare plans and programs to combat, eliminate or mitigate pollution or any particular kind of pollution;

... "

Sections 6(2) and 7(1) empower the Minister to order "any person ... to take remedial action" or to take any remedial action required, "to combat, eliminate, or mitigate a cause of pollution". Under section 8, the Minister or those authorized by him may examine "any land, air or water in the province to ascertain the degree of pollution thereof and determine the causes therefor ...".

Under Section 22, the Lieutenant-Governor in Council may make regulations to carry out the intent of the Act, including regulations:

- "(e) respecting air pollution and prescribing standards of emission of contaminants from any source of contamination; ...".

Under The Agricultural Chemicals Act (R.S.P.E.I.1974, c.A-4), provincial inspectors have broad powers with respect to the use of agricultural chemicals, which could directly or indirectly affect the type and extent of indoor chemical exposures of people in Prince Edward Island:

"15. Power of inspector. - Where an inspector is of the opinion, based upon such evidence as he considers adequate, that the use of or method of application of an agricultural chemical is or may be dangerous to the health of persons or any animal, or harmful to crops or other plant life, he may by order in writing suspend or terminate the use of or the method of application of the agricultural chemical."

Section 21 authorizes the Lieutenant Governor in Council to make regulations including regulations:

- "(l) prohibiting or restricting the use in general or in a particular way of an agricultural chemical."

P.E.I.'s Public Health Act (S.P.E.I. 1980, c.42) states that among other duties, the Minister shall:

- "3. (a) coordinate measures for the protection of public health and the distribution, supervision and evaluation of health services;
- (b) gather and analyse data on the effects of localities, employments, conditions, habits, interventions and other circumstances upon the health of the public;
- (c) survey and inquire into the causes of disease, injury, morbidity and mortality in the province, including the investigation of the harmful effects on health of the physical and social environment; ...
- (e) carry out and encourage the implementation of programs for education, training, research and information in the fields of prevention, diagnosis and treatment of disease, rehabilitation of the sick, injured and handicapped, and public health generally;
- (f) encourage the adoption of healthy modes of living by individuals and identified groups at risk in order to reduce self-imposed risks resulting from detrimental lifestyles; ..."

Section 6(1) defines "nuisance" to be "anything which, in the opinion of the Minister, is directly or potentially injurious to public health and offensive to the general community". Section 6(2) empowers the Chief Health Officer to investigate a nuisance and "take such steps as he considers necessary to abate or remedy the same".

Section 14(1) gives the Chief Health Officer power to close and order remedied a building unfit for habitation:

- "14.(1) Buildings unfit for human habitation. - If a building or any portion thereof is, in the opinion of the Chief Health Officer, unfit for human habitation or if there exists therein any condition that, in his opinion, might endanger the public health he may, by order in writing,
- (a) direct that the building be vacated and closed and give notice thereof to the owner and the occupants;
 - (b) direct the owner of the building, within such time as may be specified in the order, to alleviate the health hazard or, at the option of the owner, to demolish the building at the owner's expense. "

Section 15 allows public health officers certain powers to enter and inspect all buildings, including dwellings, and power to "cause such steps to be taken as he considers necessary to alleviate any hazard to public health."

Section 23 states that the Lieutenant Governor in Council:

"may make regulations generally for the better administration of this Act, for the prevention, treatment, mitigation and suppression of conditions of ill health and the protection of the health of the public ...".

Quebec

Quebec's Environment Quality Act (R.S.Q. 1977, c.Q-2 and amendments to 1982), like a number of the other provinces, specifically excludes indoor air from its consideration of "atmosphere" and "environment":

1. Interpretation. - In this act, unless the context indicates a different meaning, the following words and expressions mean or designate:

...

- (2) "atmosphere": the ambient air surrounding the earth, excluding the air within any structure or underground space; ...
- (4) "environment": the water, atmosphere and soil or a combination of any of them or, generally, the ambient milieu with which living species have dynamic relations; ..."

The Minister's powers under section 2 of the Act are phrased in terms of 'quality of the environment', and may therefore exclude considerations of indoor air quality under the definitions above. The Minister's general functions in the same section, however, include advising the Government on:

"the prevention of deterioration of the environment and the protection of living species and property".

"Living species" is not defined in the Act.

Notwithstanding, there are provisions in the existing legislation that could have an effect on residential indoor air quality:

For example, Section 31 allows the Government to make regulations to:

- (1) regulate or prohibit the use of any contaminant and the presence of any contaminant in products sold, distributed or utilized in Quebec. ..."

Such regulation could affect indoor pollutant concentrations as well as outdoor contaminants. Section 53 empowers the Lieutenant-Governor in Council to make regulations regarding pollution controls on motor vehicles, and to regulate the quality of various fuels. This power could indirectly affect the extent and type of pollution indoors caused by infiltration of air contaminated with combustion products or by fuel vapours into residences (e.g. from an attached garage or from chimney smoke of a neighbouring dwelling).

Under the Environment Quality Act, a Regulation Respecting Dwellings in General (R.R.Q. 1981, c Q-2, Reg. 15) specifies that:

- "1.(1) No new construction or modification of existing construction shall be undertaken unless previously approved by the municipal sanitary authority."

The regulation also specifies minimum air space in dwellings (section 25).

The Quality of Atmosphere Regulation (R.R.Q. 1981, c.Q-2, Reg. 20) is also restricted by its connection with the Environment Quality Act to considerations of outdoor air. The ambient air quality standards under this regulation will, however, have some effect on indoor air quality levels, due to routine infiltration and deliberate air change in dwellings.

Quebec's "Act Respecting the Ministere des Affaires Sociales" (R.S.Q. 1977, c.M-23) states that the Minister shall:

- "3. (b) take the necessary steps to assure the protection of the public health;
(c) see to improving the state of health of individuals, and the standard of health of the population; ...
(e) participate in the preparation and implementation of programs to clean up the physical environment of the population for whom such programs are intended; ..."

Quebec's Public Health Protection Act (R.S.Q. 1977, c.P-35) assigns the Minister of Social Affairs further specific functions which would appear to allow some consideration of residential indoor air quality issues:

- "2. The Minister of Social Affairs shall be entrusted with the application of this act. His functions shall be:
- (a) to coordinate the measures for the protection of public health and the distribution and supervision of services relating to such protection;
- (b) to participate in the preparation of programs of popular education, training and research in the fields of prevention, diagnosis and treatment of diseases, rehabilitation of the sick and public health generally; ...
- (d) to establish and maintain a system for gathering and analysing social, medical and epidemiological data ...
- (e) to establish a system for gathering and analysing data on the frequency and distribution of disease ..."

The regulatory powers of the Minister under section 69 of the Act, however, are more restrictive than parallel legislation in the other provinces, and for example, do not specify ventilation of buildings.

Saskatchewan

Saskatchewan's Air Pollution Control Act (R.S.S. 1978, c.A-17, amended S.S. 1979-80, c.M-32.01, s.3) restricts its scope to air that is not inside buildings:

"2. Interpretation. - In this Act:

...

- (b) "air pollution means the presence in the ambient air of an air contaminant in quantities that may cause discomfort to or endanger the health, safety or welfare of persons or that may cause injury or damage to property or to plant or animal life;
- (c) "ambient air" means the atmosphere surrounding the earth but does not include the atmosphere within a structure or within any underground space; ..."

The Department of the Environment Act similarly defines environment in terms of the atmosphere "other than the atmosphere in a building or in the underground works of a mine". Neither Act therefore appears to leave much scope for involvement in indoor air quality issues.

Section 13 does, however, give power to make certain regulations, including regulations:

- "(d) prohibiting, restricting or controlling the sale, use, application and disposal of chemicals. "

Section 14 also confers power to enter and inspect any premise to enforce the Act and regulations. Similarly, the Pest Control Products (Saskatchewan) Act provides power of entry and inspection (section 20) and allows the Lieutenant Governor in Council to make regulations with respect to pesticides, including:

- "(m) "prohibiting or restricting the use in general or in a particular way of a pesticide."

Such legislation may influence the amount and type of indoor exposure to contaminants of the people in Saskatchewan.

Saskatchewan's Public Health Act (R.S.S. 1978, c. P-37, amended S.S.1979, c.92, S.79) appears to provide more scope for involvement of provincial and municipal officials in indoor air quality issues.

Sections 29 and 30 of the Act allow the board of health or medical officer of health:

"to inquire into and visit premises for the purpose of ascertaining whether there are any accumulations of filth, dirt, rubbish or other matter injurious to health, or any nuisances."

Here "nuisance" is defined broadly in section 1(2) to mean:

"(x) ... any thing or condition of things that is or may become injurious or dangerous to health, or that prevents or hinders in any manner the suppression of disease; ..."

Section 73 also confers on the Lieutenant Governor in Council the power to make regulations for protection of the public health, including regulations for the purposes of:

"...

- (j) house to house visitation and inspection;
- (k) the inspection, cleaning, purifying, ventilating and disinfecting of houses ... ;
- (l) the prevention and removal of nuisances and unsanitary conditions on public or private property; ...
- (s) the plumbing, water supply, ventilation, lighting, construction and heating of buildings and premises; ...
- (u) the construction, lighting, ventilation, heating, inspection and sanitary control of apartment blocks; ...
- (tt) the construction, manufacture, alteration, renovation repairing, renewal, covering and recovering, inspection and sale of upholstered or stuffed articles."

Yukon and Northwest Territories

The Yukon Territory Area Development Ordinance (R.O.Y.T. 1971, c.A-4, amended O.Y.T. 1975 (3rd sess.), c.3) specifies that the Commissioner may make regulations for, among other purposes:

"4(b) the regulation or prohibition of the erection, maintenance, alteration, repair or removal of buildings" .

and "4(c) public health ..."

Building Regulations (1971/55 and amendments) control the standards of construction of dwellings.

In addition, Public Health Ordinance (R.O.Y.T. 1971, c.p-8) also gives the Commissioner power to make regulations, for, among other purposes:

- "3(1) (c) the location, construction, ventilation, lighting, heating, equipment, water supply, drainage, toilet and ablution facilities, excreta and garbage disposal, protection against rodents and vermin, cleansing, disinfection and disinfestation of, and the sanitary inspection and control of
 - (i) buildings and premises of any kind whatsoever, ...
- (d) the prevention and removal of insanitary conditions on public or private property;
- (e) the prevention of overcrowding of premises used for human occupation and places of public assembly, and specifying the amount of air space to be allowed for each individual therein; ...
- (n) the use of noxious materials including fertilizers, sprays or preservatives dangerous to the public health; ...
- (r) the prevention, control and abatement of air pollution due to any cause; ..."

