

RESEARCH REPORT



Studies on Indoor Air Quality in Canadian Homes: Research and Information Base



CMHC—HOME TO CANADIANS

Canada Mortgage and Housing Corporation (CMHC) has been Canada's national housing agency for more than 60 years.

Together with other housing stakeholders, we help ensure that Canada maintains one of the best housing systems in the world. We are committed to helping Canadians access a wide choice of quality, affordable homes, while making vibrant, healthy communities and cities a reality across the country.

For more information, visit our website at **www.cmhc.ca**

You can also reach us by phone at 1-800-668-2642
or by fax at 1-800-245-9274.

Outside Canada call 613-748-2003 or fax to 613-748-2016.

Canada Mortgage and Housing Corporation supports the Government of Canada policy on access to information for people with disabilities. If you wish to obtain this publication in alternative formats, call 1-800-668-2642.

STUDIES ON
INDOOR AIR QUALITY IN CANADIAN HOMES

Research and Information Base

Prepared for
the Research Division
Canada Mortgage and Housing Corporation
Ottawa, Canada K1A 0P7
by
Bruce M. Small and Associates Limited
R.R.#1, Goodwood, Ontario L0C 1A0
March 1985

Principal Consultant:	Bruce M. Small, P.Eng. Small and Associates
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 document describes the research and information base in Canada for addressing problems relating to indoor air quality in Canadian housing. Its purpose is to provide a reference document for government and building industry officials, research funding agencies, air quality and building science researchers, and other interested persons throughout Canada.

The 'Research and Information Base' study is part of a four-point project for the Canada Mortgage and Housing Corporation, to assist in defining effective means of addressing existing or potential indoor air quality problems in Canadian homes.

The following areas were addressed during 1984/85:

- 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 Research Division of CMHC would appreciate receiving comments on and additions to this publication, as well as ideas on all aspects of residential indoor air quality issues. It is planning an update, for mid 1987.

The authors of this report are grateful for the advice and assistance received from many individuals, in Canada Mortgage and Housing Corporation, in other federal departments and agencies, in provincial governments, in universities and in the private sector, during this study program.

TABLE OF CONTENTS

Foreword	ii
Table of Contents	iii
Terms of Reference	v
Introduction	vi
Index of Project Titles in Page Order	vii - xiv
PART 1: RESEARCH BASE	1 - 239
PART 2: INFORMATION BASE	240 - 278
PART 3: INDEX SECTION	279
Project Titles in Alpha- betical order (Keyword in Context Index)	281 - 324
Index of Research and Funding Organizations in Alphabetical Order	325 - 332
Name Index	333 - 336
Subject Index	337 - 352

TERMS OF REFERENCE

The listings in Part 1 and the information in Part 2 respond to the following list of actions, identified as a partial terms of reference for the Research and Information Base component of the CMHC indoor air quality studies:

1. Contact universities, research organizations, government agencies, etc. in order to determine who is, or has been, engaged in indoor air quality research in Canada (which may be relevant to Canadian housing).
2. Meet with, or carry on correspondence with, researchers and others to determine nature of work, results to date, papers available, plans for future work, suggestions for information sources and information needed by researchers, etc.
3. Through literature search and contacts, determine, to whatever extent is feasible during the study period, other major research efforts, beyond Canada, that may be relevant to the question of indoor air quality in Canadian housing.
4. Make a list of work published in Canada, in the field of indoor air quality, that is relevant to Canadian housing.
5. Determine what testing and other research facilities and equipment exist in Canada, for determining indoor air quality.
6. By querying libraries and research organizations, determine what collections of information and periodicals, relating to indoor air quality, are available to Canadians wishing to keep up to date in this field.
7. Determine what services, whether government, commercial, or non-profit, are available to individual Canadian homeowners, landlords or tenants, to assist them in acquiring information, or other assistance relating to suspected indoor air quality problems.
8. Determine what agencies or persons presently monitor the Canadian housing stock, or Canadian population, for potential indoor air quality problems and effects.
9. Determine what agencies or persons are presently responsible for, or active in alerting the Canadian public about, potential or present problems relating to indoor air quality in homes.

INTRODUCTION

Indoor air pollution represents a complex problem involving property, civil rights, human health, products, regulations, standards, consumer protection, building design and many other factors. The potential sources of indoor air pollution are numerous, as are the potential means of control. The health effects are not well understood, nor is the extent to which the Canadian population may already be affected, or at risk of being affected, with continued exposure to indoor contaminants. A potential problem, in some Canadian homes, has been identified, but that problem is still being unravelled and defined.

A problem of this complexity requires the attention of persons of many disciplines, examining problems from many different points of view. The listings in PART 1: RESEARCH BASE reflect this fact - the reader will discover that a wide variety of individuals, corporations, agencies and government bodies are already active in research of, and in providing services relating, to indoor air quality.

The listings provide skeleton outlines of the activities and expertise across Canada, in the indoor air quality field. They are deliberately brief, and readers are encouraged to directly contact the persons listed, to obtain background papers and direct answers to questions that this report may provoke. Please note that inclusion in the listings does not imply any endorsement of the capabilities of the persons or organizations listed, by either this author or by the funding agency. Persons or organizations inadvertently excluded from the listings are invited to send appropriate information to Canada Mortgage and Housing Corporation for possible inclusion in later publications/revisions of this document.

The projects are not listed in any particular order of importance. Rather, the reader is invited to make use of five different indexes in order to find the information he or she needs. The first index follows this introduction:

Index of Project Titles in Page Order

The remaining indexes can be found at the end of the document:

- o Project Titles in Alphabetical Order (Key Word in Context Index);
- o Index of Research and Funding Organizations in Alphabetical Order;
- o Name Index; and
- o Subject Index.

PART 2: INFORMATION BASE discusses the sources of written information on indoor air quality, and may provide the reader with some guidance on keeping up to date in this field. Since the Research Base section concentrates on the Canadian research scene, readers may wish to consult other organizations, listed on pp. 251-254 of the Information Base section, regarding similar activities underway in other countries.

Index of Project Titles in Page Order

Dust Associated with Urea-Formaldehyde Foam Insulation	1
Interaction of Nitrogen Oxides in Air and Certain Classes of Pesticides	2
Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO ₂ Gas	2
Production of NitrosoBaygon from Baygon in NO ₂ Gas: I. Identification of NitrosoBaygon	2
Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels	2
NitrosoBaygon Formation in Nitrogen Dioxide Gas	2
Retrofit Fireplace Damper	3
Fresh Air Intake for Fireplaces	4
Energy Efficient Housing Demonstration Project	5
A New Approach to Affordable Low Energy House Construction	5
Assessment of the Energy Saving Measures Used in the ER-1 Conservation/ Solar Research House	5
Industrial Air Quality	6
Influence of Exhaust Velocity and Wind Incidence Angle on Dilution from Roof Vents	6
Air Leakage Flow Correlations for Varying House Construction	6
A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents	6
Estimates of Building Surface Concentrations from Nearby Point Sources	6
Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes	6
The Effect of Varying Exhaust Stack Height on Contaminant Concentration at Roof Level	6
Predicting the Spatial Distribution of Concentration Fluctuations from a Ground Level Source	6
Interaction of a Roof Level Plume with a Downwind Building	6
Contamination of Air Intakes from Roof Exhaust Vents	6
Alberta Home Heating Research Facility	7
A Study of Residential Housing Envelope Heat Losses	7
A Study of Air Leakage in Calgary Residences	8
Occupational Health Clinic	9
Engineering Appraisal, Research, Advice and Testing re Air Quality	10
Indoor Air Quality Sampling and Analysis	11
Indoor Air Quality Studies and Measurement	12
Formaldehyde Measurements in Schools and Homes	13
Field Experience with Chemical Scrubbers for Formaldehyde	13
The Measurement of Formaldehyde Levels in Wall Cavities of UFFI-Insulated Buildings	14
Relationships to Indoor Living Space Formaldehyde Levels	14
Household Facilities and Equipment	15
Canada Health Survey	16
Survey of Smoking Habits	17
Indoor Air Quality Measurement - Commercial and Industrial	18
Indoor Air Pollution From Woodburning Stoves	18
Seminar on Indoor Air Quality	19
Ventilation Standards for Acceptable Indoor Air Quality	19
Air Movement and Infiltration Analysis	20

Index of Project Titles in Page Order

Building Science and Engineering	20
Energy Conservation in Buildings	20
Ventilation and Space Conditioning in Commercial, Industrial and Residential Buildings	20
Second Conference on Building Science and Technology	20
Indoor Air Quality Studies	21
Recirculation of Exhaust Gases in Academic Research Buildings	21
Determination of Biologically Active Dusts in Recirculated Air	21
Demands on Health Inspectors and Resources Needed to Handle Indoor Air Pollution Problems	21
Urea-Formaldehyde Foam Insulation in Homes	21
Hazards in the Home	22
Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems	23
Moisture Induced Problems in NHA Housing: Literature Review and Research	24
Moisture Induced Problems in NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland	25
Ambient Air Monitoring	26
Preparation and Analysis of Air Sampling Filters	27
Indoor Air Quality Sampling	28
Formaldehyde and Air Contamination Committee	29
Interim Guidelines for Domestic Formaldehyde Exposure	29
Interaction Between Energy Conservation and Indoor Air Quality	30
Residential Chimney Backdraft Checklist: Design and Evaluation	30
Emissions from Woodstoves	31
Environmental Health Factors in Falling Accidents	32
Accreditation of Standards-Writing Organizations	33
Standards for Methods of Measurement of Indoor Air Contaminants	34
Literature Review and Analysis re Ventilation Standards	35
Field Performance Evaluation of Departmental Houses	36
Energy Efficient Northern Housing	37
Indoor Air Quality Investigation and Analysis	38
TLV's for Non-Standard Work Schedules	38
Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in Port Hope, Ontario	39
Potential Health Impact of Enhanced Radiation Levels in Port Hope	39
Site Investigation Techniques	39
The Seasonal Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f")	39
The Radon/Working Level Profile	39
Measurement of UFFI Off-gassing	40
Remedial Measures for UFFI Homes	40
The Reduction of Indoor Formaldehyde Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI)	41
Air Quality Monitoring	42
Canadian Centre for Toxicology	43
Air quality Monitoring, Environmental and Socio-economic Impact	44
Consumer Information and Complaint Service	45
Airborne Asbestos Investigation in University Classrooms	46

Index of Project Titles in Page Order

Air Quality Investigation of an Office Building for Possible Presence of Airborne Asbestos	47
Airborne Formaldehyde Concentration in Carcass Storage Rooms of the College of Veterinary Medicine	48
Bad Odour Problems at a Retail Store	49
Airborne Asbestos Particles in a Printing Press	49
Air Quality in an Energy Efficient Office Building	49
Assessment of Airborne Asbestos Contamination in Saskatoon Arena	50
Indoor Air Quality and Health Investigation of Three Schools	51
Investigations of Potential Respiratory Irritants or Allergens in Thermally Insulated or Fire-gutted Homes	52
Airborne Asbestos Particles in a Curling Rink	53
Airborne Asbestos Particles in a Large Office Building	54
Investigation of Health and Comfort Complaints in the Workplace	55
Air Control Systems	56
Socio-economic and Energy-related Impacts of Regulations	57
Development of Air Purifiers	58
Testing of UFFI Homes	58
HVAC Design	59
Indoor Air Quality and Risk Assessment	60
Development of Passive Sampler Systems	60
Building Investigations and Literature Reviews	61
Report of the Subcommittee on Formaldehyde and Air Contamination	62
What You Should Know About Asbestos	62
Investigation of Homes with Urea-Formaldehyde Foam Insulation	64
Indoor Air Quality Evaluations	65
Monitoring of Developments in the Indoor Air Quality Field	65
Seminar Courses Pertaining to Indoor Air Quality	66
Homeowner Information on Energy Conservation and Air Quality	67
Insulation Aftermath	67
Canadian Answer Book to Home Insulation Conflict and Confusion	67
J'isole Mieux, Repérer et Corriger les Défauts de l'Isolation	67
Indoor Air Quality Analysis for Microbial Factors and Trace Organics	68
Seminars on Ventilation of Energy Efficient Houses	69
Contaminants from Residential Combustion Appliances in the Indoor Environment	70
Data Acquisition and Telemetry Systems Applicable to Air Quality Measurement	71
Energy Efficient Buildings Program	72
Literature Research and Air Quality Monitoring	73
Effects of Automotive Emissions	73
Air Exchange Products and Newsletter	74
Laboratory Services for Indoor Air Quality Sampling	75
Comprehensive Environmental Laboratory and Field Services	75
Chemical Hazards and Energy Conservation in Buildings	76
Home as a Hazard	77
Upgrading Residential Forced Air Filtration	78
Updating Health Standards for Residential Construction	79
Strategies for Healthful Residential Environments	79
Design and Construction of Low-Energy and Low-Pollution Homes	80

Index of Project Titles in Page Order

Low Energy Houses	80
Air Changer Application Guide	80
Information and Support for Persons with Allergies	81
Indoor Inhalant Sensitivities	81
Indoor Air Quality Monitoring: Commercial/Industrial	82
Air Quality Research: Measurement and Literature Surveys	83
A Study of Residential Combustion Air Requirements and Air Supplies	83
Criteria Reviews of Indoor Air Quality	83
Indoor Carbon Dioxide Monitoring	84
Literature Review on Indoor Air Pollution and Housing Technology	85
Indoor Air Pollution and Housing Technology	85
Studies on Indoor Air Quality in Canadian Homes	86
Research and Information Base	86
Documentary: The Twentieth Century Disease	87
State-of-the-Art Review of Indoor Pollution Research	88
Inquiries Services for Occupational Health and Safety	89
Radiation Emissions from Video Display Terminals	89
Very Low Frequency Fields Near VDTs	89
Filtering Equipment for Fine Particulates and Gaseous Pollutants	90
Filtering Equipment: Gaseous Pollutants	90
Formaldehyde in the Indoor Environment	90
Indoor Air Quality Sampling and Analysis	91
Federal Building Energy Conservation R&D Plan	92
Evaluation of Radon and Air Quality Control Techniques	93
Development of Alternative Electronic Air Filters	94
Indoor Air Monitoring for Asbestos	95
Information and Support for Persons Susceptible to Indoor Pollutants	96
Air Infiltration Monitoring	97
Radiation Monitoring	97
Smoke Movement Studies	97
Program for Monitoring Indoor Air Quality in Homes	98
Effect of Indoor Environmental Factors on Human Platelets, as Seen by Transmission Electron Microscopy	99
Urea-Formaldehyde Foam Insulation (UFFI) Home Testing	100
Indoor Air Pollution: Experience of the Public Health Branch	101
Environmental Factors in Chronic Lung Disease	102
Health Effects of Particulates and SO ₂ Level in Air Pollution	103
Self-help Group to Aid Persons with Environmental Allergy	104
Studies in Air Quality Analysis and Building Evaluation Techniques	105
Office Environment Assessment	106
Education and Rehabilitation of Persons Sensitized to Indoor Air Pollutants	107
Indoor Air Quality Databank	108
Indoor Air Quality Investigations	109
Building Performance Database	109
Air Quality in Animal Housing	112
Exploratory Examination of Hypersensitive Individuals	115
Ventilation Systems Design, Optimization and Control	116
Controlling Workplace Exposure to Asbestos Fibers	116
Indoor Air Quality Sampling, Monitoring and Modelling	117