Terms such as 'insanitary conditions' and 'air pollution' are not defined in the Ordinance.

Section 10 specifies the duties of local Boards of Health as including the administration within a municipality of the Public Health Ordinance, and advising the council on matters pertaining to public health in the municipality. Health officers have the power to enter any place and examine it for any purpose relating to enforcement of the ordinance (section 13).

The Northwest Territories Area Development Ordinance (R.O.N.W.T. 1974, c/A-5 also provides for regulation of buildings:

"4. The Commissioner may make regulations for the orderly development of a development area , and for greater certainty, but not so as to limit the generality of the foregoing, may make regulations respecting

(a) ...

(b) the regulation or prohibition of the erection, maintenance, alteration, repair or removal of buildings; ...

(d) public health ... "

The Environmental Protection Ordinance (R.O.N.W.T. 1974, c.E-3) contains relatively broad definitions:

"2. In this Ordinance ...

(b) "contaminant" means any solid, liquid, gas, odour, heat, sound, vibration or combination of any of them the discharge of which into the environment may

(i) cause or contribute to the impairment of the quality of the environment, or

(ii) adversely affect the health, safety or comfort of any person; ...

(d) "environment" means the air, water, ice, snow and land of the Territories and all animal and plant life therein; ..."

There is no specific limitation to the outdoor environment in the Ordinance.

Section 6(1) with respect to contaminants specifies:

"6. - (1) Contaminants. No person shall discharge or permit the discharge of any contaminant into the environment that

(a) causes or contributes to or is likely to cause or contribute to substantial impairment of the quality of the environment; or

(b) adversely affects or is likely to adversely affect the health, safety or comfort of any person.

(2) Notwithstanding subsection (1) no offence is committed where the level of discharge of contaminants into the environment does not exceed the level of discharge that is established by regulation. "

Section 18 empowers the Commissioner to make regulations regarding the safeguards required to prevent the discharge of contaminants.

The Pesticide Ordinance (R.O.N.W.T. 1974, c.P-4) similarly empowers the Commissioner to make regulations regarding pesticides, including regulations:

- "(b) prohibiting the application of pesticides in any area of the Territories ..."

Both ordinances may affect or could be used to affect the indoor exposure of persons in the Northwest Territories to contaminants.

The N.W.T. Public Health Ordinance (R.O.N.W.T. 1974, P-10) contains general provisions which would allow involvement of medical health officers in issues involving residential indoor air quality.

Section 3 allows the Commissioner to make regulations "for the prevention and mitigation of disease and the promotion and preservation of health" in the Territories, including regulations respecting:

- "(c) the location, construction, ventilation, lighting, heating equipment, water supply, drainage, toilet and ablution facilities, excreta and garbage disposal, protection against rodents and vermin, cleansing, disinfection and disinfestation of, and the sanitary inspection and control of,
 - (i) buildings and premises used as residences ...
- (d) the prevention and removal of unsanitary conditions on public or private property;
- (e) the prevention of overcrowding of premises used for human occupation and places of public assembly, and the fixing of the amount of air space to be allowed for each individual therein; ...
- (n) the use of noxious materials including fertilizers, sprays or preservatives dangerous to the public health; ...
- (r) the prevention, control and abatement of air pollution due to any cause; ..."

(The provisions above are similar to those in the Yukon Territories.)

Part III, section 17 of the Public Health Ordinance also gives Health Officers the right to "enter any place and examine the same for any purpose relating to the enforcement of this Ordinance or the regulations".

The Northwest Territories also has a Science Advisory Board Ordinance (S.N.W.T. 1975, c.7) establishing a Board whose duties include:

"11(c) (to) recommend research and development programmes to aid in the solutions of social and economic problems and to aid in achieving social and economic goals."

3. Regulatory Bodies, Codes and Standards

3.1 The Role of Regulations, Codes and Standards

The foregoing discussions described federal and provincial legislation that appears to be relevant to residential indoor air quality issues. It is these items of legislation that have defined the existing 'regulatory bodies'. They are none other than various departments of the Government of Canada and of the Provinces. They are empowered, by their enabling legislation and through Acts that they administer, to promulgate regulations on a myriad of subjects, either directly, or by recommendation to the Governor in Council and Lieutenants Governor in Council.

In some cases, the regulations that are promulgated are based on 'codes' and 'standards'. The primary example is that of building codes, of which there are many in Canada but all related to a common base - the National Building Code prepared by the Associate Committee on the National Building Code of the National Research Council of Canada. The Provinces have exclusive power to legislate in the area of property. In practice, however, each province has established a building code identical to, similar to, or built upon, the National Building Code, which is merely a sample code. In general, municipal councils and building inspectors are empowered to enforce the application of the provincial codes in individual buildings.

The National Building Code is no more than a set of descriptions of recommended building construction practices. The descriptions are in many cases based on 'standards', which in turn are just further, more detailed and quantitative descriptions of desirable criteria to which a material or a product or a building system should conform, to qualify for inclusion in Canadian buildings. The standards may be based on many factors, including detailed scientific research, as well as practical and economic considerations, and have been recommended by a number of different governmental, non-governmental and professional bodies.

In Canada, residential construction is regulated with the help of a system involving three types of players:

- Regulatory Bodies - departments or agencies at different government levels with legislative power to set regulations and to force people, through imposition of penalties and other measures, to act in conformity with them.
- Developers of Codes - governmental departments and agencies, (e.g. National Research Council) together with other knowledgeable individuals, all with sufficient breadth of experience to compile a workable set of descriptions of desirable practices (e.g. for constructing buildings)

Standards Bodies - governmental or nongovernmental agencies and individuals with sufficient depth of scientific and practical experience to prescribe detailed quantitative objectives (called 'standards') which must be met by a specific product, material, building system, etc. before that product etc. can be listed as acceptable to that standards body.

In some of the non-construction situations reviewed in the previous sections, there are no codes - merely standards and regulations. For example, ambient air quality standards, recommended by government officials knowledgeable about the medical, economic and social effects of air pollution, are promulgated within air quality regulations, by government environmental agencies empowered to do so.

In other cases there were no specific quantifiable standards, merely qualitative regulations (such as those health regulations regarding 'nuisance'), which require qualitative judgment in each individual situation, by knowledgeable health inspectors. There was some question in a number of cases as to whether the regulations reviewed would, or would not, apply to questions of indoor air quality. The more precisely worded the definitions used in the regulations were, the easier it was to tell whether or not they were applicable.

Similarly, the more quantifiable and defined a regulation or standard is, the easier it is to enforce, since there is little doubt when an act or a product conforms and when it does not.

3.2 The Standards Bodies

The National Building Code, the Canadian Heating, Ventilating and Air-Conditioning Code, and Residential Standards Canada all refer to specific standards of construction and manufacture set by a number of different organizations. While few of these standards are specifically designed with the sole purpose of limiting indoor air pollution, many of the standards affect indoor air pollution indirectly, by prescribing good practice for construction, installation of heating equipment, etc.

The organizations whose standards are referenced in the Canadian Heating, Ventilating and Air-Conditioning Code are as follows:

ANSI (American National Standards Institute)

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)

ASTM	(American Society for Testing and Materials)
CGA	(Canadian Gas Association)
CGSB	(Canadian General Standards Board) (formerly Canadian Government Specifications Board)
CSA	(Canadian Standards Association)
HRAIC	(Heating, Refrigerating and Air-Conditioning Institute of Canada)
HI	(Hydronics Institute (Heating))
NFPA	(National Fire Protection Association)
ULC	(Underwriters' Laboratories of Canada)
UL	(Underwriters' Laboratories, Inc.)

The list of standards bodies referenced in the National Building Code is more extensive, but the above will serve to illustrate the point.

Not all standards bodies are organized on the same principles. It is beyond the scope of this report to describe all the bodies above in detail. Several examples will be given below to illustrate who is involved in setting standards which are adopted in Canadian codes.

The Standards Council of Canada

The Standards Council of Canada was established by the federal government, in 1970, to develop a National Standards System. It establishes criteria for a set of National Standards of Canada, and operates a program for the accreditation of Canadian standards-writing organizations.

Examples of National Standards Writing Organizations (SWO's) accredited by the Standards Council of Canada include:

- Canadian General Standards Board (CGSB)
- Canadian Standards Association (CSA)
- Canadian Gas Association (CGA)
- Underwriters' Laboratories of Canada (ULC)
- Bureau de Normalization du Quebec

The Standards Council also operates separate programs to accredit Canadian certification organizations and Canadian testing laboratories. The latter program is open to environmental laboratories which might, for example, perform tests on air samples to measure pollutant content.

The Council's Standards Information Service functions as the national standards information centre, and provides a comprehensive information service on national, foreign and international standards, related documentation and activities. The information centre has acquired and maintains a reference collection of 300,000 standards and related documents. (Toll free service 1-800-267-8220).

Canadian General Standards Board (CGSB)

CGSB is recognized by the Standards Council of Canada as a Standards Writing Organization with responsibility for the development of National Standards of Canada in more than 70 subject areas. CGSB manages national certification listing programs and provides administrative expertise and support to the public and private sectors on standards, specifications, qualification and certification matters. The majority of its work is oriented to national issues of concern to the federal government, but not related to federal government purchasing.

CGSB was created originally in 1934 under the National Research Council Act as an inter-departmental "Canadian Government Purchasing Standards Committee". Its name was changed to the "Canadian Government Specifications Board" in 1948, and subsequently in 1980 to the "Canadian General Standards Board". In 1965 the responsibility for CGSB was transferred from the National Research Council to the Department of Defense Production, which in turn subsequently became part of the present Department of Supply and Services.

CGSB's corporate identity is now separated from the Government itself, through an exemption from the Federal Identity Program, by Treasury Board, in 1980. It receives government support from both the Federal and Provincial levels, as well as private sector support.

CGSB states its role as follows (CGSB Information Binder 08/82):

"The role of CGSB is to provide standards, and certification listing of products and services to these standards, for both public and private sectors for procurement, consumer requirements, legislation, technical practices, test procedures and to support international standardization in more than 100 fields."

CGSB specifications and standards development work is carried out by committees. The Standards Committees are comprised of representatives from government, industry, consumer interests and technical or research organizations. The committees develop standards through a consensus approval process wherein voting takes place by letter-ballot.

Over 1700 CGSB standards are now published for general use in both official languages. There is also now a CGSB Standards Review Board consisting of representatives of regional, industrial and consumer interests, which provides a second level review of CGSB standards proposed as National Standards of Canada.

The Canadian General Standards Board, jointly with Health and Welfare Canada, has created a new Health and Safety Advisory Board. The purpose of the new board is to review all CGSB standards activities for potential health questions that should be resolved.

The new committee will be alert in particular for the potential health effects of off-gassing from building materials and other products. Health considerations will also be included within the activities of other committees. For example, the Working Group on Air Sealing, arising out of the Committee on Standards for Residential Insulation Contractors, is giving consideration to possible health effects of caulking compounds and other sealants used to tighten homes.

American Society for Testing and Materials (ASTM)

ASTM was founded in 1898 as a scientific and technical organization for the development of standards on characteristics and performance of materials, products, systems, and services, and for the promotion of related knowledge. As the world's largest source of voluntary consensus standards, it operates through more than 137 main technical committees with 1925 subcommittees. These committees function in prescribed fields under regulations that ensure balanced representation among producers, users, and general interest participants. The Society has 29,000 active members, of whom over 17,000 serve as technical experts on committees. Membership is open to all concerned with the fields in which ASTM is active.

ASTM defines 'standards' and 'specifications' as follows (Annual Book of ASTM Standards 1982):

"standard - a specification, test, method, definition, classification, or practice that has been approved by the sponsoring committee and adopted by the Society in accordance with the procedures established in the Regulations Governing ASTM Technical Committees. ASTM standards may also take other forms such as guidelines, charts, tolerances, tables and reference photographs.

specification - a form of standard that is a precise statement of a set of requirements to be satisfied by a material, product, system, or service, indicating, whenever appropriate, the procedure by means of which it may be determined whether the requirements given are satisfied. As far as practicable, it is desirable that the requirements be expressed numerically in terms of appropriate units together with their limits. "

ASTM describes the proper use of its standards as follows:

"An ASTM standard represents a common viewpoint of those parties concerned with its provisions, namely, producers, users, and general interest groups. It is intended to aid industry, government agencies,

and the general public. The use of an ASTM standard is purely voluntary. It is recognized that, for certain work or in certain regions, ASTM specifications may be either more or less restrictive than needed. The existence of an ASTM standard does not preclude anyone from manufacturing, marketing, or purchasing products, or using products, processes or procedures not conforming to the standard. Because ASTM standards are subject to review and revision, those who use them are cautioned to obtain the latest revision. "

Canadian Standards Association (CSA)

The Canadian Standards Association (CSA) is a not-for-profit, independent, voluntary organization, engaged in developing standards and certifying to standards. It describes its corporate mission as "services in support of standardization".

CSA is funded through the sales of standards and memberships, which are open to any individual or organization. Manufacturers also pay a fee to have their products tested. CSA is governed by a Board of Directors chosen by the members from both sustaining and committee members. The Board members include representatives of various government agencies, manufacturing groups, universities, consulting firms and consumers.

CSA describes its standards as follows:

"CSA product standards are technical documents outlining specific product characteristics such as safety and/or quality. CSA standards do not stipulate how a product is to be built but do contain requirements for minimum levels of safety and in some instances, include performance requirements."

CSA certification is a process for determining by independent evaluation, that products, intended to bear the registered CSA certification mark, conform to accepted standards. It involves testing and/or examination, and follow-up procedures, to determine continuing conformity of the product to the standard(s). Manufacturers are granted a licence to use the mark on specified products for which a system of supervision, control and testing, acceptable to CSA, has been established.

CSA has no legislative powers and is not part of any government, but all three levels of government pass legislation based on CSA standards. Organizations, such as consumer groups, government departments, trade associations, or any other parties showing an interest in standardization, can approach CSA, requesting that standards be written. CSA then investigates the need for such standards and forms a committee consisting of experts, in the particular area, as well as users and regulatory authorities. These people volunteer their time and expertise to write standards. CSA has more than 400 committees with over 4000 committee members.

The Canadian Standards Association has developed a number of standards which may be relevant to indoor air quality in Canadian homes. These include standards in the areas of environmental sciences, measurement of air pollution, electrostatic air cleaners, air conditioners, electric heaters, and other appliances.

Through its Air Pollution Control Committee, CSA is continuing to develop and refine a series of standards for methods of measuring air pollutants both indoors and outdoors. Standards presently available include:

- Methods for Measurement of Ozone in Air (Z-223.23 - M1981)
- Methods for Measurement of Nitric Oxide and Nitrogen Dioxide (Z-223.24 - M1983)
- Methods for Measurement of Sulphur Dioxide in Ambient Air (Z-223.22 - M1980)
- Methods for Determination of Carbon Monoxide (Z-223.21 - M1978)

Others presently being developed include methods for measurement of total suspended particulates, vinyl chloride, arsenic, lead, mercury and fluorides in air.

American Society of Heating, Refrigerating
and Air-Conditioning Engineers) (ASHRAE)

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) is a professional organization with purposes as follows (ASHRAE By-Laws, section 1.3):

"The Society is organized and operated for the exclusive purpose of advancing the arts and sciences of heating, refrigerating and air conditioning, and ventilation, the allied arts and sciences and related human factors, for the benefit of the general public, as defined in the Certificate of Consolidation".

Its various classes of membership include registered engineers and other persons with technical experience and interest in the fields of heating, refrigerating, air conditioning and ventilation.

ASHRAE publishes and updates (on a regular basis) a series of standards, guides and handbooks regarding good engineering practice in its fields of interest. Its Standard 62-81 "Ventilation for Acceptable Indoor Air Quality Standards" discussed on page 95 following, is one of the few standards in existence today specifically addressing the reduction of indoor pollutants in residences.

3.3 Regulations, Codes and Standards for Indoor Air Quality

The National Building Code

The National Building Code, Part 9 "Houses and Small Buildings" applies to residential buildings of 3 storeys or less in building height, with a building area not exceeding 600 m² (NBC section 2.1.3).

Section 9.33 of the Code applies to ventilation and is the only section of the Code specifically aimed at reducing the level of contaminants in indoor air. The whole section is reproduced on the next two pages. Subsection 9.33.2.4 suggests that air contaminants released within buildings should be removed at their points of origin if this is possible, and that they should not be permitted to accumulate in unsafe concentrations. The term "air contaminants" is not defined in the Code.

Table 9.33.3.A. prescribes the minimum unobstructed ventilating area to the outdoors for rooms and spaces in residential buildings ventilated by natural means. Section 9.33.4.1 specifies that where rooms are mechanically ventilated, the system shall be capable of providing at least 1 air change per hour. The table and the mechanical ventilating rate are the 'standards' on which the Code is based.

Part 6 of the National Building Code, which deals with larger buildings than those in Part 9, also discusses natural and mechanical ventilation, and includes provisions for ventilating garages and spaces containing sources of contamination. Section 6.2.2. is reproduced on the third page following. Other sections of the Code may indirectly affect indoor air quality. For example, there are limitations on acceptable types of insulation, specifications for vapour barrier materials and installation practices, etc. There is no evidence, however, that indoor air quality was considered when these recommendations were formulated.

1985 Amendments to the National Building Code 1980

Amendments to Part 9 of the 1980 National Building Code, introduced in the 1985 Edition of the Code, include some provisions which are designed to ensure that carbon monoxide and other combustion gases are not allowed to escape from the garage or furnace into the living space. The following new and changed articles, for example, are designed to insure that metal liners are properly installed for high efficiency furnaces, to avoid deterioration and blockage of chimneys due to condensation within the chimney:

- 9.21.3.1 Every masonry or concrete chimney shall have a lining of clay, firebrick or metal. (replaces present 9.21.3.1)
- 9.21.3.4. Metal liners shall be constructed of at least 0.3 mm thick stainless steel. (new Article 9.21.3.4.)

(continued on page 93)

SECTION 9.33 VENTILATION

SUBSECTION 9.33.1. SCOPE

9.33.1.1. This Section applies to the ventilation of rooms and spaces in *residential occupancies* by natural ventilation and mechanical ventilation where the rated fan capacity does not exceed 2m³/s. Ventilation

9.33.1.2. Where the rated fan capacity exceeds 2m³/s, mechanical ventilation shall conform to Part 6. Mechanical ventilation

9.33.1.3. Ventilation of rooms and spaces in other than *residential occupancies* shall be in accordance with good engineering practice such as the procedures described in the ASHRAE Guide and Data Books and the ASHRAE Handbooks. Ventilation of rooms and spaces

9.33.1.4. A garage for parking more than 5 cars shall be ventilated in accordance with Part 6. Ventilation of garages

SUBSECTION 9.33.2. GENERAL

9.33.2.1. Rooms and spaces in *buildings of residential occupancy* shall be ventilated by natural means in accordance with Subsection 9.33.3 or by mechanical means in conformance with Subsection 9.33.4, except that where a *dwelling unit* is heated with other than fuel-fired equipment within the *dwelling unit*, a mechanical exhaust system of 1 or more fans or blowers having a total capacity of at least 0.05 m³/s at a pressure differential of 2.5 mm of water shall be provided for each *dwelling unit*. Ventilation of residential occupancies

9.33.2.2. A space that contains a fuel-fired heating *appliance* shall have natural or mechanical means of supplying the required combustion air.

9.33.2.3. Where the ventilation system forms part of the heating system, Section 9.34 shall also apply

9.33.2.4. Air contaminants released within *buildings* shall be removed insofar as possible at their points of origin and shall not be permitted to accumulate in unsafe concentrations. Air contaminants

Exhaust ventilation system

9.33.2.5. Every *building* in which dust, fumes, gases, vapour or other contaminants tend to create a fire or explosion hazard shall be provided with an exhaust ventilation system designed to conform with Part 6, and shall be provided with explosion relief devices and vents or other protective measures to conform with Part 3.

SUBSECTION 9.33.3. NATURAL VENTILATION

Minimum natural ventilation area

9.33.3.1. The unobstructed ventilation area to the outdoors for rooms and spaces in residential *buildings* ventilated by natural means shall conform to Table 9.33.3 A. Where a vestibule opens directly off a living or dining room within a *dwelling unit* ventilation to the outdoors for such rooms may be through the vestibule.

Protection of openings supplying natural ventilation

9.33.3.2. Openings for natural ventilation other than windows shall be constructed to provide protection from the weather and insects. Screening shall be of rust-proof material.

SUBSECTION 9.33.4. MECHANICAL VENTILATION

Mechanical ventilation

9.33.4.1. Where rooms or spaces are mechanically ventilated, the system shall be capable of providing at least 1 air change per hour. Where a kitchen space is combined with a living area, natural or mechanical ventilation shall be provided in the kitchen area.