Index of Project Titles in Page Order

Comprehensive Planning, Programming and Evaluation of Interior Environments	118
Environmental Literature Collection	118
Sampling and Analysis of Formaldehyde in UFFI Homes	119
Evaluation of Air Cleaning Devices With Respect to Formaldehyde	119
UFFI Research Program	120
UFFI Centre / Centre sur la MIUF	120
Federal Assistance Program for UFFI Homeowners	120
Urea-Formaldehyde Foam Insulation Centre	120
Sampling and Analysis of Formaldehyde in UFFI Homes	124
Biomedical Research and Toxicology	127
Formaldehyde Assay Kit	127
Toxic Chemicals on the Farm	127
International Journal of Immunopharmacology	127
Indoor Air Quality Testing, Odour Measurement and Control	128
Indoor Organic Contaminants in Energy Efficient Buildings	128
Bi-Monthly Environmental Newsletter	129
Indoor Air Quality Studies, Particularly Radon Emissions	130
Indoor Air Quality Measurements	131
Analysis of Asbestos Samples	132
Optimum Air Filter Efficiency Study	133
Indoor Air Quality: Industrial	134
Environmental Performance of Office Buildings	135
Programming, Design and Evaluation of Built Environments	136
Improved Safety of Vented Gas Appliances	137
The Effects of Residential Airtightening	137
Modelling the Movement of Radon Through Soil into Houses	138
Future Radon Levels at a Proposed Building Site	139
Remedial Measures for the Radiation Reduction and Radioactive Contamination of Elliot Lake, Ontario	140
R-2000 Low-Energy Home Demonstration Program: Air Quality Monitoring	143
HEATLINE Telephone Advisory Service	144
Measurement of Inorganic Contaminants in Indoor Environments	145
Indoor Air Quality Analysis: Polycyclic Aromatic Hydrocarbons	146
Measurement of Organic Contaminants in Indoor Environments	147
Federal-Provincial Working Group on Indoor Air Quality	148
Measurement of Radon and Radon Daughters in Canadian Homes	149
Expert Advisory Committee on Dioxins	150
Workshop on Development of Biological Indicators for the Effects of Urea-Formaldehyde Foam Insulation	151
Workshop on the Toxicology of UFFI	151
Transcription of the Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; October 1982	152
Projet de recherche sur la qualité du milieu de travail dans les édifices à bureaux	153
Quality of the Working Environment in Office Buildings	153
Analyse des éventuelles réactions d'hypersensibilité à la mousse isolante d'urée-formaldehyde et a ses sous-produits	154
Analysis of Possible Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts	154

Index of Project Titles in Page Order

Organisation d'une conférence de consensus sur les problèmes de santé potentiellement reliés à la mousse isolante d'urée-formaldehyde	155
Consensus Conference on Health Problems Potentially Related to Urea Formaldehyde Foam Insulation	155
Trace Organic Laboratory for Analyzing Indoor Air Quality	156
Occupational Safety and Health Act - Designated Substances	156
Emissions from Polyurethane Foam Insulation on Domestic Storage Tank Water Heaters	157
Indoor Emissions from Polyurethane Foam	158
Air Quality in Houses	159
Carbon Dioxide Controlled Outside Air Supply	160
Contaminant Emissions From Gas Stoves	161
Contaminant Emissions From Kerosene Heaters	162
Field Study of Formaldehyde Emissions from ParticleBoard	163
Methods for Field Measurement of Material Off-Gassing	164
Dynamic Emission Chamber	165
Air Infiltration Characteristics of Houses	166
Air Quality in Low Energy Houses	167
Air Quality Measurements in a Group of Low Leakage Houses	167
The Estimation of Total Human Exposure to Pollutants	168
Models for Indoor and Outdoor Exposure to Air Pollutants	168
Humidity, Condensation and Ventilation in Houses	169
National Research Council of Canada	169
Performance of Passive Ventilation Systems	170
Mechanical Fresh-Air Ventilation Systems in Detached Houses	171
Chemical Susceptibility and Urea-Formaldehyde Foam Insulation	172
Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; May 17/18, 1983	173
Technical Support for the Investigation of Problems Associated with Urea-formaldehyde Foam Insulation	174
Chemistry and Monitoring of Indoor Air Contaminants	175
Investigations into Various Formaldehyde Monitoring Devices	175
Testing and Analysis of Formaldehyde in UFFI Homes	177
Indoor Air Quality Measurements for Offices and Residences	178
Efficiency of Formaldehyde Gas Collection Impingers	179
Home Energy Leakage Project (H.E.L.P.)	180
Response to Inquiries on Fuel Combustion and Ventilation	181
Fuel-fired Appliances: Combustion Air Requirements Regulations	181
Impact of Energy Conservation on Indoor Air Quality	182
Household Pollutants and Householder Education	183
Comité sur la qualité de l'air dans les habitations	184
Committee on Residential Air Quality	184
Controlled Exposure of Asthma Patients to UFFI Gases and Formaldehyde	185
Relationship Between Indoor Air Quality and Weathersealing	187
Custom Electronic Instrumentation	188
Environmental Analysis Using Gas Chromatography and Mass Spectrometry	189
Project Management and Research in Indoor Air Quality	190
Residential Combustion Safety Checklist	190
Facilities Design for Air Cleaning and Monitoring	191
Indoor Air Pollution Monitoring	192

Index of Project Titles in Page Order

Energy Conservation and Indoor Air Quality	192
Occupational and Environmental Health Unit	193
Working Group on Environmental Monitoring (1982)	194
Physiological Reactions to the Sum of all Indoor Problems	196
Literature Review Capability: Indoor Air Quality	197
Facts and Policy Issues Regarding Indoor Air Quality	198
Chemical and Mutagenic Activity of Adsorbed Polycyclic Aromatic Hydrocarbons	199
Canadian Issues and Opportunities in Indoor Air Quality	200
International Specialty Conference on Indoor Air Quality in Cold Climates	202
Hazardous Heating and Ventilating Conditions in Housing	203
Ventilation Standards for Areas North of the Tree Line	204
Evaluation of Remedial Measures in UFFI Homes	205
Ventilation for Humidity Control	206
Indoor Air Quality Effects of Heat Recovery Ventilators	207
Assessment of Medium Efficiency Air Filtration	208
Testing Air Quality in Weatherized Homes	209
Changes in Air Exchange Guidelines: Ontario Building Code 1983	210
Evaluation of Air Exchange Levels (Elliot Lake)	210
Remedial Measures Advice for UFFI Homeowners and Contractors	211
Richmond Hill Demonstration Project: An Air Sealing Study	211
Thermal and Flow Performance of Chimney Flues	211
Analysis of Formaldehyde Dosimeters	213
Laboratory Registration Program	213
Energy Conservation Studies	215
Development of a Water Spray Air Scrubber	216
Adverse Health Effects from Urea-Formaldehyde Foam Insulation	217
Comparison of UFFI and Non-UFFI Residents Before and After Remedial Measures	218
Historic Health Records of School Children in UFFI Homes	219
Removal of Urea-Formaldehyde Foam Insulation from Masonry Structures	220
Identification of Formaldehyde Sources and Emission Rates	221
Factors that Influence Assessments of Health Effects of Air Pollution	222
Health and Safety Advisory Panel	223
Safety Evaluation of Unvented Kerosene Heaters	224
Testing of Unvented Kerosene Heaters	225
Sampling and Evaluation of Interior Environments	226
Investigation of Air Quality in Sick Buildings	227
Investigation of Air Quality in Energy Efficient Homes	228
Investigations Into Cost Effective UFFI Removal Techniques	230
Techniques to Reduce Formaldehyde Levels	230
Heating and Ventilation of Residences	231
Energy Implications of Various Outdoor Air Ventilation Standards for Office Buildings	232
Thermal Envelope Upgrading	233
Ventilation Studies	233
Structure of Airflow in Rooms	234
Air Quality Monitoring	235
Field Research on Indoor Air Quality	236
Indoor/Outdoor Air Quality Relationships for Homes and Elementary Schools	237

Index of Project Titles in Page Order

Identifying Ventilation-Troubled Houses	238
Pollution and Education in Toronto	239
Information Base	241
Periodicals Containing Articles Relating to Indoor Air Quality	243
Library Holdings in Indoor Air Quality	246
Bibliographies, Update Services and Newsletters	251
Published Texts and Reports	251
Air Infiltration Review and Additions to AIRBASE	252
Indoor Air Quality Research Notes	252
Using Major Canadian and U.S. Computer Data Base Systems	255
Directory of Federally Supported Research in Universities	260
Libraries with Data Access Facilities	265
Direct Access to Computer Databases	272
Getting Hard Copy of Desired Articles	275
Accessing Other Computer Data Bases	277
Directory of Canadian Scientific and Technical Databases	277

PART 2: RESEARCH BASE

Activity and Description:

**Investigation of Dust Associated with
Urea-Formaldehyde Foam Insulation**

While an associate professor with the Man-Environment Studies Division of the University of Waterloo, Dr. Edward Farkas postulated and investigated the theory that, at least in part, health problems associated with urea-formaldehyde foam insulation (UFFI) could be related to the production of a fine dust from degradation of the foam. The UFFI dust is carried from the wall cavities into the living space of a home.

Preliminary investigation included assessment of methods for collecting and analyzing UFFI dust in 1981 and 1982.

Research Organization:

University of Waterloo

Edward J. Farkas, Sc.D., P.Eng.
(formerly Assoc. Prof., Man-Environment Studies
University of Waterloo)

present address:
71 Black Hawkway
Willowdale, Ontario
M2R 3L7
(416)-665-2479

Activity and Description:

Interaction of Nitrogen Oxides in Air and Certain Classes of Pesticides Commonly Used in Buildings

Certain classes of pesticides commonly used in buildings (e.g. carbamates) react with nitrogen oxides (NO_x) in air to produce potent carcinogenic and teratogenic compounds (N-nitroso pesticides). Gas stoves, kerosene heaters, and other combustion equipment or activities in dwellings, as well as infiltration of exterior air pollution (e.g. from urban environments), supply NO_x to indoor air. Over the period of exposure (to the nitrogen oxides) of deposited pesticide films (e.g. on baseboards, in cupboards), substantial formation of N-nitroso derivatives of the pesticides occurs.

Research underway includes identification of compounds produced in the interaction and evaluation of the environmental impact of the interaction.

Research Organization:

University of Western Ontario

Joseph E. Cummins, Ph.D.
Assoc. Professor, Dept. of Plant Sciences
Biological and Geological Sciences Building
University of Western Ontario
London, Ontario
N6A 5B7
(519)-679-2891

Funding Organization:

Natural Sciences and Engineering Research Council (Canada)

Publications:

Cummins, J.E., 1982. Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO₂ Gas. Pesticides Division, Health and Welfare Canada, August 5, 1982.

Cummins, J.E., 1981. Production of NitrosoBaygon from Baygon in NO₂ Gas: I. Identification of NitrosoBaygon. Pesticides Division, Health and Welfare Canada, December 16, 1981.

Cummins, J.E., 1982. Production of NitrosoBaygon from Baygon in NO₂ Gas: II. Formation of NitrosoBaygon at Low NO₂ Levels. Pesticides Division, Health and Welfare Canada, August 24, 1982.

Cummins, J.E., 1982. NitrosoBaygon Formation in Nitrogen Dioxide Gas. *Envir. Mutagenesis* 4:337.

Activity and Description:

Retrofit Fireplace Damper

The purpose of this project was to develop and test a top sealing fireplace damper, which reduces infiltration caused by non-operating masonry chimneys, and which is fail safe and easy to operate. The test results confirmed that the damper has excellent sealing quantities which reduce heat loss through the fireplace chimney.

Project is completed.

Researcher:

Dr. M. A. Hatzinikolas, P.Eng.
3240 - 105 Street
Edmonton, Alberta
T6J 3A2
(403)-435-5142 or (403)-489-1768

Funding Organization:

Alberta Department of Housing

Robert Sloat, Manager
Research and Development
4th Floor, 112 Professional Building
10050 - 112 Street
Edmonton, Alberta
T5K 2J1
(403)-427-8150

Publication:

Hatzinikolas, M.A., 1983. Report on Retrofit Fireplace Damper
Published by Alberta Department of Housing, Innovative Housing Grants
Program, Fourth Floor, 10050-112 St., Edmonton, Alberta T5K 2J1.
September 1983, 20 pages. ISBN 0-88654-012-7.

Activity and Description:

Fresh Air Intake for Fireplaces

This project designed, developed and tested an internally operated fresh air intake device for fireplaces to supply combustion and makeup air. The device provides controlled combustion, and because of the double shutter arrangement eliminates heat loss when the fireplace is not in operation.

The project is completed.

Researcher:

Dr. M. A. Hatzinikolas, P.Eng.
3240 - 105 Street
Edmonton, Alberta
T6J 3A2
(403)-435-5142 or (403)-489-1768

Funding Organization:

Alberta Department of Housing

Robert Sloat, Manager
Research and Development
4th Floor, 112 Professional Building
10050 - 112 Street
Edmonton, Alberta
T5K 2J1
(403)-427-8150

Publication:

Hatzinikolas, M.A., 1984. Fresh Air Intake for Fireplaces.
Alberta Dept. of Housing, Innovative Housing Grants Program, Fourth
Floor, 10050 112 Street, Edmonton, Alberta T5K 2J1, April 1984.
22 pages, ISBN 0-88654-044-5.