Air from dwelling unit

9.33.4.2. No air from any *dwelling unit* shall be circulated directly or indirectly to any other *dwelling unit*, *public corridor* or public stairway

9.33.4.3. Except for self-contained systems that serve individual *dwelling units*, *exhaust ducts* from rooms containing water closets, urinals, lavatories, showers or slop sinks, and *exhaust ducts* serving rooms containing cooking equipment, shall not be interconnected, and shall not be connected to duct systems serving other areas of the *building*, except at the inlet of the exhaust fan. Where such a connection is made, devices shall be installed to prevent the circulation of exhaust air through the *building* when the fan is not operating. Exhaust ducts from toilet room and kitchen

APPENDIX A / Regulatory Bodies, Codes and Standards

Table 9.33.3.A.
Forming Part of Article 9.33.3.1.

NATURAL VENTILATION		
Location		Minimum Unobstructed Area
Within dwelling unit	Bathrooms or water-closet rooms	0.09 m ²
	Unfinished basement space	0.2 per cent of the floor area
	Dining rooms, living rooms Bedrooms, kitchens, combined rooms Dens, recreation rooms and all other finished rooms	0.28 m ² per room or combination of rooms
Other than within dwelling unit	Bathrooms or water-closet rooms	0.09 m ² per water-closet
	Sleeping areas	0.14 m ² per occupant
	Laundry rooms, kitchens, recreation rooms	4 per cent of the floor area
	Corridors, storage rooms and other similar public rooms or spaces	2 per cent of the floor area
	Unfinished basement space not used on a shared basis	0.2 per cent of the floor area
Column 1	2	3

9.33.4.4. Where a *vertical service space* contains an *exhaust duct* that serves more than 1 *fire compartment*, the duct shall have a fan located at or near the exhaust outlet to ensure that the duct is under negative pressure, and such individual *fire compartments* shall not have fans that exhaust directly into the duct in the *vertical service space*.

9.33.4.5. Air intakes shall be located so as to avoid contamination from exhaust outlets or other sources in concentrations greater than normal in the locality in which the *building* is located.

Contamination from exhaust outlets

9.33.4.6. *Exhaust ducts* shall discharge directly to the outdoors. Where the *exhaust duct* passes through or is adjacent to unheated space, the duct shall be insulated to prevent moisture condensation in the duct.

Exhaust discharge

9.33.4.7. Ventilation equipment shall be accessible for inspection, maintenance, repair and cleaning. Kitchen *exhaust ducts* shall be designed and installed so that the entire duct can be cleaned where the duct is not equipped with a filter at the intake end.

Access to ventilation equipment

9.33.4.8. Outdoor air intake and exhaust outlets shall be shielded from weather and insects. Screening shall be of rust-proof material.

Air intake shield

9.33.4.9. Outdoor air intake openings into the cold air return system shall be provided with a manually operated or automatic damper. Air intake openings larger than 127 mm diam shall be equipped with a manually operated closure if the system is gravity type, or an automatic closure if the system is mechanically operated.

Automatic damper

9.33.4.10. Except as provided in Article 9.33.4.11., every ventilating duct shall conform to the requirements of Section 9.34 for *supply ducts*.

9.33.4.11. An *exhaust duct* that serves only a bathroom or water-closet room and that is contained entirely within a *dwelling unit* or space that is common to no other *dwelling unit*, may be of *combustible* material provided the duct is reasonably air tight and constructed of a material impervious to water.

9.33.4.12. Underground ventilating ducts shall be adequately drained. Such ducts shall have no sewer connections and shall be provided with access for inspection and cleaning.

SUBSECTION 6.2.2. VENTILATION

6.2.2.1.(1) Except as provided in Sentences (2) and (3), the ventilation of rooms or spaces shall conform to the requirements of this Part

(2) The ventilation of rooms or spaces by natural methods in Group C occupancies shall conform to Part 9.

(3) The ventilation of rooms and spaces in occupancies other than residential occupancies by natural methods shall be permitted in lieu of mechanical ventilation where such ventilation will provide sufficient air change to provide healthful conditions in that occupancy.

6.2.2.2.(1) Except as provided in Sentences (4) and (5), an enclosed storage garage and repair areas in a garage shall have a mechanical ventilation system designed to limit the average concentration of carbon monoxide to not more than 100 parts per million parts of air for periods longer than 1 h with a maximum concentration at any time of not more than 400 parts of carbon monoxide per million parts of air when measured between 900 mm and 1 200 mm from the floor. (See Appendix A.)

Garage
ventilation

(2) The requirement in Sentence (1) is considered to be met by a system designed to provide a continuous supply of fresh air at a rate equal to at least 14 m³/h for each square metre of floor area. (See also Sentences 3.3.7.7.(4) and 3.3.1.14.(1).)

(3) Mechanical ventilation systems provided in accordance with Sentence (1) shall include automatic ventilating fan control by means of accepted carbon monoxide monitoring devices, located so as to provide full protection for the occupancy.

(4) In garages subject to the requirements of Sentences (1), (2) and (3), where motor vehicles are parked by mechanical means, the ventilation requirements may be reduced by one half.

(5) Storage garages with a total capacity of less than 20 motor vehicles need not have mechanical ventilating systems if the downward slope of the floor to the outside door is 1 in 120 and the garage floor is above outside ground level.

(6) The requirements of Sentences (1) to (5) shall not apply to any storage garage provided

- (a) at least 25 per cent of the total area of the perimeter walls on each storey is open to the outdoors and distributed to provide cross ventilation,
- (b) no portion of any floor of the garage is more than 1 m below grade, and
- (c) no tarpaulins, glass or other materials are used to close the required exterior openings at any time.

6.2.2.3.(1) Air contaminants released within buildings shall be removed insofar as possible at their points of origin and shall not be permitted to accumulate in unsafe concentrations

Air
contaminants

(2) Systems serving spaces that contain sources of contamination shall be designed in such a manner as to prevent spreading of such contamination to other occupied parts of the building and surrounding areas.

Systems for
contaminated
spaces

(3) Systems serving spaces that contain hazardous gases, dusts or liquids such as grain elevators, metal powder plants and ammonium nitrate storage shall be designed, constructed and installed to conform to the requirements of the appropriate provincial legislation or, in the absence of such legislation, to good engineering practice such as is described in the publications of the National Fire Protection Association and in the National Fire Code of Canada 1980. (See Appendix A.)

(4) Systems for the ventilation of restaurant and other commercial cooking equipment shall be designed, constructed and installed to conform to NFPA 96-1978, "Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment," except as required by Sentence 3.5.3.1.(1) and Article 3.5.4.2.

1985 Amendments to the National Building Code 1980
(continued from page 89)

- 9.21.3.5. Metal liners shall only be used in chimneys serving appliances with an intended flue gas temperature not in excess of 540 degrees C. (new Article 9.21.3.5.)
- 9.21.3.9. Liners for chimneys serving appliances with intended flue gas temperatures under 200 degrees C shall be designed to prevent condensed flue gases from penetrating the joints and entering the space between the liner and the surrounding masonry (see Appendix A). (new Article 9.21.3.9.)

Amendments for the 1985 edition of the National Building Code also include new notes which are to be added to provide further information about chimney liners (Article 9.21.3.9) and about gas-tight barriers between dwelling units and garages (Article 9.10.9.24):

Article 9.21.3.9.

Clay Chimney Liners (New Note)

Modern high efficiency wood, oil and gas furnaces and heaters produce flue gas temperatures well below that on which previous Code requirements were based. Extruded clay liners with mortared butt joints are not considered to provide adequate protection against corrosion or freeze-thaw action due to resulting condensation in chimneys operating at such low temperatures. Butt jointed clay liners are still considered adequate for high temperatured appliances such as fireplaces.

Article 9.10.9.24.

Separation Between Dwelling Units and Garages (New Note)

The gas-tight barrier between a dwelling unit and an attached garage is intended to provide reasonable protection from carbon monoxide and gasoline fumes entering a dwelling unit. Construction assemblies incorporating a vapour barrier will perform adequately with respect to gas tightness provided reasonable care is exercised where the wall or ceiling is pierced by service assemblies. Where a garage is open to the adjacent attic space above the dwelling units it serves, a gas-tight barrier in the dwelling unit ceiling will also provide protection. Unit masonry walls forming the separation between a dwelling unit and an adjacent garage should be provided with two coats of sealer, plaster or covered with gypsum wallboard on the side of the wall exposed to the garage.

The Residential Standards Canada

The Residential Standards Canada 1980 were prepared by the Standing Committee on Houses and Small Buildings, which is responsible to the Associate Committee on the National Building Code, National Research Council of Canada. This set of building standards is essentially an expanded Building Code, and contains the requirements for buildings of residential occupancy from Part 9 of the National Building Code, as well as additional requirements which go beyond the scope of the National Building Code, and which are considered necessary to regulate residential construction under the National Housing Act.

The ventilation requirements of the Residential Standards are identical to those set out in the National Building Code, Part 9, with the exception of the following clause (section 33 of the Residential Standards):

"A. Scope

- (1) The requirements for natural ventilation in this Section apply to all buildings regardless of size. The requirements for mechanical ventilation apply only to buildings that are not more than 3 storeys in building height and with a building area of not more than 600 m². For buildings exceeding these limits the requirements in the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code apply."

The Heating, Ventilating and Air-Conditioning Code

The Heating, Ventilating and Air-Conditioning Code is also prepared by the Associate Committee on the National Building Code. Insofar as ventilation is concerned, it relies on section 3.6.3 of Part 3 of the National Building Code which, in turn, relies on the ventilation section in Part 6 of the National Building Code, which has been reproduced on a previous page.

The code in general relies on 'good engineering practice' defined as follows:

"6.2.1.1 Heating, ventilating and air conditioning systems shall be designed, constructed and installed to conform to good engineering practice such as described in the ASHRAE Guide and Data Books, the ASHRAE Handbooks, the HRA Digest and the Hydronics Institute Manuals."

The Guides and Handbooks of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) specify in detail the mechanical ventilation requirements for the various spaces within large residential buildings. The guides therein rely, in turn, on specific ASHRAE Standards for ventilation and air quality.

ASHRAE Standards

ASHRAE Standard 62-1981 "Ventilation for Acceptable Indoor Air Quality" specifies ventilation rates for various types of buildings and spaces within buildings. Standard 62-81 and its previous form, 62-1973 "Standards for Natural and Mechanical Ventilation", were prepared to resolve diverse and often conflicting ventilation requirements in building codes in the United States, which had recognized the need for ventilation standards since the early 1900's.

The standard, which is not reproduced here because of copyright regulations, but which will be available for perusal in the CMHC National Library, defines ventilation requirements for building spaces intended for human occupancy, taking into account the preservation of the occupants' health, safety and well-being. It emphasizes that good ventilation practice exists when sufficient ventilation air is provided to maintain required oxygen, carbon dioxide and other air quality levels. The standard does not deal with humidity or temperature control.

The standard specifies the minimum requirements of quality for ventilation air (air brought in from outside) in terms of maximum concentrations of particulates, sulfur oxides, carbon monoxide, nitrogen oxides, photochemical oxidants, hydrocarbons and other contaminants. In more general terms it states that air will be considered unacceptable as ventilation air if it contains any contaminant in a concentration greater than one-tenth the Threshold Limit Value (TLV) currently accepted by the American Conference of Governmental Industrial Hygienists, another standards body. Under the ASHRAE standard, suitable ventilation air may be a mixture of outdoor air and filtered or treated air such that the criteria are met, but the standard specifies minimum percentages of outdoor air.

Examples of ASHRAE's recommended minimum ventilation rates include:

building space	minimum ventilation rate	
	in lps/room*	in cfm/room**
General living areas	5	10
Bedrooms	5	10
Kitchens	50	100 ***
Toilets, bathrooms	25	50
All other rooms	5	10

* lps = litres per second

** cfm = cubic feet per minute

*** (intermittent operation)

Guidelines for Exposure to Radon

Under the Atomic Energy Control Act, for all radon contamination arising from the nuclear industry and for houses built in uranium mining areas or those contaminated by refined radium or contaminated fill, the primary clean-up criterion for radon daughter products indoors is 0.02 WL (Working Level) based on annual average concentration:

<u>Action Recommended</u>	<u>A.A. Working Level</u>
Prompt Interim Action	greater than 0.15 WL
Primary Criterion	greater than 0.02 WL
Investigation Level	greater than 0.01 WL

Radon and its daughter products are always found together and are inhaled together but, in most cases, the resultant radiation dose received by the lungs is due predominantly to the daughter products, rather than the radon gas. Consequently, the clean-up criterion is quoted in working levels (WL), which is the unit of radon daughter product concentration. The WL unit provides a measure of the total alpha radiation energy associated with the short-lived radon daughter products in 1 litre of air. If the degree of equilibrium between radon and its daughter products is known, it is possible to convert from daughter products concentrations, expressed in WL's, to radon gas concentrations, expressed in pico curies per litre (pCi/l). Using an average value of 0.3 for the Equilibrium Factor gives approximate radon concentration equivalents, as follows:

Prompt Interim Action	greater than 50 pCi/l
Primary Criterion	greater than 7 pCi/l
Investigation Level	greater than 3 pCi/l

These guidelines were set by the Federal/Provincial Task Force on Radioactivity.

Remedial measures start with a detailed survey of the building and its surroundings, in order to locate and identify the source of radon. Any radioactive material found will be removed to an appropriate waste management site or, if this is not practicable, other measures may be taken such as improving the ventilation or sealing the walls and floors of the basement. Once remedial measures have been started, they will continue until the radon levels have been reduced below the primary criterion.

A second criterion is an interim guideline for all other areas in Canada, developed by the Federal/Provincial Radiation Surveillance Subcommittee of the Health and Welfare Committee on Occupational and Environmental Health. This involves natural radiation not associated with the nuclear industry, and reads as follows:

"A single grab sample measured in the most critical area of less than 0.1 WL shall require no further action. If the working level is greater

than or equal to 0.1, then a realistic estimate of the annual effective dose must be determined. Should this estimate exceed 5 millisieverts (500 mrem), then remedial measures shall be undertaken."

This interim guideline is presently under review by the subcommittee.

Guideline for Formaldehyde Exposure

The Department of National Health and Welfare has also established a recommended guideline of 0.1 ppm (120 mcg/m³) for the concentration of formaldehyde in Canadian residences, in connection with the emissions from Urea-Formaldehyde Foam Insulation. This guideline was developed from consideration that the Threshold Limit Value (TLV) in the workplace is 2 ppm (2400 mcg/m³) formaldehyde, for healthy adults during a 40-hour week. A safety factor of 20 was incorporated, in order to allow for the fact that households can include infants, young children, the old and the ill, and because the home environment may be occupied 24 hours a day.

Guidelines for Other Indoor Air Pollutants

A Federal-Provincial Working Group* has been established under the Federal-Provincial Advisory Committee on Environmental and Occupational Health, a committee which in turn reports through the Conference of Deputy Ministers of Health, a consultative body composed of the Provincial and Federal Deputy Ministers of Health.

The Working Group, underway since 1981, has identified 18 principal substances or groups of substances considered to be potential indoor pollutants. It has been charged with the task of developing guidelines for acceptable concentrations of these contaminants in the home environment, and of making recommendations on ways to reduce exposure to these substances.

In order to reach a consensus on appropriate guidelines, the Working Group is examining evidence available in the scientific literature which deals with population responses to, and toxicological data on, the pollutants concerned. These include: radon and radon daughters, carbon monoxide, formaldehyde, oxides of nitrogen, sulphur oxides, particulate matter, polycyclic aromatic hydrocarbons, carbon dioxide, water vapour, biological agents, aldehydes other than formaldehyde, ozone, lead, pest control products, chlorinated hydrocarbons, product aerosols, fibrous materials and tobacco smoke.

*(Secretariat, Working Group on Indoor Air Quality, Monitoring and Criteria Division, Health and Welfare Canada, Ottawa K1A 0L2)

3.4 Summary

The answer to the question posed in the Introduction to this report is a simple one: there are few regulations, codes and standards that have much to say directly about indoor air quality in Canadian homes.

The regulatory powers have been reviewed in the preceding sections and in many cases, it is not entirely clear whether these powers can be applied directly to indoor air quality problems, without modification of existing legislation.

The codes - National Building Code, National Heating Ventilating and Air Conditioning Code, and the Residential Standards - have been discussed in the preceding sections and were also discussed under the National Research Council of Canada and under Canada Mortgage and Housing Corporation, in the section describing relevant federal legislation. There are, as yet, few provisions in these codes which deal with indoor air quality, in anything but a general way.

Standards, and the standards bodies that set them, have been discussed in the previous sections. It is safe to say there is a worldwide shortage of standards for residential indoor air quality. This is due partly to the lack of definitive research on the health effects of complex mixes of low-level contaminants in indoor air. It should be acknowledged, however, that the same cooperative process that has, in the past, produced standards in so many other areas, is presently at work trying to address this shortage.

Standards also have their limitations, and these are freely acknowledged by the standards bodies. One important idea that is being pioneered within the federal government, by Public Works Canada, is that of 'overall building performance evaluation'. The American Society For Testing and Materials (ASTM) is also active in establishing procedural guidelines for conducting overall building performance evaluations. Such evaluations are an attempt to understand building design and performance, with the building envisaged or operating as a complete unit, rather than a series of separate systems (mechanical, electrical, etc.). The need for this new viewpoint is suggested by the fact that, in many of those buildings in Canada today that adhered strictly to accepted standards (insofar as their component parts are concerned), overall performance and acceptability has been disappointing, and some means of predicting this phenomenon is required.

In the case of indoor air quality problems, the complexity of activities and materials used in a building, from day to day, can easily defeat all intentions in design of the building structure, materials and ventilation systems, to acceptable standards, and poor indoor quality is still possible. This serves to illustrate that, while standards for indoor air quality may be helpful, they cannot alone guarantee acceptable residential air quality.

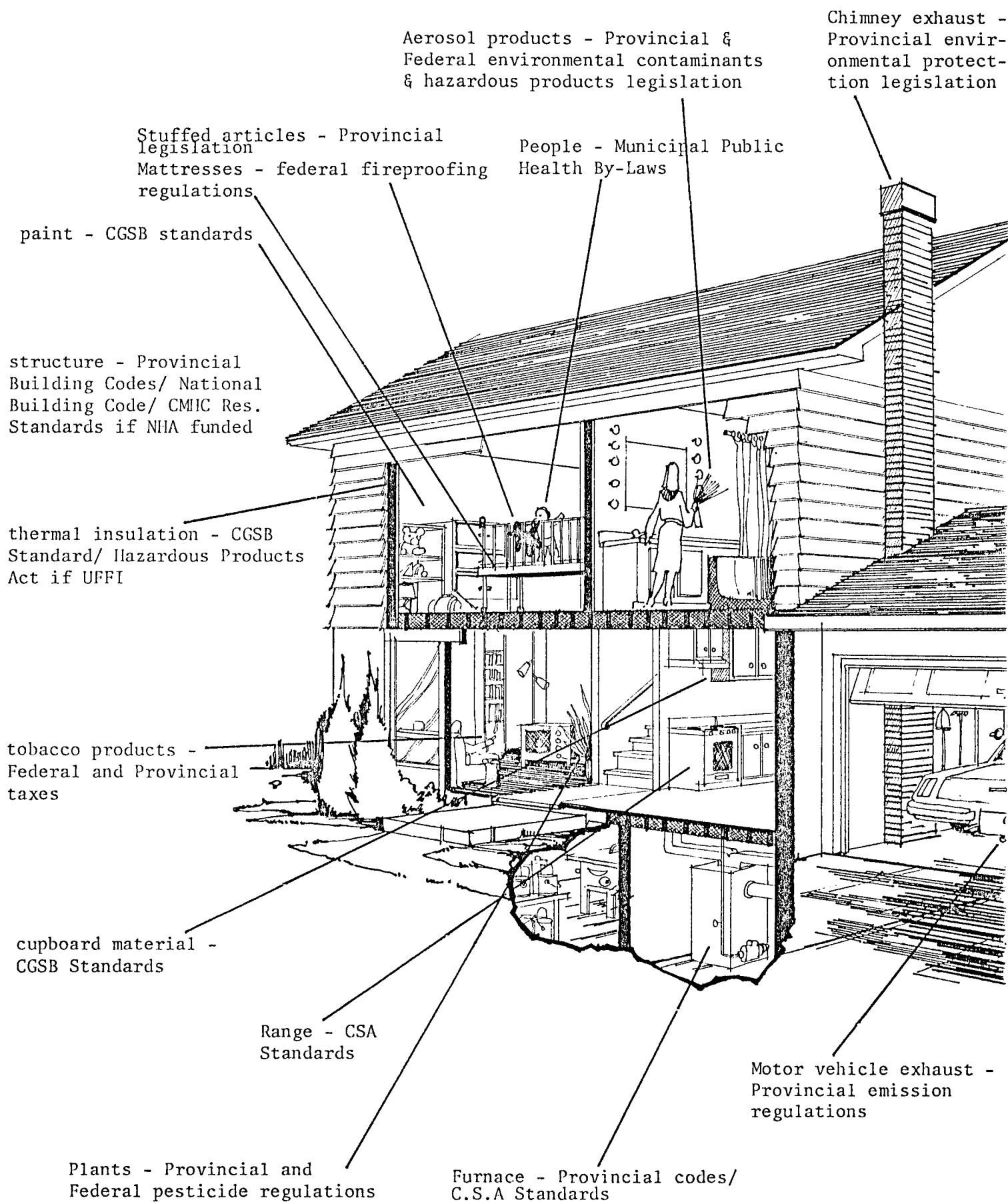
4. Visual Representation of Canadian Residence

The following page portrays a two-storey single family Canadian residence, with wall sections removed to reveal activities inside. Evident in the drawing are various potential sources of indoor air quality problems, depending on the specific materials involved and the levels of sensitivity of the occupants:

- o building materials and insulation
- o heating system
- o infiltration of exhaust and other fumes from garage
- o tobacco smoking
- o gas stove
- o basement workshop and storage of volatiles
- o spray cleaning products
- o various furnishings and fireproofed fabrics
- o synthetic carpets
- o unvented appliances, including television
- o indoor vegetation
- o the people and their metabolic products

Lines have been drawn from specific points within the dwelling to labels surrounding the drawing. These identify either specific legislation, or the general jurisdiction, government level, or standards body involved in surveillance or regulation of the situation or product.