Activity and Description:

Energy Efficient Housing Demonstration Project

Part of this project is to monitor the performance of test/demonstration houses, in terms of operating cost, air quality, envelope performance, etc., and document the results.

The project is ongoing.

Research Organization:

Lincolnberg Development Corporation

Lewis Nakatsui, P.Eng.
Vice-President, Projects
4367 - 99 Street
Edmonton, Alberta
T6E 5E4
(403)-438-2436

Associates - J. W. Lstiburek, P.Eng., J. K. Lischkoff

Funding Organization:

Alberta Department of Housing

Robert Sloat, Manager
Research and Development
4th Floor, 112 Professional Building
10050 - 112 Street
Edmonton, Alberta
T5K 2J1
(403)-427-8150

Publication:

Lstiburek, J.W., and Lischkoff, J.K., 1984. A New Approach to Affordable Low Energy House Construction. By Lincolnberg Development Corporation for Alberta Dept. of Housing. Innovative Housing Grants Program, Fourth Floor, 10050 112 Street, Edmonton, Alberta T5K 2J1, July 1984. 78 pages, ISBN 0-88654-074-7.

Rekken, G.M., P.Eng., and Howell, D.G., P.Eng., 1983. Assessment of the Energy Saving Measures Used in the ER-1 Conservation/ Solar Research House. G. M. Rekken and Associates Ltd. for Alberta Dept. of Housing. Innovative Housing Grants Program, Fourth Floor, 10050 112 Street, Edmonton, Alberta T5K 2J1, Tel: (403)-427-8150. July 1983. 73 pages & App., ISBN 0-88654-017-8.

Activity and Description:

Industrial Air Quality

Prof. David Wilson has expertise in industrial air quality work, stack design for dispersion, and air infiltration in housing.

Research Organization:

University of Alberta

Prof. David J. Wilson
Dept. of Mechanical Engineering
University of Alberta
Edmonton, Alberta
T6G 2J9
(403)-432-5467

Publications:

Wilson, D.J., and Chui, E., 1985. "Influence of Exhaust Velocity and Wind Incidence Angle on Dilution from Roof Vents". Submitted for ASHRAE Symposium on Air Flow Around Buildings and for publication in ASHRAE Transactions.

Kiel, D.E., Wilson, D.J., and Sherman, M.H., 1985. "Air Leakage Flow Correlations for Varying House Construction", submitted to ASHRAE Transactions.

Wilson, D.J., 1983. "A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents". ASHRAE Transactions 89, Part 2.

Wilson, D.J., and Britter, R.E., 1982. "Estimates of Building Surface Concentrations from Nearby Point Sources". Atmospheric Environment 16, pp. 2631-2645.

Wilson, D.J., 1982. "Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes". ASHRAE Transactions 88, part 1, pp. 503-513.

Wilson, D.J., and Winkel, G., 1982. "The Effect of Varying Exhaust Stack Height on Contaminant Concentration at Roof Level". ASHRAE Transactions 88, Part 1, pp. 513-533.

Wilson, D.J., Robins, A.G., and Fackrell, J.E., 1982. "Predicting the Spatial Distribution of Concentration Fluctuations from a Ground Level Source". Atmospheric Environment 16, pp. 497-504.

Wilson, D.J., and Netterville, D.D.J., 1978. "Interaction of a Roof Level Plume with a Downwind Building". Atmospheric Environment 12, pp. 1051-1059.

Wilson, D.J., 1976. "Contamination of Air Intakes from Roof Exhaust Vents". Trans. ASHRAE 82, pp. 1024-1038.

Activity and Description:**Alberta Home Heating Research Facility**

Six housing modules have been evaluated, over a four year period, in terms of heat loss. A continuous air leakage monitoring system, using sulphur hexafluoride gas, has been developed as part of the project. Project began 1979 and is continuing post 1983.

Research Organization:

University of Alberta, Dept. of Mechanical Engineering

Doug Dale, researcher
 Mark Ackerman, T. Forest, David J. Wilson,
 G.W. Sadler, associate researchers
 Department of Mechanical Engineering
 University of Alberta
 Edmonton, Alberta
 T6G 2G8
 (403)-432-5317

Funding Organization:

Alberta/Canada Energy Resources Research Fund
 Natural Sciences and Engineering Research Council, Ottawa
 Energy Mines and Resources Canada
 Alberta Masonry Institute

Juergen Kleta, Director,
 Energy Conservation and Renewable Energy Research
 Alberta Energy and Natural Resources
 2nd floor, Pacifica Plaza, 10909 Jasper Ave.
 Edmonton, Alberta T5J 3M8
 (403)-427-2983

Publication:

Dept. of Mechanical Engineering, U. of Alberta, Edmonton T6G 2G8:

Report No. 34 (1983): "Final Report on the Alberta Home Heating Research Facility"

Report No. 35 (1983): "A Study of Residential Housing Envelope Heat Losses"

Report No. 36 (1983): "A Simulation Model for a Direct Gain Passive House and its Experimental Verification"

Report No. 41 (1984): "Fourth Annual Report on the Alberta Home Heating Research Facility: Results of the 1982-83 Heating Season"

(1979-present): "The Alberta Home Heating Research Facility - Annual Updates - Annual Meetings of the Solar Energy Society of Canada, Inc."

Activity and Description:

A Study of Air Leakage in Calgary Residences

The fan depressurization method is being used to collect data on the air leakage performance of 120 owner occupied homes in the Calgary region. Two groups of 20 houses will be chosen from the sample to carry out different means of reducing the air infiltration (professional vs. homeowner sealing). The energy consumption one year after modification will be compared to the year before for each of the forty houses.

The study will also compare the annual energy consumption of 8 new R2000 homes - 4 with air-to-air heat exchangers and 4 without. The data collected by this study will be useful to compare to other provincial studies, to verify theoretical estimates of effects and payback periods of air leakage reduction measures and understand the impact of an air-to-air heat exchanger in an air tight dwelling.

Period of study: January 1, 1984 to March 31, 1985.

Research Organization:

Bill Johnston Architect Ltd.

Bill Johnston
Bill Johnston Architect Ltd.
#104, 209 - 19 Street N.W.
Calgary, Alberta
T2N 2H9
(403)-283-3880

Funding Organization:

Alberta/Canada Energy Resources Research Fund

Juergen Kleta, Director,
Energy Conservation and Renewable Energy Research
Alberta Energy and Natural Resources
Alberta Energy and Natural Resources
2nd floor, Pacifica Plaza, 10909 Jasper Ave.
Edmonton, Alberta T5J 3M8
(403)-427-2983

Publication:

Inquire Alberta E&NR, 10909 Jasper Ave., Edmonton, Alberta T5J 3M8

Activity and Description:**Occupational Health Clinic**

St. Michael's Hospital, Toronto, now operates an occupational health clinic, specializing in the investigation, diagnosis and treatment of occupational illness and similar disorders. The Clinic offers a comprehensive consulting service including air monitoring and chemical sampling. Problems investigated by the Clinic include the effects of urea-formaldehyde foam insulation and effects of air quality on the health of office workers and school children. Computerized literature searches are available to business, government, educational institutions and members of the public, and are co-ordinated with the information service in the Occupational and Environmental Health Unit at the University of Toronto.

The clinic is a combined venture of the Faculties of Medicine and Engineering at the University of Toronto, and St. Michael's Hospital, where it forms a part of the hospital's Department of Occupational and Environmental Health. The clinic's investigative facilities are integrated with the diagnostic departments at St. Michael's Hospital, and the laboratory facilities at the University of Toronto.

Research Organization:

St. Michael's Hospital

Dr. James Nethercott, M.D., FRCP(C)
 Director, Occupational Health Clinic
 St. Michael's Hospital
 30 Bond Street
 Toronto, Ontario
 M5B 1W8
 (416)-861-5104

Funding Organization:

Ontario Ministry of Labour (grant providing partial funding)

Publication:

Faculty of Medicine, University of Toronto, and Department of Occupational and Environmental Health, St. Michael's Hospital. "Occupational and Environmental Health Unit". Pamphlet available from St. Michael's Hospital, 30 Bond St., Toronto M5B 1W8.

Activity and Description:

Engineering Appraisal, Research, Advice and Testing re Air Quality

Engineering expertise in air quality work. No in-house lab facilities; access to three outside laboratories in the Vancouver area.

Research Organization:

Schultz International Ltd.

W. D. Ewing, President
Schultz International Ltd.
1155 West Georgia St.
Vancouver, B.C.
V6E 3H4
(604)-684-7335

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Indoor Air Quality Sampling and Analysis

Extech Systems is a supplier of air quality monitoring and air purification systems, and has a good knowledge of what is commercially available in the field. Their product line includes all the analyzers and instruments that are routinely used in air quality monitoring, occupational environment, and safety programmes. They also carry products which address the requirements of indoor air scrubber and purification systems.

Research Organization:

Extech Systems Ltd.

Murray Ward, B.Eng., President
Extech Systems Ltd.
1638 W. 6th Avenue
Vancouver, B.C.
V6J 1R3
(604)-734-4211
Telex 04-508584

Extech Systems Ltd.
#180, 3025 12th St. N.E.
Calgary, Alberta
T2E 7J2
(403)-250-5025
Telex 038-27920

Funding Organization:

Client funded studies.

Publication:

Client reports are confidential.

Activity and Description:

Indoor Air Quality Studies and Measurement

Dr. John Sullivan's group within the University of Western Ontario has been active in indoor air quality in industrial, commercial and residential environments.

Extensive testing has been done on homes insulated with urea-formaldehyde foam insulation, including formaldehyde levels for several hundred homes on behalf of the owners. Dr. Sullivan has studied the seasonal changes of formaldehyde concentrations, and has investigated different methods for sampling of formaldehyde and relations between cavity and room air concentrations.

In a sample study of three homes in the London area total chemical, biological and other contaminants have been measured. The three sample houses represent the cases: 'UFFI in', 'UFFI removed', and 'no UFFI'. Tracer gas techniques were used in this study.

Most recently Dr. Sullivan is embarking on a study of particulates from UFFI, and room air formaldehyde studies will be continued to determine the effects, on formaldehyde concentrations, of wind velocities and pressures on the sides of the home.

Dr. Sullivan was program co-ordinator of a special research seminar on recent developments in measurement, evaluation and effects of indoor air pollution, May 13th, 1983, in Toronto, Ontario.

Research Organization:

University of Western Ontario

John L. Sullivan, P.Eng., Ph.D.
Professor of Environment Engineering, Faculty of Engineering Science
University of Western Ontario, London, Ontario N6A 5B9
(519)-679-3305

Funding Organizations:

National Research Council of Canada
Consumer and Corporate Affairs Canada

Cliff Shirtliffe
Division of Building Research, NRC, Ottawa, Ontario K1A 0R6
(613)-993-1821

Publications:

Inquire Occupational Health and Safety Resource Centre, University of Western Ontario, Engineering and Mathematical Sciences Building, London, Ontario N6A 5B9; Tel: (519)-679-3913.

Activity and Description:

- 1. Formaldehyde Measurements in Schools and Homes**
- 2. Field Experience with Chemical Scrubbers for Formaldehyde**

Geortec Limited has participated in a number of federally-funded research projects under the UFFI research program.

Formaldehyde levels were studied in wall cavities and room air, in order to evaluate relative effectiveness of formaldehyde measurement devices, both active (i.e. detection tubes) and passive (both room and wall cavity types). Geortec assisted in a 200 home dosimeter survey, in which three new Canadian dosimeters were evaluated against standard devices.

Continuous monitoring of formaldehyde in wall cavities was conducted with CEA 555, MIRAN 1A and Draeger devices. The field performance of CEA, NIOSH and pararosaniline was evaluated.

Formaldehyde measurements were conducted in several schools and houses in Newfoundland. Experiments were designed to evaluate passive formaldehyde monitors and the factors which affect them, e.g. seasonal effects.

A passive and an active-type chemical scrubber for formaldehyde were deployed in several UFFI-containing homes. Formaldehyde levels were monitored to evaluate the effects of the scrubbers. In general, the active scrubber was more effective than the passive type.

A study is underway to determine the potential bio-hazardous nature of indoor environments, by assessing the mutagenicity of particulates collected from the indoor air of homes.

Research Organization:

Geortec Limited

Dr. Paris E. Georghiou
Geortec Limited
86 Hamilton Ave.
St. John's, Newfoundland
A1E 1H9
(709)-579-3228

Funding Organization:

National Research Council of Canada
Consumer and Corporate Affairs Canada

Cliff Shirliffe
Division of Building Research
National Research Council of Canada
Montreal Rd., Ottawa, Ontario
K1A 0R6
(613)-993-1821

Publication:

Georghiou, P.E., and Snow, D., 1982. "The Measurement of Formaldehyde Levels in Wall Cavities of UFFI-Insulated Buildings, and Their Relationships to Indoor Living Space Formaldehyde Levels". Report on DSS Contract Serial #0SR-81-00056, by Geortec Limited for National Research Council, Division of Bldg. Research, Bldg. M-20, NRC, Ottawa, Ontario K1A 0R6

Activity and Description:

Household Facilities and Equipment

Annual survey taken in the spring. Includes data re fuels used in the home for heating and cooking, home air conditioners, recent dwelling improvements (within the previous 2 yrs.) such as heating or electrical improvements. Items such as fuel-burning fireplaces, portable humidifiers and recent energy improvements are included on a rotational basis.

Annual survey: 2/3 sample of the Labour Force Survey frame.

Research Organization:

Statistics Canada

Penny Barclay / Cindy Veness
Consumer Income and Expenditure Division
Statistics Canada
Tunney's Pasture
Jean Talon Bldg., 5-D2
Ottawa, Ontario
K1A 0T6
(613)-990-9775

Funding Organization:

Same as above.

Publication:

Statistics Canada, 1984. "Household Facilities and Equipment"
Statistics Canada Catalog 64-202. Statistics Canada Publications,
Ottawa K1A 0T6

Activity and Description:

Canada Health Survey

This survey collected data on the lifestyle and health of Canadians; it complements existing administrative Data Bases. Sample of 31,668 persons, based on the Labour Force Survey frame. Geographic coverage: all provinces, no territories.

This was a one-time survey. Data were collected for the nine-month period July 1978 though March 1979.