The drawing is not intended to be complete or comprehensive. Rather it serves to illustrate that indoor air quality is both a complex physical problem and a complex organizational problem.



APPENDIX B: Policy, Regulatory and Consumer Education Issues
(Paper Presented at the 3rd International Conference on Indoor
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INDOOR AIR QUALITY IN CANADIAN HOMES:
POLICY, REGULATORY AND CONSUMER EDUCATION ISSUES

Peter Russell

Canada Mortgage and Housing Corporation, Ottawa, Canada

Bruce M. Small

Small and Associates, Goodwood, Ontario, Canada

Abstract

There are a number of reasons to question whether regulation should be the primary means of dealing with indoor air quality problems. The nature of hypersensitivity to indoor pollutant exposures is such that any practical form of regulation may not address the population that is experiencing the greatest difficulty from indoor pollution. The primary conclusion is that a broad look at various limited forms of regulation and of alternatives to regulation should be undertaken. For example, consumer, industry and professional education represent important components of an overall solution and could in some cases be significantly more effective than regulation in reducing residential indoor air pollution and improving health. Many indoor air quality problems are not technically difficult to solve. Encouraging technical innovation in housing design and better communication of early warnings could forestall proliferation of construction methods that cause indoor air quality problems.

Regulation as a Partial Solution to Indoor Air Quality Problems

It has been assumed by many that regulation will play a major part in the overall solution to residential indoor air quality problems. The nature of those problems and of the health effects involved indicates that there are many reasons to question whether regulation of products or materials should be considered the primary means for achieving reductions in residential indoor air pollution.

Fact - 'Indoor air quality' is a general term referring to a diverse set of problems. Each has its own characteristics; each may affect a distinct sub-population; each may be best addressed by a different set of solutions.

The use of volatile hobby products is a problem of different character and scope than the leakage of combustion products from furnaces and stoves. In the latter case, regulation of combustion devices, and of the design, installation and inspection of them might help to reduce the incidence of illness or death due to leakage of combustion products. In the case of hobby products, limited forms of regulation, such as banning extremely hazardous products and mandatory labelling of others, may help prevent outright poisonings. But more

intensive education of users of such products may be absolutely necessary if low-level damage due to inadequate ventilation or other misuse is to be avoided.

Fact - Residential indoor air quality problems are often multi-causal. Regulation of a few products and materials without regard to other pollution sources, such as consumer activities, may fall short of reducing illness related to indoor exposures.

A home built of materials meeting the strictest emission standards can be rendered hazardous to the health of the occupants by consumer activities such as smoking, or by using volatile household cleaners or deodorizers. While regulations may play a part, they must be incorporated in an overall set of solutions, and the occupant must be recognized as an important determinant of the indoor atmosphere.

Fact - There is a wide variation of tolerance to chemical and biological indoor air contaminants within the population. Some people have become hypersensitive to even low-level exposures to a large number of chemical and biological pollutants.

Regulations are usually built on standards which indicate a rate of emission that is not to be exceeded by a material, or a resulting maximum acceptable pollutant concentration that is not to be exceeded. To be practical, the limits must be suitable for the majority of the population.

However, high-risk and hypersensitive sub-populations include individuals who may be affected at or below these limits. These individuals may represent a significant proportion of the people reporting illness in homes, and a regulation that does not address this core group may fall short of reducing incidence of such illness. Yet setting standards at levels which recognize this group's needs may impose unrealistic construction penalties on the majority.

Fact - In contrast to other handicapped groups, the hypersensitive population is not a static one. Tolerance of chemical pollutants will vary considerably, even in one individual, with changes in age, nutritional condition, infection and other stress. Different risk factors also predispose different subgroups to be more susceptible to different individual pollutants (e.g. heart disease and carbon monoxide).

If the sub-populations affected by pollutants were relatively static, it might be possible to sort the population into different groups and ensure that housing were available to match their different pollutant tolerances. But this is not the case -- any one family may contain a wide variation in tolerances, and this range will change with time as children are born and grow, as everyone ages, etc. Evidence also indicates that chemical overexposure can trigger a state of hypersusceptibility in some persons who would appear to have no predisposing factors such as a history of allergy or family history of disease.

Fact - Persons sensitive to one pollutant are often sensitive to a number of others.

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Choosing one or two key pollutants (e.g. carbon monoxide, carbon dioxide, formaldehyde, etc.), and regulating them where possible could certainly be an important step in reducing risk from poor indoor air quality. Yet this action alone may fall short of reducing existing illness to the degree that might be expected, because those who have already been sensitized often react to a wide variety of pollutants at extremely low levels of exposure. Some attention should be paid to the problem of lowering overall exposure loads, particularly for those who already experience adverse symptoms. This may be better achieved by education and technical innovation rather than regulation.

At least two kinds of adaptation in housing may be required in the future:

1. Availability of a Variety of Homes Firstly, because there are persons who have become extremely susceptible to low-level exposures, there will always be a requirement for special housing which meets their specific needs. This is similar to the need to have some dwellings accessible to persons in wheelchairs. Not all dwellings, however, need be built to these special standards.
2. Adaptability of Any One Home Secondly, it appears desirable that the climate and air quality control in any home be designed to be adaptable for a relatively wide range of pollutant tolerance among occupants, since their sensitivities may change over time and occupancy may change. This flexibility might also minimize the induction of hypersensitivity in persons who are presently healthy, by minimizing indoor pollutant exposures for the general population.

Alternatives to Regulation

To investigate alternatives to regulation, three aspects of indoor air quality may be considered:

- 1) sources
- 2) methods of transmission
- 3) effects on people

An effective set of solutions to indoor air quality problems may include a balance of actions in all three areas (e.g. regulation of products, ventilation of homes, and medical treatment of hypersensitive individuals).

Medical Research to Reduce Susceptibility

For example, some reports indicate that nutritional therapy and therapy to reduce infection caused by fungal agents have led to a decrease in the chemical hypersensitivity in some people.

While such developments in medical research might not alter the need for major reductions in indoor air pollutants in many homes, they may reduce the need for specialized housing in which pollutant levels must be far lower than those normally well tolerated by the general population.

It is important to note that people may acquire a state of intolerance to common exposures in the home that they previously tolerated well. Often it is not the home environment itself that appears to have triggered this state -- hypersensitivity may accompany viral infection, fungal infection,

nutritional deficits, drug use, chemical exposures outside the home, and other events. Therefore even the basic focus on the indoor environment as a cause of illness, rather than merely as a symptom of illness in some cases, requires re-examination.

Technical Innovation in Housing Design

It is sometimes assumed that construction techniques which will reduce indoor air pollution are costly, impractical for general application, and incompatible with energy conservation.

There are, however, a number of techniques that could significantly reduce risk of indoor air pollutant exposure, but that are quite compatible with energy conservation and could prove both practical and cost-effective in general construction.

These include:

- o effective separation of house and combustion device air flows
- o provision of a continuous, repairable internal air barrier
- o provision of a fail-safe fresh-air ventilation system with variable control, combined with heat reclamation from exhaust air
- o use of low-emission materials and furnishings

These techniques are discussed in more detail in a separate paper. The conclusion in this context, however, is that continued research, with the goal of developing techniques which meet all these criteria, could provide the physical means to reduce indoor air pollution problems, and avoid what may ultimately prove to be unnecessary debate about compromises among health, economics and energy conservation.

Limited Forms of Regulation

There are also various limited forms of regulation, short of mandatory control, which may be useful in addressing indoor air quality problems. Two examples are voluntary regulation and regulated education.

Voluntary Regulation - Voluntary regulations formulated by industry or by non-government agencies can be effective in promoting a uniform and safe product standard. Organizations such as the Canadian General Standards Board and the Canadian Standards Association in Canada establish country-wide standards that are followed widely in industry and often adopted in building codes at the municipal level.

Regulated Education - Regulations can be used to enforce specific labelling of products, so that the consumer can be made aware of certain constituents or offgassing substances. Examples include warning labels on solvent-containing sealing compounds and outgassing standards met by different grades of particle board.

It can also be helpful to require registration and education of trades involved in construction or renovations. For example, in Canada the contractors who are carrying out remedial work in houses containing Urea-Formaldehyde Foam Insulation (UFFI) must have

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completed a training program, dealing not only with procedures to remove UFFI but how to neutralize the impregnation of wood with formaldehyde. They are also taught how to protect themselves and others during the process.

Education -- a Complement to Regulation

Education of householders and others to the state-of-the-art in indoor air pollution management need not be postponed, notwithstanding the gaps in our knowledge. This approach to indoor air quality improvement has the advantages that individual circumstances can be taken into account, and that individual choices and freedoms are not restricted.

Possible consumer actions include:

- o use of less volatile cleaning products
- o use of safer pest control methods
- o storage in outbuildings of solvents and other products which may leak trace amounts from their containers
- o control of humidity in order to reduce microbiological populations (e.g. dust mites, moulds)
- o use of low-outgassing furnishings
- o use of low-outgassing materials in renovation projects
- o increased ventilation of hobby activities
- o regular maintenance of combustion equipment and periodic checking to ensure adequate combustion air supply

Other groups such as landlords, builders, architects, engineers, manufacturers, physicians, medical researchers, and public health officials might also play a part, and educational material for these groups may prove important.