Research Organization:

Statistics Canada

Doug Angus
Health Division
Statistics Canada
Tunney's Pasture
R. H. Coats Bldg., 17-J
Ottawa, Ontario
K1A 0T6
(613)-990-8573

Funding Organization:

This survey was jointly funded by Health and Welfare Canada and by Statistics Canada.

Publication:

Statistics Canada, 1981. "The Health of Canadians, Report of the Canada Health Survey". Statistics Canada Catalogue 82-538. Report, soft-cover. A micro-data tape is also available for \$300. Inquire Statistics Canada Publications, Ottawa K1A 0T6.

Activity and Description:

Survey of Smoking Habits

Examination of smoking trends for: non-smokers, regular smokers and occasional smokers. Sample: 23,000 households (2/6 sample of the Labour Force Survey frame). Enumeration method: interview.

Frequency: biennial.

Research Organization:

Statistics Canada

Michael Sheridan
Special Surveys Division
Statistics Canada
Tunney's Pasture
Jean Talon Bldg., 3-C7
Ottawa, Ontario
K1A 0T6
(613)-996-5717

Funding Organization:

Same as above.

Publication:

Inquire Statistics Canada Publications, Ottawa K1A 0T6

Activity and Description:

- 1. Indoor Air Quality Measurement - Commercial and Industrial**
- 2. Indoor Air Pollution From Woodburning Stoves**

Kent Engineering's primary involvement in indoor air quality work has been commercial and industrial, including the design of ventilation and makeup air systems for factories, to control the indoor atmosphere and eliminate contaminants of various kinds.

The firm has a limited in-house capability for measurement of hydrocarbons, and relies on outside laboratories for other measurements.

Kent Engineering was involved jointly with the firm of Woodbridge Reid, in a technical and marketing study of woodburning stoves, for the British Columbia Department of Industry and Small Business Development. The report and background work involved some investigation of the production of indoor air pollutants by woodstoves.

Research Organization:

Kent Engineering Limited

Clarence D. Kent, P.Eng., President
Kent Engineering Limited
Engineers & Consultants
475 Gordon Ave.
West Vancouver, B.C.
V7T 1R7
(604)-926-8601

Funding Organization:

Client funded studies

Woodstove study: British Columbia Department of Industry and Small Business Development, Mr. John Mason

Publication:

Woodbridge Reid and Kent Engineering, 1983. "Wood-burning Appliances: Market Potential and Manufacture in B.C.; Inquire B.C. Industry & Small Business Devt., Victoria, B.C. V8V 1X4.

Activity and Description:

1. Seminar on Indoor Air Quality
2. Ventilation Standards for Acceptable Indoor Air Quality

The Research and Technical Committee of Toronto Chapter of ASHRAE held a seminar on Indoor Air Quality on April 4, 1983, at the Park Plaza Hotel in Toronto. Committee Chairman at the time was R. Dalton Stubley, P.Eng. (The committee has since been renamed the Technical Committee, and the chairman for 1984/85 was Mr. Cedric Smith.)

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) is a professional organization organized and operated "for the exclusive purposes 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..." (By-Laws, 1.3)

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 62-1981 "Ventilation for Acceptable Indoor Air Quality Standards" is one of the few standards in existence today specifically addressing the reduction of indoor pollutants in residences.

Research Organization:

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

ASHRAE Toronto Chapter
Suite 226, 5468 Dundas Street West
Islington, Ontario
M9B 6E3
(416)-239-8193

Mr. Cedric Smith, Chairman, Technical Committee
ASHRAE Toronto Chapter
c/o Buildings Department
City of Scarborough
150 Borough Drive
Scarborough, Ontario
M1P 4N7

Publication:

Toronto Chapter ASHRAE R&T Committee, 1983. Collection of Papers Delivered at ASHRAE Research and Technical Committee Seminar on Indoor Air Quality, April 4, 1983, Toronto; One copy available for photocopying at ASHRAE, 5468 Dundas St. W., Ste. 226 Islington, Ontario M9B 6E3; (416)-239-8193.

ASHRAE, 1981. "ASHRAE Standard 62-1981: Ventilation for Acceptable Indoor Air Quality". Available from ASHRAE Publications Sales Dept., 1791 Tullie Circle NE, Atlanta, GA 30329.

Activity and Description:

1. Air Movement and Infiltration Analysis
2. Building Science and Engineering
3. Energy Conservation in Buildings
4. Ventilation and Space Conditioning in Commercial, Industrial and Residential Buildings.

Building Engineering Group assisted in the organization of the Second Conference on Building Science and Technology, November 12 and 11, 1983, at the University of Waterloo. (Jointly sponsored by The Canadian Society for Civil Engineering - Ontario Region, University of Waterloo, and the Division of Building Research of the National Research Council of Canada).

The conference focussed on buildings and their in-service problems, and included such topics as moisture problems in housing and commercial buildings.

The Group has worked together with Dr. Gordon Bragg of the University of Waterloo (see separate listing).

Research Organization:

Building Engineering Group

Eric F.P. Burnett, Director
Building Engineering Group
415 Phillip Street
Waterloo, Ontario
N2L 3X2
(519)-886-5280

Funding Organization:

Client funded studies

Publication:

Client reports are usually confidential, but the members of BEG do publish non-proprietary reports and technical papers.

Activity and Description:

Indoor Air Quality Studies

Three studies conducted within the University of Toronto Department of Chemical Engineering include:

- o Recirculation of Exhaust Gases in Academic Research Buildings (M.A.Sc. project).
- o Determination of Biologically Active Dusts in Recirculated Air (M.Eng. project).
- o Demands on Health Inspectors and Resources Needed to Handle Indoor Air Pollution Problems (M.Eng. project - see separate entry for Madeleine G. Harris, Ontario Ministry of Health).

Research Organization:

University of Toronto

Dr. James W. Smith
Dept. of Chemical Engineering
University of Toronto
Toronto, Ontario
M5S 1A1
(416)-978-4467

Funding Organization:

Natural Sciences and Engineering Research Council, Ottawa
University of Toronto

Publication:

Smith, J. W., 1982. "Urea-Formaldehyde Foam Insulation in Homes". Dept. of Chemical Engineering, University of Toronto. Presented at 'Formaldehyde: The Facts', Corpus Forum, Toronto, May 3-4 1982. Research Paper, 10 pg. Inquire Chem. Eng. Dept., U. of Toronto, Toronto, Ont. M5S 1A1

Activity and Description:

Hazards in the Home

Overview study showing initial dimensions of housing hazards, especially accidents in the house and the quality of indoor air. In addition, existing data bases and ongoing work and research are also described and recommendations made for further work.

Research Organization:

Kathrine Greiner
20 Eleanor Drive
Nepean, Ontario
K2E 6A2
(613)-224-6618

Funding Organization:

Canada Mortgage and Housing Corporation

Research Division, Policy Development and Research Sector
Canada Mortgage and Housing Corporation
National Office
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2316

Publication:

Greiner, Kathrine, 1984. "Hazards in the Dwelling: A Preliminary Assessment of Data". For Canada Mortgage and Housing Corporation. Research Report, 51 pages. Inquire Canadian Housing Information Centre, CMHC, Montreal Rd., Ottawa K1A 0P7

Activity and Description:

**Moisture Induced Problems in NHA Housing:
Analysis of Field Survey Results and Projections of Future Problems:**
Part 1 of a 3 part series (see entries following)

A Canada-wide field investigation of some 201, moisture-damaged NHA-financed housing units was undertaken. Selection was in accordance with the geographic distribution of reported problems. This study forms part of an overall project to investigate the extent, severity, causes and geographic distribution of moisture induced problems in NHA-financed housing units.

The consultant's report includes a discussion of siding problems, sheathing damage, mould and mildew, interstitial moisture. No conclusions are drawn regarding the observed mould and mildew as possible indoor pollutants, or as potential health risks.

Research Organization:

Marshall Macklin Monaghan Limited
Consulting Engineers, Surveyors, Planners

J. H. VanPoorten, P.Eng., MBA
Marshall Macklin Monaghan Limited
275 Duncan Mill Rd.
Don Mills, Ontario
M3B 3H9
(416)-449-2500

Funding Organization:

Canada Mortgage and Housing Corporation

Alvin J. Houston
CMHC Project Manager, Research Division
Policy Development and Research Sector
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2315

Publication:

Marshall Macklin Monaghan Limited, 1983, for Canada Mortgage and Housing Corporation. "Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems; June 1983; Part 1 of a 3 Part Series". Consultant report, 124 pages. CMHC Cat. No. NH20-1/2-1983-1E; ISBN 0-662-12662-9. Available from Canadian Housing Information Centre, CMHC National Office, Montreal Rd., Ottawa, Ontario K1A 0P7; Tel (613)-748-2367; Telex CMHC OTT 053-3674.

Activity and Description:

Moisture Induced Problems in NHA Housing:

Literature Review and Research:

Part 2 of a 3 part series (see entries preceding and following)

A review of relevant literature and a field investigation to investigate moisture problems in NHA financed housing. The study discusses specific moisture problems, structural details observed to lead to moisture problems, possible solutions for both new and retrofit housing and further research that needs to be undertaken.

One of the unique findings of the study is the impact of the meso-climate on the type and severity of moisture problems.

Research Organization:

Marshall Macklin Monaghan Limited
Consulting Engineers, Surveyors, Planners

J. Timusk, Ph.D., University of Toronto
c/o Marshall Macklin Monaghan Limited
275 Duncan Mill Rd.
Don Mills, Ontario
M3B 3H9
(416)-449-2500

Funding Organization:

Canada Mortgage and Housing Corporation

Alvin J. Houston
CMHC Project Manager, Research Division
Policy Development and Research Sector
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2315

Publication:

Marshall Macklin Monaghan Limited, 1983, for Canada Mortgage and Housing Corporation. "Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems; Part 2 of a 3 Part Series". Consultant report. CMHC Cat. No. NH20-1/2-1983-2E; ISBN 0-662-12663-7. Available from Canadian Housing Information Centre, CMHC National Office, Montreal Rd., Ottawa, Ontario K1A 0P7; Tel (613)-748-2367; Telex CMHC OTT 053-3674.

Activity and Description:**Moisture Induced Problems in NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland:**

Part 3 of a 3 part series (see preceding entries)

A detailed discussion of venting, as a means of ameliorating high internal moisture generation and associated problems, such as mould and mildew, specifically in the Newfoundland situation.

Since moisture problems in flueless NHA housing are specifically frequent in Newfoundland, this study investigated typical moisture generation, through household activities, and projected required ventilation rates needed to reduce internal relative humidity to an acceptable level, where mould and mildew were observed to not occur.

Since passive ventilation was seen to be not an economical solution, other non-passive means were also investigated.

Research Organization:

Marshall Macklin Monaghan Limited
Consulting Engineers, Surveyors, Planners

J. Melchers, P.Eng.
Fodor Engineering Ltd.
275 Duncan Mill Rd.
Don Mills, Ontario
M3B 3H9
(416)-449-2500

Funding Organization:

Canada Mortgage and Housing Corporation

Alvin J. Houston
CMHC Project Manager, Research Division
Policy Development and Research Sector
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2315

Publication:

Marshall Macklin Monaghan Limited, 1983, for Canada Mortgage and Housing Corporation. "Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems; Part 3 of a 3 Part Series". Consultant report. CMHC Cat. No. NH20-1/2-1983-3E; ISBN 0-662-12664-5. Available from Canadian Housing Information Centre, CMHC National Office, Montreal Rd., Ottawa, Ontario K1A 0P7; Tel (613)-748-2367; Telex CMHC OTT 053-3674.

Activity and Description:

Ambient Air Monitoring

Promet Environmental Group Ltd. is a consulting service firm comprised of professional meteorologists and air quality technicians. Their research experience includes microclimatic measurements using very sensitive instrumentation and sophisticated automation and datalogger equipment. The company also has experience in making solar controls, in both active and passive capacities. Promet rents datalogging and meteorological equipment, and air quality measurement instrumentation such as analyzers for oxides of nitrogen and sulphur.

Gas monitors include nitrogen oxides, sulphur dioxide, hydrogen sulphide, carbon monoxide, hydrocarbons, ammonia, and ozone.

Research Organization:

Promet Environmental Group Ltd.

Dave S. Chadder
Air Pollution Meteorologist
Promet Environmental Group Ltd.
1338P-36 Ave. N.E.
Calgary, Alberta
T2E 6T6
(403)-276-9123

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Preparation and Analysis of Air Sampling Filters

Bondar-Clegg & Company specializes in the preparation and analysis of sampling filters. Work has concentrated on analyzing the collected material for heavy metal content, but the laboratory has a capability to run PCB and DDT tests, particularly in water, soils, or sediments.

Research Organization:

Bondar-Clegg & Company Limited

Peter Helena
Bondar-Clegg & Company Limited
764 Belfast Rd.
Ottawa, Ontario
K1G 0Z5
(613)-237-3110

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Indoor Air Quality Sampling

Novalab Limited has full analytical capability for indoor air quality sampling and analysis. Equipment available includes sampling devices, gas chromatograph, liquid chromatograph and gas chromatograph/mass spectrometer.

Research Organization:

Novalab Limited

Dr. I-Fu (Alex) Hung
Manager, Technical Services
Novalab Limited
9420 Côte de Liesse
Lachine, Québec
H8T 1A1
(514)-636-6219 or 631-1838

Funding Organization:

Client-funded studies.

Publication:

Client studies are confidential.

Activity and Description:

Formaldehyde and Air Contamination Committee

The British Columbia Ministry of Health participates actively in the Formaldehyde and Air Contamination Committee of a B.C. Inter-Ministry Committee of Safety and Occupational Health (see separate entry under B.C. Ministry of Labour). The Division of Epidemiology published interim guidelines for domestic formaldehyde exposure in 1981 (0.1 ppm), for distribution to health districts and health departments in British Columbia.

The Ministry also sits on the Federal-Provincial Working Group on Indoor Air Quality.

Research Organization:

British Columbia Ministry of Health

Peter Bazowski, Deputy Minister
B.C. Ministry of Health
1515 Blanshard St.
Victoria, B.C.
V8W 3C8
(604)-387-5494

Funding Organization:

Same as above.

Publication:

Division of Epidemiology, B.C. Ministry of Health, 1981. "Interim Guidelines for Domestic Formaldehyde Exposure: July 30, 1981". Inquire BC Min. of Health, 1515 Blanshard, Victoria V8W 3C8.