A number of the indoor air quality problems that have arisen are not technically difficult matters to deal with. They have become 'problems' because they have not been adequately recognized until the conditions that caused them have been reproduced over and over in the housing stock.

For example, tightening housing without specific provision for adequate air to combustion devices can lead to dangerous conditions in which furnaces may backdraft and carbon monoxide may accumulate and cause illness or death. It is important that people be educated to recognize this situation as a potential cause of illness and possible fatality.

More organized means of gathering 'early warnings' from the consumer and from professionals such as physicians, who see the early effects of indoor air quality problems, could also short-circuit major problems.

Conclusions

A broader look at limited forms of regulation and at alternatives to regulation should be considered. Consumer, industry and professional education has an important part to play in the overall network of solutions to indoor air quality problems. Further technical innovation in housing design could help to avoid the need for compromises among health, air quality and energy conservation.

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1. Introduction

Section 3 of the preceeding report suggested that sufficient research has been done to provide a basis for discussions among all levels of government, as well as non-government bodies, as to whether or how government regulatory powers could be used effectively to assist in solving or avoiding potential indoor air quality problems.

Although much remains to be known about the incidence and effects of many indoor air contaminants, enough is known about several topics to be able to use these as examples for such discussions. Specific problems (such as furnace design, chimney backdrafting, and emissions from sealing compounds) could be used to help focus such discussions on real, rather than theoretical, issues.

There are many questions and issues, some as yet unanswered, that might be raised by one or more parties during such discussions. This Appendix presents a sample list of the kinds of questions that are, in this author's opinion, of sufficient concern at this time to warrant inclusion.

2. Federal, Provincial and Municipal Powers

2.1 Federal Powers

Which aspects of residential indoor air quality are best addressed at the federal government level? (e.g. research on potential problems, health standards and air quality guidelines relevant to all Canadians, standards for nationally distributed household products or building materials?)

Should the federal government initiate or lead activity in this field? Does it have a role to play in overcoming lack of provincial resources for mounting appropriate research programs? Should it become a source of information only?

2.2 Provincial Powers

Which aspects of residential indoor air quality are best addressed at the provincial government level? (e.g. situations peculiar to certain geographic regions, monitoring of general public health by region, activities such as inspection and provision of information requiring direct people contact?)

2.3 Municipal Powers

Which aspects of residential indoor air quality are best addressed at the municipal government level? (e.g. gathering information on local conditions, monitoring effectiveness of programs, providing advice to

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householders (on a one-to-one basis), enforcement of building codes?)

Should municipalities be free to set indoor air quality standards which may differ from sample standards offered by the Federal or Provincial Governments?

2.4 Limits to Government Powers

Which aspects of residential indoor air quality should not be the concern of government, but rather that of manufacturers, the construction industry, and individual consumers?

2.5 Overlap of Jurisdiction

Is overlap of jurisdiction inevitable? Is overlap of jurisdiction desirable (e.g. because ensuring indoor air quality can be a complex task and may require the involvement of many people with different expertise and viewpoints?)

3. Existing Legislation

3.1 Limitations in Present Legislation

What limitations of the present legislative framework could retard the implementation of measures to improve indoor air quality, where specific problems have been identified?

Are there factors other than limitations in legislation that represent much more significant impediments at this stage?

3.2 Additional Legislation

Is it necessary to mention indoor air quality explicitly in legislation, to deal adequately with such issues?

In the longer term, would additional legislation and/or regulative authority, or additional use of existing authority, assist in improving residential indoor air quality in Canada, where necessary?

Should existing environmental legislation be broadened to include consideration of indoor air, as well as outdoor air? Should indoor and outdoor air be addressed separately in legislation? Should workplace air quality and residential air quality be addressed separately in legislation?

4. The Role of Canada Mortgage and Housing Corporation

4.1 Building Standards on Indoor Air Quality

Homes financed under provisions of the National Housing Act can be directly regulated, through application of the Residential Standards and any other building requirement imposed by CMHC. The National Energy Program (1980) noted that CMHC's position afforded an opportunity to enforce those building standards for energy conservation that would be desirable for the country as a whole. Would enforcement of building techniques, that would ensure acceptable indoor air quality, also be in the national interest?

Would such standards in fact protect the value of Canadian housing stock and thereby protect the mortgage insurance position of the federal government? Does indoor pollution necessarily and/or significantly reduce housing value?

Would such standards, in fact, help to avoid potential building-material-related health problems for Canadians in NHA-financed homes?

Should research be undertaken, by CMHC, to determine in detail, with the help of other appropriate parties, practical standards and other building requirements relating to indoor air quality that could be applied through the mortgage provisions of the National Housing Act?

4.2 Public Information and Education

CMHC also carries an overall responsibility for promoting improvement of housing conditions in Canada, independent of the mode of mortgage financing. Within this authority, it may carry on research and disseminate information to the public and to the building industry. Is public education a practical and economical means by which to avoid potential indoor air quality problems (e.g. furnace backdrafting?)

Should CMHC undertake to make the information available to the general public that will allow householders to make their own decisions as to the importance of indoor air quality issues to them?

Should CMHC actively promote the adoption of techniques within the building industry, and by the general public, that will minimize or avoid potential problems relating to indoor air quality?

4.3 Information Systems

Should CMHC develop procedures for accessing updated information on indoor air quality, for ongoing adjustments of residential standards, mortgage requirements, building guidelines and public education programs?

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5. The Role of the Building Industry5.1 Responsibilities

Individual housing consumers have not always been in a position to deal effectively with indoor air quality problems that have arisen. Should the building industry take prime responsibility for using construction methods and materials that will not cause indoor air quality problems?

Is regulatory support needed from government, to assist the industry in developing consistent methods and standards?

What are the best forums for discussing industry responsibility with appropriate representatives?

6. Self-Regulation6.1 Self-Regulation vs. External Regulation

Do some potential indoor air quality problems require more self-regulation than external regulation? Should individuals monitor and control indoor air quality to their satisfaction, with detection devices and ventilation fans, the way they address problems of heat and cold with thermostats and furnaces? Or should government regulate potential problems externally, by using laws?

6.2 Consumer Choice

To what extent can the marketplace be used as a means of curbing proliferation of products which might adversely affect the health of at least some of the population? Public information and education will stimulate some people to make choices in favour of products which do not cause them discomfort. Where can the line be drawn between a product or product characteristic that is sufficiently hazardous to be regulated, and one that may present risks that only certain individuals may wish to avoid?

6.3 Truth-in-Labelling

Would consumer power to affect the production and distribution of those products known to have at least some potential health effects, be enhanced by regulations requiring better product labelling? For example, should manufacturers be required to disclose on the product labels the types and levels of emissions from a product under normal usage (and perhaps during combustion as well)?

6.4 Buyer Resistance and Competition among Builders

Many builders have noted that the public is not always willing to pay for improvements in construction techniques and energy conservation. Buyers want a reasonably priced house, and may bypass a better built, energy conserving home in favour of one that is less expensive. Can builders be expected to voluntarily introduce measures to ensure good air quality, if in doing so there is any effect on their competitive position?

6.5 Consumer Responsibility

Should individual consumers have a responsibility for understanding their own relative susceptibility to environmental factors? Should it be up to the consumer to make those choices that may be necessary to provide his or her own compatible environment? At what level of sensitivity, or number of persons, does it become the responsibility of standards bodies or regulators to protect from possible hazard? Should consumers be responsible for reporting initial warning signs of possible hazards? Should consumers be responsible for educating themselves about possible hazards of products they use?

6.6 Flexibility in Design

Are there ways of designing and building homes that allow the consumer as much flexibility as possible in regard to indoor air quality standards? For example, energy conserving homes may be equipped with air-to-air heat exchangers with controllable fans. One family may choose, for health reasons or personal preference, the full volume of air flow, while another may choose the lowest volume of air flow.

7. The Approach to Regulation and Standards

7.1 Consumer Education vs. Regulation

Whether self-regulation or external regulation should dominate is not simply a matter of rights and jurisdictions. Would consumer education actually reduce health risks from indoor air pollution incidents more effectively than regulatory activity?

7.2 Residential vs. Occupational Environments

Can air quality in residential and occupational environments be properly considered separately? Is the total pollutant load on an individual an important determinant of disease. For example, is it possible that contaminants in the home environment may not alone be sufficient to trigger disease but that, combined with workplace

APPENDIX C: Checklist of Questions

exposures, or vice versa, conditions for disease exist? How could workplace or residential standards take into account these other exposures?

7.3 Inside vs. Outside Air

Can the issues of indoor air and outdoor air be separated? Since so much of our time is spent indoors, do outdoor air quality standards have any meaning insofar as health effects are concerned? Can they be properly determined without considering total individual exposures over time, whether indoors or outdoors?

7.4 Diversification of Lifestyle

Regulations and standards may deal effectively with products which present a potential health hazard by themselves. But those that present no hazard by themselves may, in combination with others, present a problem for some individuals. Does this suggest that a large part of our attention must be focussed on finding ways of assessing and solving indoor air quality problems in each individual home, rather than on considering products at the manufacturing level?

Indoor air quality problems are very much a function of the total mix of products, materials, construction methods and activities within a Canadian home. With the wide variety of products available to Canadians, and increasing flexibility in lifestyles, is it inevitable that there will be an increase in the number of situations for which action will be required?

7.5 Deregulation

Should government consider additional involvement in regulation, at a time when the very approach of regulation has come into question, in both Canada and other parts of the world? Should regulation, as a means of ensuring adequate residential indoor air quality, be considered only as a last resort?

8. Technological Advance

8.1 Testing Technology

It is likely that advances will be made in the development of technology for testing the effects of environmental factors on humans. At present, few tests exist that will give definitive answers and there is a great deal of controversy over the validity of tests. Will the advent of means which tell, for certain, whether a person is reacting adversely to the presence of a given contaminant, change the approach to solving indoor air quality problems?

Will the liability picture change, i.e. will it be easier to prove that a manufacturer is at fault for producing a product that adversely affects someone?

Will it lead to greater regulation, or greater responsibility for the consumer to choose products that are acceptable to his own individual sensitivities? Will it make it easier to produce products that do not have the potential to adversely affect the health of some individuals?

8.2 Consumer Product Technology and Lifestyle

One of the reasons that indoor air quality has come into prominence as an issue, is the rapid introduction of new materials, products, building techniques and lifestyles into Canadian homes, over the past several years. If technology advances as fast or faster in the coming years, is it realistic to think that any system of regulation and standards could ever protect the public from adverse health effects? Will new problems arise more rapidly than the rate at which old ones can be solved? Or will advancing technology help us keep ahead of new potential problems?