Activity and Description:

**1. Interaction Between Energy Conservation and Indoor Air Quality
2. Residential Chimney Backdraft Checklist: Design and Evaluation**

Sheltair Scientific has conducted a number of studies which investigate the relationship between energy conservation measures, such as sealing building envelopes, and air quality within a home.

Recent work for Canada Mortgage and Housing Corporation involved the preparation of a residential chimney backdraft checklist for determining the potential for downdrafts in combustion flues.

Further field testing is underway to produce a more comprehensive safety check capable of detecting any potential air pollution hazard from failure of vented combustion appliances. Remedial measures are being implemented and evaluated on houses that fail the safety check.

Sheltair is also participating in a number of research projects involving the design and evaluation of residential ventilation systems in airtight new housing on the west coast.

Research Organization:

Sheltair Scientific Ltd.

Sebastian Moffatt
Sheltair Scientific Ltd.
3422 West First Ave.
Vancouver, B.C.
V6R 1G7
(604)-732-9106

Funding Organization:

Client-funded studies.

Backdraft study: Canada Mortgage and Housing Corporation

Peter Russell
Research Division
Canada Mortgage and Housing Corporation
Montreal Road
Ottawa, Ontario
K1A 0P7
(613)-748-2306

(Proj. Officer: J. Lorimer; Scientific Authority: J. White/P. Russell)

Publication:

Moffatt, Sebastian, (not yet published). "Residential Chimney Backdraft Checklist: Design and Evaluation". Sheltair Scientific Ltd. for Canada Mortgage and Housing Corporation. Inquire Canada Housing Information Centre, CMHC, Montreal Road, Ottawa K1A 0P7.

Activity and Description:**Emissions from Woodstoves**

Roche Associés has been involved in many surveys of formaldehyde levels in homes insulated with Urea-Formaldehyde Foam Insulation, funded by Supply and Services Canada.

Air contaminant studies have also been realized for many clients in offices and schools. The sampling was often for: oxygen percentage, carbon monoxide, dusts, fumes, solvents and various gases that could be suspected, usually complemented by temperature and relative humidity measurements, as well as ventilation surveys. These studies were followed by detailed reports and recommendations, but not published, since the studies were generally of private interest.

The firm employs engineers, chemists, architects, construction specialists and various other specialists. The company is well equipped with many measurement instruments and has a laboratory for handling most of the analyses relating to air pollution measurements.

Among the firm's most recent work in the indoor air quality field is a literature inventory of information on polycyclic organic matter emanating from woodstoves. The client was Environment Canada.

Research Organization:

Roche Associés Ltée

Donald Labrie
2535 Boul. Laurier
Ste. Foy, Québec G1V 4M3
(418)-871-9600

Funding Organization:

Woodstove study: Environment Canada

DeGuisse Pilon, Ingénieur de projets
Assainissement de l'air, Service de la protection de l'environnement
Environnement Canada, Région du Québec
Bureau 410, 1550 ouest, boul. de Maisonneuve
Montréal, Québec H3G 1N2
(514)-283-2341

Publication:

Roche Associés Ltée. (not yet published) "Inventory of Polycyclic Organic Matter from Woodstoves: English/French Summary". Inquire Environment Canada, 1550 Boul. de Maisonneuve, Montreal H3G 1N2.

Roche Associés Ltée., 1983. "Quantification et prévision des émissions provenant du chauffage résidentiel au bois au Québec". Environment Canada, March 1983, French only, No. 12SD.KE303-2-0217. Inquire Environment Canada, 1550 Boul. de Maisonneuve, Montreal H3G 1N2.

Activity and Description:

Environmental Health Factors in Falling Accidents

This study surveys the literature, and other sources of expertise, to assess the possible role of environmental air pollutants in accidents involving falls in buildings.

Evidence is presented which shows that certain pollutants can cause both gross and subtle perceptual and motor ability changes, which clearly add to the risk of a falling accident occurring. In addition, it is shown that some people can be much more highly susceptible to common indoor air pollutants than others, and specific precautions to help such persons minimize risk of accidents are outlined.

The study recommends that indoor air pollution should be recognized as both a health problem and a safety problem, and a number of followup investigations are suggested.

Research Organization:

Bruce M. Small and Associates Limited

Bruce M. Small, P.Eng.
Small and Associates
R.R.#1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Funding Organization:

National Research Council of Canada
DSS Contract #05SX 31155-2-3205

Jake L. Pauls
Medical Engineering Section, Rm. 178, Bldg. M50
Division of Electrical Engineering
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6
(613)-993-0475

Publication:

Small, Bruce M., 1982. "Environmental Health Factors in Falling Accidents: November 1982". Small and Associates for National Research Council of Canada. Research Report, 75 pg. Inquire Medical Engineering Section, Rm. 178, Bldg. M50, NRC Ottawa K1A 0R6.

Activity and Description:**Accreditation of Standards-Writing Organizations**

The Standards Council of Canada operates a program for the accreditation of Canadian standards-writing organizations, two of which develop standards in subject areas which pertain to indoor air quality:

- o Canadian Standards Association: develops standards in areas of environmental sciences, measurement of air pollution, electrostatic air cleaners, air conditioners, electric heaters, etc.
- o Canadian General Standards Board: develops standards in area of home building products, insulation, etc.

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).

Research Organization:

Standards Council of Canada
 Head Office
 350 Sparks Street, Suite 1203
 Ottawa, Ontario
 K1R 7S8
 Tel: (613)-238-3222
 Telex: 053-4403 STANCAN OTT

Publications:

Pamphlets available from Standards Council of Canada, 350 Sparks St., Suite 1203, Ottawa K1R 7S8; Tel: (613)-238-3222:

"Standards Council of Canada", June 1984, forty-pages.

"The National System of Standards in Canada", July 1982. (Inquire Public Relations Branch).

"Does Your Lab Offer Quality Services?", 1984. (Inquire National Standardization Branch).

Activity and Description:

Standards for Methods of Measurement of Indoor Air Contaminants

The Canadian Standards Association, through its Air Pollution Control Committee, 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 flourides in air.

Research Organization:

Canadian Standards Association

John Watson
Canadian Standards Association
178 Rexdale Boulevard
Rexdale, Ontario
M9W 1R3
(416)-747-4102
Telex 06-989344

Funding Organization:

Same as above.

Publications:

Inquire CSA, 178 Rexdale Blvd., Rexdale, Ont. M9W 1R3 (416)-747-4000

Activity and Description:

Literature Review and Analysis re Ventilation Standards

This project is a fact finding mission concerning ventilation standards and related concerns. The literature on ventilation standards is being reviewed and an executive summary is being developed, identifying the need, or otherwise, for consensus standards for controlled ventilation.

The report will be used as a position paper and reference paper for a Canadian Standards Association standards committee.

Research Organization:

Brian Dickens
c/o P.O. Box 390
Imperial Harbour Estates
Bonita Springs, Florida
USA 33923
(813)-992-7058

Funding Organization:

Canadian Standards Association

Brian Rosborough
Canadian Standards Association
178 Rexdale Blvd.
Rexdale, Ontario
M9W 1R3
(416)-747-4365

Publication:

Dickens, Brian (not yet published). "Controlled Ventilation in Houses: A Summary Review". Inquire Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario M9W 1R3.

Activity and Description:

Field Performance Evaluation of Departmental Houses

Various field performance evaluations were conducted, by Scanada Consultants Limited, on selected DIAND housing units in Frobisher Bay, N.W.T.

Building inspections were performed on two residential units, referred to as DIAND 426 and 598. Field testing took place from December 1st to 7th, 1982, focussing on three areas:

- o degree of airtightness;
- o insulation performance; and
- o air quality of the indoor air.

Both formaldehyde and carbon dioxide were measured in the houses. cursory measurements indicated carbon dioxide levels were not of concern, but that formaldehyde levels were slightly high in one of the houses.

Research Organization:

Scanada Consultants Limited (Contract 82-421/File A1632-82-421)
446 Reynolds Street
Oakville, Ontario
L6J 3M4
(416)-842-3633

Funding Organization:

Indian and Northern Affairs Canada

G. W. Richards, Supervising Technologist
Buildings Division
Technical Services and Contracts Branch
Indian and Northern Affairs Canada
Ottawa, Ontario
K1A 0H4
(613)-997-9166

Publication:

Scanada Consultants Limited, 1983. "Field Performance Evaluation of Departmental Houses 426 and 598 Frobisher Bay, N.W.T.". Contract 82-421/File A1632-82-421, for Indian and Northern Affairs Canada, January 26, 1983, 74 pages, Doct. No. EA-HQ-83-52. Available from Indian Affairs and Northern Development, Ottawa K1A 0H4.

Activity and Description:**Energy Efficient Northern Housing**

DIAND Building Division Staff monitored performance of existing Departmental houses #426 and 598 in Frobisher Bay, N.W.T. (two relatively-airtight, highly-insulated prefabricated buildings) from April 1, 1982 to March 31, 1983. This project was accepted as part of the National Energy Program in 1982/83, through the Inter-department Building Energy Conservation Sector Committee (BECS).

The objects of the work were to evaluate energy conservation technology, for application to northern energy-efficient house design, construction and retrofit, and to develop recommendations contributing to the formulation of northern residential standards for energy conservation. Measurement included ventilation rates, as well as air quality and comfort levels.

The work was planned to be continued into the 1983/84 period.

Research Organization:

Buildings Division, Indian and Northern Affairs Canada

B. Semchuk, Buildings Division
Indian and Northern Affairs Canada
Ottawa, Ontario
K1A 0H4
(613)-997-0337

Funding Organization:

Energy Mines and Resources Canada, with Indian and Northern Affairs

G. W. Richards, Supervising Technologist
Buildings Division
Technical Services and Contracts Branch
Indian and Northern Affairs Canada
Ottawa, Ontario
K1A 0H4
(613)-997-9166

Publication:

Buildings Division, Indian and Northern Affairs Canada, 1983.
"Status Report on Research and Development Project, Energy Efficient Northern Housing, Frobisher Bay, N.W.T." Research Report, September 1983, 17 pages, Doct. No. EA-HQ-83-50. Available from Indian Affairs and Northern Development, Ottawa K1A 0H4.

Activity and Description:

Indoor Air Quality Investigation and Analysis

SENES Consultants Limited is a group of professional engineers and scientists providing specialized services in the areas of environmental, nuclear and energy studies. The firm has considerable experience in the areas of indoor air quality and occupational hygiene.

Experience includes response to suspected cases of indoor contamination in commercial and industrial facilities and in residences. Monitoring experience includes measurements of lead, carbon monoxide, nitrogen oxides, sulphur compounds, ozone, radon, radon daughters, dust, odours, and noise.

In addition to these monitoring services, SENES provides data analysis, undertakes problem identification, formulates corrective actions and recommends control procedures. SENES also has experience in compliance monitoring of radon and radon daughter levels in buildings.

The firm has extensive capability in outdoor air quality, water quality, climatology, meteorology and radiation measurement, evaluation and reporting on hazardous and low level radioactive waste management, and in environmental impact assessment.

Research Organization:

SENES Consultants Limited

Eugene Koczur, Chairman
SENES Consultants Limited
499 McNicoll Ave.
Toronto, Ontario
M2H 2C9
(416)-499-5030

Funding Organization:

Client funded studies

Publication:

Client reports are generally not available and in some cases may be confidential.

Publications in the open literature include:

Lowe, L.M. and Chambers, D.B., 1983. "TLV's for Non-Standard Work Schedules". Pollution Engineering, November 1983.

.../continued

(continued)

Case, G.G., Chambers, D.B., and Lowe, L.M., 1983. "Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in Port Hope, Ontario". Presented at the Fourth Annual Conference of the Canadian Radiation Protection Association, Toronto, Ontario, May 1983.

Chambers, D.B., Lowe, L.M., Sutherland, R.B., and Chart, E.J., 1981. "Potential Health Impact of Enhanced Radiation Levels in Port Hope". Presented at the Second Annual Meeting of the Canadian Radiation Protection Association, Ottawa, Ontario, May 1981.

Case, G.G., 1979. "Site Investigation Techniques". Presented at the Second Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Processing, Bancroft, Ontario, March 1979.

Case, G.G., 1979. "The Seasonal Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f")". Presented at the Second Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Processing, Bancroft, Ontario, March 1979.

Case, G.G., 1978. "The Radon/Working Level Profile". Presented at the First Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Processing, Elliot Lake, Ontario, March 1978.

Activity and Description:

- 1. Measurement of UFFI Off-gassing**
- 2. Remedial Measures for UFFI Homes**

Dr. H. Gesser, in conjunction with Dr. Samoiloff, both of University of Manitoba, has conducted a number of studies on the off-gassing of urea-formaldehyde foam insulation.

Recently, another study involved testing energy-efficient homes for abatement of formaldehyde levels with the operation of air-to-air heat exchangers. A study is also underway to determine the reaction of ammonia gas with urea formaldehyde foam insulation and the effectiveness of ammonia treatment in houses.

Additional research has involved the testing and development of treated filters for use with forced air heating systems. High molecular weight polymeric amines are used to react specifically with formaldehyde. Further testing is required to increase the filter lifetime and devise ways of reducing cost (patent pending).

Further research proposed for joint work with Dr. Samoiloff will involve the development of passive systems for monitoring indoor air quality. Passively exposed samples will be directly tested for toxicity, using biological systems.

Dr. Samoiloff, a biologist, has conducted experiments involving the exposure of nematodes to formaldehyde, in order to assess biological effects and develop biological monitors.
(see also entry for Bioquest International Inc.)

Work underway includes a study to collect and fractionate samples of effluent gases from UFFI samples. These fractions are being tested for bacteriocidal activity by Dr. Samoiloff. Those effluent chemicals, that are shown to have biological activity, will be identified and quantified by Dr. Gesser.

Research Organization:

University of Manitoba

Dr. H. D. Gesser, 532 Chemistry Building
Dr. Martin R. Samoiloff, Dept. of Zoology
University of Manitoba
Winnipeg, Manitoba R3T 2N2
(204)-474-9893 (Gesser)
(204)-474-9821 (Samoiloff)

../ continued

(continued)

Funding Organization:

National Research Council of Canada

Cliff Shirtliffe

Division of Building Research

National Research Council of Canada

Montreal Rd. Ottawa, Ontario, K1A 0R6

(613)-993-1231

Publications:

Gesser, H.D. (in press). "The Reduction of Indoor Formaldehyde Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI)". Environmental International.

Activity and Description:

Air Quality Monitoring

Pan Canadian Consultants Limited has a capability for air quality analyses, including measurement of carbon monoxide and organic contaminants. The firm has no in-house laboratory facilities but has access to outside laboratories.

Research Organization:

Pan Canadian Consultants Limited

William B. Alderton
Pan Canadian Consultants Limited
Suite 626, 744 West Hastings Street
Vancouver, B.C.
V6C 1A5
(604)-688-8618

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Canadian Centre for Toxicology**

The Canadian Centre for Toxicology has been incorporated as a non-profit research and teaching centre for toxicology in Canada. It is an autonomous centre and represents a joint undertaking between the University of Toronto, the University of Guelph, the Government of Canada, the Government of Ontario, and industry.

Initial plans for the Centre involved research in toxicology, training of students in toxicology, providing information to the public and to researchers, and providing services as may be required by industry, government or the public at large. The Centre may be involved in research on proprietary compounds. The Centre will have facilities at both the University of Toronto and the University of Guelph. Administrative headquarters will be at Guelph.

Research Organization:**Canadian Centre for Toxicology**

Dr. Ian C. Munro
Canadian Centre for Toxicology
645 Gordon St.
Guelph, Ontario
N1G 2W1
(519)-837-3320

Funding Organization:

Government of Ontario
University of Guelph
University of Toronto

Each of the governments of Canada and Ontario initially earmarked the expenditure of \$10 million for capital construction for the Centre. The Centre was to be built in phases, with the first phase involving \$24 million of capital. Federal funding was cancelled in the fall of 1984.

Publication:

Canadian Centre for Toxicology, 1984. "Planning Study" and "Facilities Needs Study". Inquire Canadian Centre for Toxicology, 645 Gordon St., Guelph, Ontario N1G 2W1.

Activity and Description:

Air quality Monitoring, Environmental and Socio-economic Impact

Western Research has extensive experience in outdoor ambient and stack air quality monitoring, primarily at sour-gas plants. Capability in air quality monitoring, and in environmental and socio-economic impact studies, could be applied in indoor air quality studies. The company has consulting, laboratory and field personnel.

Western Research is conducting a feasibility study, for determining the concentration of formaldehyde in air, using chromatography. This will demonstrate the feasibility of hydrogenation as a technique for lowering the detection limit for formaldehyde in air.

Research Organization:

Western Research Division of Bow Valley Resource Services Ltd.

John McKee / Don Colley
Western Research
1313 - 44th Ave. N.E.
Calgary, Alberta
T2E 6L5
(403)-276-8806

Funding Organization:

Client funded studies.

Publication:

Client reports are confidential.
For some publications on ambient air quality monitoring, inquire Western Research at address above.

Activity and Description:

Consumer Information and Complaint Service

The Consumer Information Centre and the Licencing and Investigation Branch of Saskatchewan Consumer and Commercial Affairs responds to public questions about products which affect air quality, and complaints regarding indoor air quality problems. Response is in several forms, as applicable:

- o provision of information;
- o investigation of complaints;
- o referral to other agencies (e.g. Saskatchewan Research Council, National Research Council of Canada, Saskatchewan Health and Labour, and Consumer and Corporate Affairs Canada).

Research Organization:

Consumer Information Centre
Saskatchewan Consumer and Commercial Affairs
1871 Smith Street
Regina, Saskatchewan
S4P 3V7
(306)-565-5550

Funding Organization:

Government of Saskatchewan

Ron Kessler, Deputy Minister
Saskatchewan Consumer and Commercial Affairs
1871 Smith Street
Regina, Saskatchewan
S4P 3V7
(306)-565-5551

Activity and Description:

Airborne Asbestos Investigation in University Classrooms.

Airborne asbestos in a university's older buildings was sampled and quantified. The concentrations of chrysotile asbestos were lower than the Ontario recommended safety limit.

Work completed 1982.

Research Organization:

Saskatchewan Research Council

Ken Yoshida, Ph.D., Environment Sector
Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Research Associate: K. Wallace, B.Sc. (Hons.)

Funding Organization:

University of Saskatchewan, Occupational Health and Safety Committee

Publication:

Yoshida, K., et al, 1982. "Investigations of ambient air within University of Saskatchewan Buildings for Possible Presence of Asbestos Particles". Saskatchewan Research Council Pub. P-781-3-E-82; inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1.

Activity and Description:

**Air Quality Investigation of an Office Building for Possible
Presence of Airborne Asbestos.**

Confidential client study.

Research Organization:

Saskatchewan Research Council

Ken Yoshida, Ph.D., Environment Sector
Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Research Associate: K. Wallace, B.Sc. (Hons.)

Funding Organization:

Client funded.

Publication:

Client report is confidential.

Activity and Description:

Airborne Formaldehyde Concentration in Carcass Storage Rooms of the College of Veterinary Medicine

The concentration of formaldehyde was high enough to cause a chronic health hazard to an anatomy laboratory technician. A control measure was proposed to prevent further contamination of adjacent confinements.

Work completed 1980.

Research Organization:

Saskatchewan Research Council

Ken Yoshida, Ph.D., Environment Sector
Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Research Associate: K. Wallace, B.Sc. (Hons.)

Funding Organization:

University of Saskatchewan, Occupational Health & Safety Committee

Publication:

Yoshida, K., and Wallace, K., 1980. "Determination of Airborne Formaldehyde Concentration in Carcass Storage rooms of the College of Veterinary Medicine." Saskatchewan Research Council Pub. P-786-4-C-80; Inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1.

Activity and Description:

1. Bad Odour Problems at a Retail Store
2. Airborne Asbestos Particles in a Printing Press
3. Air Quality in an Energy Efficient Office Building.

Confidential client studies.

Work completed 1982 and 1983.

Research Organization:

Saskatchewan Research Council

Ken Yoshida, Ph.D., Environment Sector
K. Wallace, B.Sc. (Hons.), Environment Sector
Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-8120

Funding Organization:

Client funded

Publication:

Client reports are confidential.

Activity and Description:

Assessment of Airborne Asbestos Contamination in Saskatoon Arena

Airborne asbestos inside a building was sampled and analyzed for non-occupational exposure assessment. The fiber concentration of chrysotile asbestos was lower than the recommended standard of Ontario.

Activity completed in 1979-1980.

Research Organization:

University of Saskatchewan

Ken Yoshida, Ph.D., Adjunct Associate Professor
Dept. of Social and Preventive Medicine, College of Medicine
University of Saskatchewan
c/o Saskatchewan Research Council, 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Research Associate: J. W. Markham
(at present with University of Calgary)

Funding Organization:

City of Saskatoon

Publications:

Markham, J.W., and Yoshida, K., 1979. "Investigation of the Ambient Air Within the Saskatoon Arena for the Presence of Asbestos Particles." Dept. Soc. & Prev. Med., Univ. of Saskatchewan. Inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1.

Markham, J.W., and Yoshida, K., 1980. "Assessment of Asbestos Contamination of Air in the Saskatoon Arena During Knights of Columbus Indoor Games." Dept. Soc. & Prev. Med., Univ. of Saskatchewan. Inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1

Activity and Description:

Indoor Air Quality and Health Investigation of Three Schools

An extensive case-control study was conducted, along with detailed examination of indoor air quality in a new energy efficient school building, in comparison with 2 other schools. Causes of health complaints by teachers and pupils were uncertain. Aspects of mass psychogenic illness was discussed as a possible cause.

Work completed 1981.

Research Organization:

University of Saskatchewan

Ken Yoshida, Ph.D., Adjunct Associate Professor
Dept. of Social and Preventive Medicine, College of Medicine
University of Saskatchewan
c/o Saskatchewan Research Council, 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Primary Researcher: J. W. Markham, M.B., FRCP(c)
(at present with University of Calgary)

Funding Organization:

Health Department, City of Regina

Publication:

Markham, J.W., and Yoshida, K., 1981. "An Investigation of Health Complaints at McLurg School, Regina." Dept. Soc. & Prev. Med., Univ. of Saskatchewan. Inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1.

Activity and Description:

**Investigations of Potential Respiratory Irritants or Allergens in
Thermally Insulated or Fire-gutted Homes**

Confidential clinical studies.

Work completed 1983.

Research Organization:

University of Saskatchewan

Ken Yoshida, Ph.D., Adjunct Associate Professor
Dept. of Social and Preventive Medicine, College of Medicine
University of Saskatchewan
c/o Saskatchewan Research Council, 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Funding Organization:

Private client.

Publication:

Client report is confidential.

Activity and Description:

Airborne Asbestos Particles in a Curling Rink

The presence of amosite asbestos originated from sprayed ceiling was identified. However, the airborne concentration was far below any existing safety standards.

Work completed 1982.

Research Organization:

University of Saskatchewan

Ken Yoshida, Ph.D., Adjunct Associate Professor
Dept. of Social and Preventive Medicine, College of Medicine
University of Saskatchewan
c/o Saskatchewan Research Council, 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Primary Researcher: J. W. Markham, M.B., FRCP(c)
(at present with University of Calgary)

Funding Organization:

Saskatchewan Department of Health

Publication:

Markham, J.W., and Yoshida, K., 1982. "An Investigation of Ambient Air Inside a Curling Rink, Swift Current, for Possible Presence of Airborne Asbestos Particles." Dept. Soc. & Prev. Med., Univ. of Saskatchewan. Inquire K. Yoshida, SRC, 30 Campus Drive, Saskatoon S7N 0X1.

Activity and Description:

Airborne Asbestos Particles in a Large Office Building

Confidential client study.

Work completed 1982.

Research Organization:

University of Saskatchewan

Ken Yoshida, Ph.D., Adjunct Associate Professor
Dept. of Social and Preventive Medicine, College of Medicine
University of Saskatchewan
c/o Saskatchewan Research Council, 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1
(306)-664-5436

Primary Researcher: J. W. Markham, M.B., FRCP(c)
(at present with University of Calgary)

Funding Organization:

Saskatchewan Power Corporation

Publication:

Client report is confidential.

Activity and Description:**Investigation of Health and Comfort Complaints in the Workplace**

The New Brunswick Occupation Health and Safety Commission responds to complaints received regarding health and comfort problems in office buildings. These are largely from high rise buildings and during the cold season. Complaints are non-specific and in the nature of sore throats, runny noses, eye irritation, headaches, rashes, general malaise, etc. In a few cases, pollutants such as formaldehyde, ozone, carbon monoxide, dust, solvents, etc. have been measured, but no significant amounts have been detected, i.e. levels were far below the occupational health standards, or Threshold Limit Values (TLVs).

Recommendations made in such situations may include checking of the ventilation system for obvious sources of pollutants, regular maintenance of the system, to provide 6 L/s (12 cfm) of fresh air per person as required under Regulation 77-1 of the Occupational Health and Safety Act, and to maintain humidity at acceptable levels.

Developments in the indoor air quality field are being monitored. Consideration is being given to adopting a standard such as ASHRAE 62-1981 for office environments as a guideline.

Organization:

New Brunswick Occupation Health and Safety Commission

Bandu Imbulgoda, Occupational Hygienist
Occupation Health and Safety Commission (of New Brunswick)
P.O. Box 6000
Fredericton, N.B.
E3B 5H1
(506)-453-2467

Funding Organization:

Same as above

Activity and Description:

Air Control Systems

LMBDS-SIDAM Inc. is deeply involved in industrial and plant engineering, dealing with large volume HVAC systems (heating, ventilating and air conditioning). Other work includes commercial renovations, office buildings and light industry plants.

They have experience in designing to strict air control standards for the hospital environment. Also they are equipped to advise clients on means of meeting new Quebec standards, set down in recent occupational health and safety legislation.

Research Organization:

LMBDS-SIDAM Inc.

J. L. Roquet, Vice-President, Marketing
LMBDS-SIDAM Inc.
515 W. St. Catherine St., #625
Montreal, Quebec
H3B 1B4
(514)-282-1803

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Socio-economic and Energy-related Impacts of Regulations**

James F. Hickling Management Consultants Ltd. has experience particularly in analyzing socio-economic impact. For example, they have presently just completed a study of the socio-economic effects of the phase-out of lead in gasoline in Canada, for Environment Canada.

The same capability is applicable to the question of potential impact of regulations to promote acceptable indoor air quality, or to the potential effectiveness, in behavioural terms, of proposed solutions to residential and other indoor air quality problems.

Research Organization:

James F. Hickling Management Consultants Ltd.

J. A. McMullen
James F. Hickling Management Consultants Ltd.
Suite 605
350 Sparks St.
Ottawa, Ontario
K1R 7S8
(613)-237-2220

Publication

Lead phaseout study not yet published. Inquire to address above.

Activity and Description:

- 1. Development of Air Purifiers**
- 2. Testing of UFFI Homes**

Nova Chem Ltd. has had extensive involvement in the testing of formaldehyde levels in homes insulated with urea-formaldehyde foam insulation, throughout the Maritime provinces. This work was under contract to Consumer and Corporate Affairs Canada.

Most recently, the company has completed a report on the development of air purifiers. This work involved investigation of various pollutant absorbant systems, designed to purify the indoor air in homes.

Research Organization:

Nova Chem Ltd.

Dr. D. Davies
Nova Chem Ltd.
P.O. Box 1030 Armdale
Halifax, Nova Scotia
B3L 4K9
(902)-455-4690

Funding Organization:

Air Purifiers: Canada Mortgage and Housing Corporation
UFFI Testing: Consumer and Corporate Affairs Canada

Canada Mortgage and Housing Corporation
National Office
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2306

Publication:

Nova Chem Ltd., August 1983. "Development of Air Purifiers".
For Canada Mortgage and Housing Corporation. Inquire Canada
Housing Information Centre, CMHC, Montreal Rd., Ottawa K1A 0P7.

Activity and Description:

HVAC Design

W. L. Wardrop & Associates Ltd. has approximately thirty years of experience in the HVAC (Heating/Ventilating/Air Conditioning) design field. Experience includes familiarity with nuclear and hazardous waste storage and design of ventilating systems handling these materials.

Research Organization:

W. L. Wardrop & Associates Ltd.

W. D. (Bud) Christie, P.Eng.

W. L. Wardrop & Associates Ltd.

77 Main St.

Winnipeg, Manitoba

R3C 3H1

(204)-956-0980

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

1. Indoor Air Quality and Risk Assessment
2. Development of Passive Sampler Systems

Bioquest International, Inc., is very active in the area of determination of indoor air quality and risk assessment, and is presently receiving federal funds for the development of passive sampler systems, to be coupled with bioassays for location of potential problem locations in buildings, and in the evaluation of corrective measures.