8.3 Information Technology and Feedback

Indoor air quality problems, when they arise, may present situations typical of our complex technological society in general: change, diversity, and multiple factors. Since the many potential combinations can never be anticipated in advance, must we rely instead on effective feedback to detect problems that have occurred and prevent them from continuing? This feedback, however, presently comes from multiple sources to multiple inputs - from patients to doctors, homeowners to government officials, consumers to retailers and manufacturers, etc.

How can such feedback information be effectively used? Should there be a central, independent, co-ordinating library, to which all responsible parties could contribute information, and from which they could extract information? Can computer technology be used effectively to make useful information widely available to the public, to corporations and to government?

9. Public Education

9.1 Access to Information

Widespread access to good information may be essential, if potential indoor air quality problems are to be prevented. Who should gather and disseminate such information? How can objectivity be assured? Should basic environmental control be part of school hygiene programs?

9.2 Lifestyle

Many activities within homes can cause indoor pollutant levels which present a potential health risk to some individuals. For example, certain hobby activities can be harmful particularly, if inadequate ventilation is supplied. Smoking definitely presents a health risk to both the smoker and the non-smoker.

Should government bodies inform, or attempt to influence, Canadians about adopting healthier habits relating to indoor air quality? Precedents include the Department of National Health and Welfare's activities aimed at a reduction in smoking. An example, in another area, is the active promotion of energy-conserving activity by the federal Department of Energy, Mines and Resources, (e.g. turning lights out in unoccupied rooms).

9.3 Awareness vs. Worry

Some officials have expressed concern that the public may be worse off with a little information than with none at all. Some individuals tend to embark on major changes which may not be necessary, at the slightest suggestion of a problem. To what extent should government be concerned about "worrying" Canadians? Should technical information ever be with-held because officials fear it will be misunderstood or cause anxiety?

9.4 Advocating Specific Building Practices

Should CMHC, and/or other agencies such as the National Research Council of Canada, advocate certain building construction or maintenance practices to the general public (including persons other than those involved in construction of NHA-financed dwellings) in order to minimize indoor air quality problems?

Other government bodies, such as the Department of Energy, Mines and Resources, have advocated specific techniques (eg. caulking the space between baseboards and floors on outside walls) for energy conservation purposes. However, CMHC has taken the position previously, at least in the case of the Canadian Home Insulation Program, that as a government agency it "cannot advocate the use of any particular product or practice". (CMHC Materials Acceptance, October 1981, p.6, as referenced in Standing Committee on Health, Welfare and Social Affairs Report on U.F.F.I. Dec. 1982, p.18).

9.5 Public Interest and Co-operation

Is public interest and co-operation necessary before government bodies are justified in promoting activities to reduce potential health problems? Or does government, in fact, have a responsibility for promoting public interest and cooperation, as soon as a potential problem is suspected?

10. Medical Considerations

10.1 Information and Techniques Available to Medical Practitioners

The House Standing Committee on Health, Welfare and Social Affairs pointed out, in its report on Urea-Formaldehyde Foam Insulation (December 1982, p.16), that, even if a product undergoes a pre-market review, its potential as a health hazard may not be discovered until it is widely distributed on the market. If there is to be feedback on potentially hazardous products, physicians and other health personnel must be on the lookout for the role of household products and pollutant exposures in disease.

Should there be more attention paid to provision of information to medical personnel on the role of environmental factors in disease, and should funding be made available to the research community to develop reliable testing techniques that can be applied or ordered easily by the general practitioner? Much of the controversy over UFFI has stemmed from the inability to prove decisively whether or how UFFI exposures have affected the specific individuals involved.

10.2 Inclusion of Health Factors in Standards Reviews

Should more health specialists be included on the committees of agencies that draw up accredited material and product standards? To date many building standards relate solely to engineering considerations such as strength, durability, and adequacy for the particular purpose to which it is applied.

10.3 Independent Evaluation

Would the existence of more independent review agencies help to avoid situations wherein major problems are not recognized until they are well advanced? Are there problems caused by concentrating the power to 'close the book' on a subject in a small number of hands? Does the present overlap of federal and provincial power in the area of indoor air quality provide sufficient means to avoid such a situation?

10.4 Active or Passive Alert to Potential Problems

In the area of indoor air quality and health effects, will it suffice to have review agencies which are responsive to published reports of potential problems with particular products (e.g. in the recognized scientific literature)? Does the rapidity of proliferation of new materials, products and techniques require more aggressive and expensive detective work to help recognize potential problems in their very earliest stages, before more extensive proof of damage has been fully collected and accepted by the majority of the research community?

10.5 Reduction in Pollution or Reduction in Susceptibility

In those cases in which indoor air pollution is shown to be a factor in illness, is the problem the pollution or the illness? The approach of some physicians is to treat the illness, e.g. by medications that will reduce symptoms, or by other treatments that may reduce the susceptibility of the individual to the pollutant. The approach of others is to advise that the level of air pollution be reduced.

At the same time as research is directed towards decreasing indoor air pollution, should research be encouraged that is directed towards increasing human tolerance to pollutants?

11. Professional Responsibilities

11.1 Roles and Duties of Design Professionals

Where do professional responsibilities for potential health effects of products and structures lie? Is it sufficient for the design professions to ignore potential health effects unless notified by the health professions? Should the building design professions take a more active interest in indoor air quality considerations?

(Regulation 691 under the Professional Engineers Act, Ontario includes in the definition of "professional misconduct" any violation of the Code of Ethics prepared and published by the Council of the Association of Professional Engineers of Ontario. The APEO Code of Ethics states that a professional engineer shall:

"make effective provisions for the safety of life and health of a person who may be affected by the work for which he is responsible; and at all times shall act to correct or report any situation which he feels may endanger the safety or welfare of the public".)

Could professional organizations and media (journals, etc.) be an effective channel for further education regarding potential indoor air quality problems?

11.2 Barriers Between Disciplines

Narrow professional affiliations often impede communication about problems which in reality affect many disciplines. Can these barriers be removed or minimized?

11.3 Involvement of the User in Design

Has building design suffered from lack of involvement of the end user? Could consumer input, earlier in the design process, or better consumer

feedback, help to avoid some of the potential indoor air quality problems that have now been identified? Is there any mechanism for obtaining feedback between the design professions and housing consumers?

12. Rights of Individuals

12.1 Privacy and Control of the Home

Does government have any business inquiring about the state of indoor air in Canadian residences? Can it, at the same time, meet its responsibility to promote health and to reduce hazards to Canadians, and not impose its power in the individual home? Can it, or should it, only affect the air in individual homes through attention to manufactured products? (In the case of energy, the government has promoted the application of conservation techniques by individual homeowners, and has not confined its attention to the manufacturing level.)

Do parents, and others caring for dependents, have a responsibility to provide certain standards of air quality in private homes? While people might accept this responsibility in the case of a pollutant such as carbon monoxide from furnaces, would they accept it with respect to particulate matter from tobacco smoke?

13. Legal Liability

13.1 Liability for Damage Incidental to Products or Information

Are manufacturers liable if health damage is induced by their products? Is this so even if persons affected appear to be far more susceptible to health effects than the general population? Are government agencies liable if health effects arise incidental to some other recommended action (e.g. energy conservation)?

13.2 The Cost of Seeking Legal Redress

Given the high cost of retaining legal counsel and taking a dispute through the courts, is it reasonable to consider our system of legal redress as an adequate control over potential indoor air quality problems? Sometimes people who appear to have been affected by indoor pollutants are in a poor position to retaliate, because of their state of health or because of depletion of financial resources from medical costs, lost working time, and housing changes (e.g. rebuilding a UFFI home).

APPENDIX C: Checklist of Questions

14. Economic Considerations**14.1 Economic Hardship**

The banning of U.F.F.I. made it clear that there is economic hardship and dislocation to consumers, manufacturers, distributors and installers of products which may, after initial approval, be declared hazardous. To what extent are economic factors such as these inhibiting the reduction of potential health risks due to residential indoor air pollution? Are there ways of mitigating economic hardship without postponing consideration of potential health effects?

14.2 Problems or Opportunities

Ever since control of the pollution sources affecting the outdoor environment first began in earnest, there has been controversy over whether pollution control represents a business cost or a business opportunity. The answer is twofold - it is a cost to those who pollute and an opportunity to those who are selling pollution control equipment and advice.

Should Canada investigate the potential for business opportunities related to indoor air quality control? Is this a potentially viable industry in which Canada could seize a lead role? Can exportable Canadian building technology become known for its attention to indoor air quality, as one component of good design?

15. Homeowner, Landlord and Tenant Responsibilities**15.1 Homeowner Responsibilities**

Just as family members take on responsibilities for feeding, clothing, housing and otherwise nurturing the family unit and providing financial security, it may be reasonable to expect that the adults of a family should also make themselves knowledgeable about environmental factors. Should it be as much a homeowner's responsibility to know how to provide clean air, as it is to know how to turn the furnace on, keep the grounds trimmed, etc.?

How could government shoulder the major responsibility for indoor air quality when a homeowner may be directly responsible, by his or her activities (e.g. smoking, hobbies, etc.), for the greatest proportion of the potential air quality problems?

15.2 The Tenant Rights and Responsibilities

Tenants too can pollute their own air, and to that extent the questions above also apply to them. But they also can affect others

if they live in a multiple unit dwelling. Leaky multiple unit dwellings often spread odours from one apartment to another, affecting individuals who may be more sensitive than others to tobacco smoke, perfumes, cooking smells, etc. Should tenants have any less right to clean air indoors than homeowners? Do tenants in multiple units have a responsibility to curtail polluting activities for the sake of their neighbours?

15.3 Tenant Control over Indoor Pollution Problems

Tenants often have far less control over their dwellings than do homeowners. They are not usually free to make modifications themselves if they discover an indoor pollution problem (e.g. leaky furnace) and must rely on others agreeing to provide what they may need. Should landlord and tenant legislation deal explicitly with questions of indoor air quality, requiring landlords to respond when problems arise?

15.4 Landlord Responsibilities

Should specific standards of indoor air quality be established that must be met, by landlords for their tenants? There is wide variation in individual sensitivities to air pollutants; to what extent should landlords be responsible for catering to persons with greater sensitivities? To what extent are landlords presently liable for damages suffered as a result of poor indoor air quality?

15.5 Responsibilities of the Multiple Unit Developer

Should special construction techniques be required for multiple unit dwellings, to avoid inadvertent mixing of air between apartment units (through unsealed pipe chases, etc.)? Are there ways of building and operating multiple units dwellings that will allow tenants greater control over their own environment?

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