As well, Bioquest has been active in the area of determination of potential hazards in occupational settings, including evaluation for toxic constituents in air.

The basic scientific premise of the firm is that the determination of toxic potential in contaminated environments can best be determined by the application of biological "yardsticks" to samples of the contaminated environment, rather than by merely determining the presence and levels of specific chemicals from a hazardous chemical list. In part, this is because such lists are often incomplete, and fail to consider the interactions between various contaminants, but also because of a conviction that it is the effect of the contaminants in a particular environment that is of primary importance.

Dr. Martin R. Samoiloff, Department of Zoology, University of Manitoba, is Bioquest's senior scientist for these projects. (See separate entry for work by Dr. Samoiloff and Dr. H. D. Gesser on the determination of toxicity of urea-formaldehyde foams, and evaluation of toxic constituents of foams.)

Research Organization:

Bioquest International Inc.

Ms. Hortencia Acosta, Project Manager
Bioquest International Inc.
7 Loyola Bay
Winnipeg, Manitoba
R3T 3J7
(204)-269-3067

Funding Organization:

Passive sampling: Consumer and Corporate Affairs Canada

UFFI Centre/Centre de la MIUF
Place du Centre
Hull, Québec K1A 0C9
1-800-567-6870

Publications:

Inquire Bioquest International at address above.

Activity and Description:**Building Investigations and Literature Reviews**

The British Columbia Ministry of Labour has not undertaken formal research projects dealing with indoor air quality in homes. However, the Occupational Environment Branch of the Ministry is very much involved in assessing workplace air quality. The Subcommittee on Formaldehyde and Air Contamination in Public Buildings, under the B.C. Inter-Ministry Committee on Safety and Occupational Health, recommended, in July 1983, that the Occupational Environment Branch of the Ministry of Labour be designated as the appropriate agency to continue the work of the Subcommittee. Ministry activities include:

- o Investigation of complaints of indoor air quality in commercial occupancies;
- o Ensuring that the minimum outdoor air requirements, specified in ASHRAE 62-81, are provided in the buildings investigated;
- o Ensuring that building HVAC systems are operated so that contaminants, generated during non-occupied periods, are controlled;
- o Producing a report on formaldehyde and indoor air quality, for circulation to interested parties in British Columbia (see reference below);
- o Conducting a program of evaluating and controlling the hazards, caused by friable asbestos insulation in existing buildings (see references below); and
- o Production of a booklet on office conditions, in which the issues of indoor air quality and adequate ventilation rates are addressed (to begin in near future).

(An additional summary of the Occupational Environment Branch's mandate and approach to indoor air quality is included following the listing of publications.)

Research Organization:

British Columbia Ministry of Labour

K. R. Martin, Director
Occupational Environment Branch
B.C. Ministry of Labour
#220 - 4946 Canada Way
Burnaby, B.C.
V5G 4J6
(604)-291-9494

Funding Organization:

Same as above

.../ continued

Publications:

Occupational Environment Branch, B.C. Ministry of Labour, 1983.
"Report of the Subcommittee on Formaldehyde and Air Contamination in Buildings to the British Columbia Inter-Ministry Committee of Safety and Occupational Health". Research report No. ST30120-1, July 1983, 32 pages. Inquire B.C. Min. of Labour, #220-4946 Canada Way, Burnaby V5G 4J6

Occupational Environment Branch, B.C. Ministry of Labour, 1983.
"What You Should Know About Asbestos (A guideline Program for the Control and Management of Friable Asbestos Material in Buildings)" Booklet, ISBN 0-7719-9787-6, 10 pages. Inquire B.C. Min. of Labour, #220-4946 Canada Way, Burnaby V5G 4J6.

Committee on Asbestos Hazards in Public Buildings, Occupational Environment Branch, B.C. Ministry of Labour, 1983. "The Control and Management of Friable Asbestos Materials: (Guidelines for identifying and controlling the hazards associated with friable asbestos-containing building materials). Booklet, ISBN 0-7719-9149-5, 16 pages. Inquire B.C. Min. of Labour, #220-4946 Canada Way, Burnaby V5G 4J6

Additional Summary: Occupational Environment Branch - B.C. Min. of Labour

The Occupational Environment Branch, B.C. Ministry of Labour, has a responsibility to ensure that working environments meet minimum standards which are conducive to the health, safety and well being of employees. This includes the provision of acceptable indoor air quality in factories, offices and stores within the province.

The Branch has received a large number of employee complaints of discomfort or illness that may be linked to indoor air quality. Upper respiratory irritation, allergy-like reactions, and headaches are typical of the reported employee symptoms. The symptoms often affect, to a varying degree, a significant portion of the building's population. Widely differing individual sensitivities to poor air quality conditions have been observed. The symptoms are usually specific to the building, so that when employees leave the building, the symptoms disappear.

Low level accumulations of indoor contaminants, such as cigarette smoke, formaldehyde gas, carbon dioxide, appear to be the most probable causes of the indoor air quality complaints, yet testing for elevated levels of specific contaminants is often fruitless. The problems appear most often in buildings of recent construction for where energy saving practices have been instituted. For example, to save energy the amount of indoor air introduced into a building may have been reduced. Problems can often be rectified by examining and modifying the operation of the building's heating, ventilating and air conditioning systems, to ensure that adequate fresh air is delivered to all spaces.

The Branch uses the American Society of Heating, Refrigerating, and Air Conditioning Engineers, (ASHRAE), Standard 62-1981 as a guide in appraising acceptable indoor air quality conditions. The standard addresses

../continued

(continued)

the need for lead time operation of HVAC systems in buildings where the systems are shutdown or operate in a full recirculation mode during non-occupied periods. We have found that lead cycles must often be modified to allow for adequate dilution of any contaminants which have been generated in the building space independently of the occupants or their activities.

The following are examples of indoor air quality problems found in commercial buildings:

- o poor distribution of ventilation air in the building;
- o inadequate or intermittent ventilation rates, particularly in variable air volume systems;
- o contaminated air entering the building through fresh air intakes or openings (for example, automobile exhausts from parking garages and pesticides or fertilizers from gardens and lawns near the building);
- o lack of outdoor, air due to fresh air dampers being closed to save energy;
- o low humidity levels during winter months;
- o contaminants of indoor origin, off-gassing from furniture, building materials, or photocopying; and/or
- o contaminants from chemicals used in building maintenance.

Activity and Description:

Investigation of Homes with Urea-Formaldehyde Foam Insulation

Field investigation into wall and window construction and infiltration problems, development of appropriate corrective measures for on-site applications on commercial and institutional buildings.

Investigations of the circumstances surrounding specific houses containing urea-formaldehyde foam insulation and the success of any remedial measures. (completed 1983)

Investigation into urea-formaldehyde foamed-in-place insulation and of the interaction between houses, U.F.F.I., climate, occupants and remedial measures.

Research Organization:

Clerk Window & Wall Technical Services Ltd.

Marc Clerk
Clerk Window & Wall Technical Services Ltd.
370 Riviere
Cowansville, Quebec
J2K 1N3
(514)-725-4713

Funding Organization:

National Research Council of Canada

Cliff Shirtliffe
Division of Building Research
National Research Council of Canada
Montreal Rd., Ottawa, Ontario K1A 0R6
(613)-993-1821

Publication:

Clerk, Marc, 1983. "Investigations of the Circumstances Surrounding Specific Houses Containing Urea-Formaldehyde Foam Insulation and the Success of any Remedial Measures". For National Research Council of Canada. DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

1. Indoor Air Quality Evaluations
2. Monitoring of Developments in the Indoor Air Quality Field

The Occupational Health Division of the Nova Scotia Department of Health is keeping close track of developments in the field of indoor air pollution.

T. A. Mejzner, P.Eng. Director of the Division, represents the Department on the Federal-Provincial Working Group on Indoor Air Pollution. Division staff has also been involved in various committees dealing with houses insulated with urea-formaldehyde foam insulation, and has been evaluating indoor air quality since 1980. The number of residential evaluations peaked in 1981, when 368 homes were checked, prior to Federal inspection and grant programs for UFFI.

Inspections are still carried out for homeowners, at the request of physicians who suspect their patients' symptoms may be caused by poor indoor air quality. Current investigations usually consist of formaldehyde measurement, but often include checks for the presence of other hydrocarbons and gaseous and particulate contaminants, as well as biological agents. Standards presently used by the Division are:

1. Environmental Standards;
2. Threshold Limit Values (TLVs);
3. Levels proposed in drafts presented at different meetings of the Fed/Prov. Working Group ; and
4. Canadian, U.S. and British Code Ventilation Standards.

Division staff has also been involved, when requested, in presentations to interested public groups, on indoor air pollution problems, including indoor air pollution in offices.

Research Organization:

Nova Scotia Department of Health

T. A. Mejzner, P.Eng., Director, or
 Jim LeBlanc, Occupational Hygienist
 Division of Occupational Health
 Nova Scotia Department of Health
 P.O. Box 488
 Halifax, Nova Scotia
 B3J 2R8

Funding Organization:

Same as above.
 Residential investigations are confidential.

Publications:

No publications for general use issued to date.

Activity and Description:

Seminar Courses Pertaining to Indoor Air Quality

The Faculty of Environmental Design, University of Calgary, has organized and conducted a series of seminars pertaining to indoor air quality, and to the conditions required to maintain human health. Dr. Valerius Geist, principal speaker, has attempted to reach architects and designers within and beyond the university community, to relay information in this field that could be given practical application in building design and construction.

Research Organization:

University of Calgary

Dr. Valerius Geist
Faculty of Environmental Design
University of Calgary
2500 University Drive N.W.
Calgary, Alberta
T2N 1N4
(403)-284-7430

Publication:

Geist, Valerius, 1978. "Life Strategies, Human Evolution, Environmental Design". Springer-Verlag, New York.

Wilson, Jim, 1983. "Indoor Air Quality: A 'Chemical Soup' in our Homes and Workplaces" (includes interview with Dr. Geist). Environment Views 6, No. 4, pp. 12-15, July/August 1983. Publication available from Alberta Environment, Communications Branch, 11th floor, Oxbridge Place, 9820 - 106 St., Edmonton T5K 2J6

Activity and Description:**Homeowner Information on Energy Conservation and Air Quality**

Publication of a homeowner's 'question and answer' guide to home rewinterizing, to resolve confusion about conflicting recommendations, insulation hazards, etc. Contains section specifically dealing with questions of indoor air quality.

Development of video production capacity in energy conservation and indoor air quality, including four short videos for home show use, featuring caulking, weatherstripping, attic insulation and foundation wall insulation. Longer term projects include the formation of a stock shot-bank of video images which would allow others to produce inexpensive videos without technical field shooting.

Research Organization:

Jon Eakes Enterprises, Inc.

Jon Eakes
Jon Eakes Enterprises, Inc.
C.P. 387, Succursale Delorimier
Montreal, Quebec
H2H 2N7
(514)-598-9988

Funding Organization:

Homeowner guide: Independent Productions
Four videos: Canadian Electrical Association

Georges Portelance
Canadian Electrical Association
1 Westmount Square, Suite 580
Montreal, Quebec
H3Z 2P9
(514)-937-6181

Publication:

Eakes, Jon, 1982. "Insulation Aftermath (The Canadian Answer Book to Home Insulation Conflict and Confusion)". Ontario Marketing Productions Limited, Softcover booklet, 79 pages. Inquire Rewinterizing, OMP, 109 Scollard St., Toronto Ont. M5R 1G4.

Eakes, Jon, 1984. "J'isole Mieux, Repérer et Corriger les Défauts de l'Isolation". Les Éditions de l'Homme, softcover book, 334 p. Updated Translation of "Insulation Aftermath". Inquire Les Éditions de l'Homme, 995, rue Amherst, Montréal, Québec H2L 3K4.

Activity and Description:

Indoor Air Quality Analysis for Microbial Factors and Trace Organics

CANPRO Laboratories concentrates primarily on commercial and industrial air quality analysis, but has been involved in some residential work as well. Experience includes formaldehyde analysis in homes insulated with urea-formaldehyde foam insulation.

The laboratory is equipped with samplers to test for both microbiological factors and trace organic chemicals in air. Much of the microbiological work has been industrial and agricultural in nature, and includes detection of both moulds and mould toxins. Facilities are available for gas and liquid chromatography and gas chromatography/mass spectrometry.

Research Organization:

CANPRO Laboratories (A Division of Research Foods (1976) Ltd.)

Stuart Terhune
CANPRO Laboratories
77 Champagne Dr.
Downsview, Ontario
M3J 2C6
(416)-635-8692

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Seminars on Ventilation of Energy Efficient Houses

As part of an extension program for rural audiences, seminars are presented dealing with mechanical ventilation and indoor air quality. Information is from published sources. Seminars are ongoing.

Research Organization:

Alberta Agriculture, Home & Community Design Branch

Donald Wharton
Energy Management Engineer
Home & Community Design Branch
Alberta Agriculture
7000 - 113 Street, 2nd floor
Edmonton, Alberta
T6H 5T6
(403)-427-2181

Research associate: Donna Bagdan

Funding Organization:

Same as above.

Publication:

Wharton, Donald, 1982. "Residential Air-to-Air Heat Exchangers".
Home and Community Design Branch, Alberta Agriculture. Homedex
1700-78-4, Fact Sheet, 9 pages, September 1982. Available from Alberta
Agriculture, Edmonton T6H 5T6 FO:

Activity and Description:

**Contaminants from Residential Combustion Appliances
in the Indoor Environment**

The Residential Fuel Combustion Committee, APCA TS-2.3 of the Air Pollution Control Association, held a technical session at the 1984 Annual Meeting of the Air Pollution Control Association (APCA) in San Francisco, June 24-29, 1984, on the subject of 'Contaminants from Residential Combustion Appliances (in the indoor environment)'.

Increased emphasis on energy conservation has resulted in new types of heating equipment, such as unvented space heaters, undiluted furnaces and woodstoves. With the simultaneous reduction in air change by house tightening, some of these changes can bring about a benefit, while others may present serious pollution hazards to the house occupants. Contaminant levels and/or hazardous conditions, with their possible solutions, were highlighted.

The Ontario Section of the Air Pollution Control Association co-sponsored a specialty research seminar on recent developments in the measurement, evaluation and effects of indoor air pollution, May 13, 1983 at the University of Toronto. The seminar was co-sponsored with the Occupational Hygiene Association of Ontario, with program assistance from the Ontario Ministry of Labour and Dr. John L. Sullivan of the University of Western Ontario.

Research Organization:

Air Pollution Control Association

Dr. P. Complin, President
Air Pollution Control Association (Ontario Section)
c/o McLaren Plansearch
33 Yonge Street, 7th floor
Toronto, Ontario
M5E 1E7
(416)-365-7275

(re Residential Fuel Combustion Committee)
A. C. S. Hayden, Research Scientist
Canadian Combustion Research Laboratory
555 Booth St.
Ottawa, Ontario K1A 0G1
(613)-996-4570, ext. 182

Publications:

Air Pollution Control Association, 1982. "APCA Issues Position Statement on Indoor Air Quality" (article). Air Pollution Control Association Journal 32, p. 548, May 1982.

Activity and Description:

**Data Acquisition and Telemetry Systems Applicable to
Air Quality Measurement**

Canadian Applied Technology manufactures data acquisition and telemetry systems, and represents a line of air quality analyzers - for carbon monoxide, carbon dioxide, various hydrocarbons, etc.

The Company equips firms to do full air quality investigations, including data logging and hard copy output. Any equipment providing voltage or current outputs can be interfaced with the datalogger and converted to engineering units. The datalogger may be used through an RS232 computer port, to provide a network approach with central microcomputer, graphics and plotting, etc.

Research Organization:

Canadian Applied Technology

Julie Christian
Canadian Applied Technology
16th Avenue, Buttonville Airport
Markham, Ontario
L3P 3J9
(416)-477-6681

Funding Organization:

Client funded studies

Publications:

Inquire Canadian Applied Technology at address above.

Activity and Description:

Energy Efficient Buildings Program

The Canadian Electrical Association has been conducting an 'energy-efficient (Double E) building program' aimed at commercial, industrial and residential customers. CEA's role has been to provide information to the building trades. Several hundred Double E houses have been built across the country since the program began in 1979. Currently, the Residential Technical Committee of CEA is evaluating the existing Double E Homes and compiling an Owner's Manual for those who want to maximize the energy efficient features built into their homes.

The residential program advocates tighter building envelopes to reduce uncontrolled air leakage, but recognizes the importance of providing adequate air quality. Mechanical ventilation systems, capable of 0.5 air changes per hour, are required under the Program.

Research Organization:

Canadian Electrical Association

Georges Portelance, Manager
CEA Customer Services Division
Canadian Electrical Association
Suite 580, One Westmount Square
Montreal, Quebec
H3Z 2P9
(514)-937-6181
Telex 05-267401

Funding Organization:

Same as above.

Publication:

Canadian Electrical Association, 1983. "Research Continues to Analyze Indoor Air Quality". Double E Information Vol. 2, No. 1, Spring/Summer 1983. Inquire Double E Information, 1 Westmount Sq., Montreal H3Z 2P9.

Activity and Description:

- 1. Literature Research and Air Quality Monitoring**
- 2. Effects of Automotive Emissions**

The Environmental Applications Group has experience primarily in outdoor air quality research and monitoring, but is presently entering the indoor air quality field.

Related work in outdoor air quality includes:

A literature review study, for Environment Canada, on the health and environmental effect of automobile exhaust emissions, plus indoor/outdoor air quality relationships.

Analyses of stack gas emissions being entrained into an office building ventilation system, and general assessment relevant to indoor air quality.

Receptor modelling of the contributions of emission sources of particulates to ambient loadings in cities across Canada.

Specification of Volatile Organic Compounds (VOCs) from indoor solvent use and smoking, as part of the Ontario VOC Emission Inventory.

Research Organization:

The Environmental Applications Group Ltd.

Gilles Castonguay
The Environmental Applications Group Ltd.
114 Avenue Rd.
Toronto, Ontario
M5R 2H4
(416)-968-3684

Funding Organization:

Automobile emission study: Environment Canada

Publications:

The Environmental Applications Group, 1983. "Effects of Automotive Emissions". For Environment Canada. Inquire Environment Canada Publications, Ottawa, Ontario K1A 0H3.

Kolomeychuk, R., Yeager, L., Spiegel, J., and Yassi, A., 1984. "Effects of Automotive Emissions". Preprints, 77th Annual Meeting of the Air Pollution Control Association, June 24-29th, 1984, San Francisco, California. Inquire Env. Applications Group, address above.

Activity and Description:

Air Exchange Products and Newsletter

Periodic newsletter, dealing with information on indoor air quality issues and promotion of company's air exchange products. Research, development and marketing of air exchange products for energy-conservative construction.

Research Organization:

CES - Conservation Energy Systems Inc.

Richard W. Olmstead, President
Conservation Energy Systems
800 Spadina Crescent East
P.O. Box 8280
Saskatoon, Sask.
S7K 6C6
(306)-665-6030

Funding Organization:

Same as above.

Publication:

Conservation Energy Systems, Inc., 1983 to present. "The Air Exchange (Newsletter)". Regular publication, first issue Fall 1983. Available from CES, PO Box 8280, Saskatoon S7K 6C6.

Activity and Description:**Laboratory Services for Indoor Air Quality Sampling**

The Enviroclean Division of MacLaren Plansearch has a fully equipped laboratory in London, Ontario, with trained personnel and equipment suitable for air sampling and analysis.

The laboratory is equipped for the determination of trace metals by atomic absorption, for organic vapours by gas chromatography and for a variety of other contaminants. Methods of analysis are those approved by NIOSH (U.S.) and the Ontario Ministry of Labour and are continuously reviewed and updated, in keeping with new developments in analytical methodology.

The lab's quality assurance program includes regular participation in a number of interlaboratory comparison programs, including the FICP check sample program (Agriculture Canada), the FCAP quality assurance program (Environment Canada) and the UFFI laboratory registration program.

MacLaren Plansearch, in conjunction with MacLaren Engineers, has conducted a number of large-scale research projects, including studies of indoor contaminant buildup in houses, monitoring of ambient air quality in offices, and a variety of ventilation studies using tracer dilution techniques.

Research Organization:

Enviroclean Division of MacLaren Plansearch

Dr. Roy Whitehead, Manager

W. M. Neaves, Chemist

Enviroclean Laboratories

Enviroclean Division of MacLaren Plansearch

320 Adelaide St. South

London, Ontario

N5Z 3L2

(519)-686-7558 (Roy Whitehead)

(519)-686-5711 (Bill Neaves)

Telex 06-23765

Cable LAVALIN TOR or JAYMAC

Funding Organization:

Client funded studies.

Publication:

Enviroclean, 1983. "Comprehensive Environmental Laboratory and Field Services". Inquire Enviroclean, 320 Adelaide St. S., London N5Z 3L2.

Activity and Description:

Chemical Hazards and Energy Conservation in Buildings

The study is a review of available information relevant to chemical hazards and energy conservation in buildings. It outlines measures for conserving energy in both dwellings and commercial buildings, identifies the most common sources of indoor airborne chemicals, together with the pollutant levels expected, discusses the potential health effects of these pollutants, and considers possible connections between conservation measures and health effects.

Research Organization:

Michael Holliday & Associates

Michael Holliday, Ph.D.
149 Bayswater Avenue
Ottawa, Ontario
K1Y 2G2
(613)-728-9769

Research Associates: David Fletcher, cJohn Park, Jennifer Engelhardt

Funding Organization:

Health and Welfare Canada

Dr. Peter Toft, Chief
Monitoring and Criteria Division
Environmental Health Directorate
Health and Welfare Canada
Environmental Health Centre
de la Colombine Blvd.
Tunney's Pasture
Ottawa, Ontario
K1A 0L2
(613)-992-0891

Publication:

Not yet published. Inquire Health and Welfare Canada at above address.

Activity and Description:

Master's Thesis: Home as a Hazard

This research has concentrated on developing and applying risk assessment techniques to the problem of chemical hazards in the domestic environment.

Completion December 1983.

Research Organization:

David Fletcher
Department of Urban Geography
University of Toronto
Toronto, Ontario
M5S 1A1

Publication:

Fletcher, David (not yet published). "Home as a Hazard".
Enquire Dept. of Urban Geography, Univ. of Toronto,
Toronto M5S 1A1.

Activity and Description:

Upgrading Residential Forced Air Filtration

Detached dwelling units, with forced air heating, offer the possibility to significantly lower levels of suspended particulate matter. Several medium-to-high efficiency filtration systems are compared-with respect to capital costs, annual operating costs and maintenance requirements.

Data from filter suppliers, heating system installers and maintenance companies are summarized. Costs for medium-efficiency filtration are marginally higher, initially, and equivalent in the long term, when compared with continued use of conventional low-efficiency filtration. Energy impacts may be minimal - any losses due to increased resistance are presumably balanced by gains in fan assembly efficiency, due to cleaner operation. Maintenance, at regular intervals, is obligatory for such filters.

Public health impacts may be anticipated from the considerable reduction in suspended particles of small diameter. Furnace industry policies have contributed to a deterioration in the efficiency of residential filtration. Complex distribution and marketing problems prevent widespread availability of medium efficiency filters at present.

Research Organization:

Karl H. Raab, Ph.D.
22, Place du Marechal Leclerc
F - 59046 Lille Cedex
France
Tel: 33-20-072008

(formerly Vancouver, B.C.)

Funding Organization:

Canada Mortgage and Housing Corporation

Peter Russell, Research Division
Canada Mortgage and Housing Corporation
National Office, Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2306

Publication:

Raab, Karl, Ph.D., 1982. "Upgrading Residential Forced Air Filtration". For Canada Mortgage and Housing Corporation. Research Report, May 1982, 34 pages. Inquire CMHC Housing Information, Montreal Rd., Ottawa K1A 0P7.

Activity and Description:

- 1. Updating Health Standards for Residential Construction**
- 2. Strategies for Healthful Residential Environments**

The first study was a short critique of the National Building Code, dealing predominantly with protection of indoor air quality.

The second study reviews the available techniques for air quality maintenance in residences. The methods are classified as source controls, cleaning and dilution control. Strategies are proposed for occupants of four typical housing/heating system combinations. They include technical approaches, elementary housekeeping practices and some low technology applications.

The researcher notes that a successful household strategy requires an understanding of pollutant sources, and understanding of elementary principles of pollution control, periodic review of changes in lifestyle factors which could alter generation rates, and awareness of improvements in available technologies.

Research Organization:

Karl H. Raab, Ph.D.
22, Place du Marechal Leclerc
F - 59046 Lille Cedex
France
Tel: 33-20-072008

(formerly Vancouver, B.C.)

Funding Organization:

Canada Mortgage and Housing Corporation

Peter Russell, Research Division
Canada Mortgage and Housing Corporation
National Office, Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2306

Publications:

Raab, Karl, Ph.D., 1982. "Updating Health Standards for Residential Construction". For Canada Mortgage and Housing Corporation. Inquire Housing Information Centre, CMHC, Ottawa K1A 0P7.

Raab, Karl. Ph.D., (not yet published). "Strategies for Healthful Residential Environments". Inquire Housing Information Centre, CMHC, Ottawa K1A 0P7.

Activity and Description:

Design and Construction of Low-Energy and Low-Pollution Homes

Allen-Drerup-White Ltd. was responsible for both the design and construction of two special low-pollution residences for clients just west of Ottawa, Ontario. Each residence is designed for the lowest practical indoor air pollution levels, and takes into account the specific allergic sensitivities of the owners. One house was finished in the spring of 1984, while the other was substantially completed by fall 1984. The firm also explored the concept of a low-pollution housing co-operative, for persons desiring a clean indoor environment.

For over eight years, the principals of Allen-Drerup-White Ltd. specialized in the development of new, passive solar, low-energy building technologies. They are recognized for their work in super-insulation and solar design, airtight construction and heat recovery ventilation systems. Studies undertaken by the firm include an assessment of ventilation standards and their impact on energy conservation and air quality, for the Riverdale Co-op in Toronto.

They have also been involved in the design and prototyping of air-to-air heat exchangers for residential use, marketed by The Air Changer Company Ltd., an associated company.

Research Organization:

formerly Allen-Drerup-White Ltd.
(Designers-Builders and Consultants,
Energy Conservation and Solar Heating)

Greg Allen, P.Eng.
73 Woodville Ave.
Toronto, Ontario
M4K 2J5
(416)-421-4071

Publications:

Allen-Drerup-White Ltd. "Low Energy Houses: Residential Brochure". Brochure, 30 pages, English.

The Air Changer Company Limited. "The Air Changer Application Guide". Brochure, 12 pages (English), 16 pages (French).

Activity and Description:**Information and Support for Persons with Allergies, Including Indoor Inhalant Sensitivities**

The Allergy Information Association is a nonprofit organization federally registered as a charitable organization. It provides information and support for persons inquiring about allergic problems, including common indoor inhalant allergies to dust, mould, animal dander, etc.

Information sheets are available on various subjects, and include discussion of the role of indoor inhalant and chemical contaminants in allergic disease.

Research Organization:**Allergy Information Association**

Susan Daglish, President and Newsletter Editor
Allergy Information Association
Room 7, 25 Poynter Drive
Weston, Ontario
M9R 1K8
(416)-244-9312

Funding Organization:

The Association is a federally registered charitable organization. Funding is by memberships, donations, grants, publication sales and fund-raising activities.

Publication:

Allergy Information Association. "The Allergy Shot".
Periodical, ISBN 0227-7387, English. Inquire AIA, Room 7, 25 Poynter Dr., Weston, Ont. M9R 1K8.

Activity and Description:

Indoor Air Quality Monitoring: Commercial/Industrial

Barringer Research Limited provides a measuring and monitoring service for indoor pollutants, and specializes in sampling particulates, using high volume samplers. Work to date has been commercial and industrial, but expertise and equipment could be applied to residential work as well.

Barringer has a fully equipped laboratory for inorganic and organic trace analyses, including instrumentation for gas chromatography/mass spectrometry. Technical capability includes laboratory expertise in environmental science and mineral exploration analyses.

Research Organization:

Barringer Research Limited

Dr. Ron Jackson, Senior Analytical Chemist
Mr. Alan J. Lipski, Laboratory Manager
Barringer Research Limited
304 Carlingview Drive
Rexdale, Ontario
M9W 5G2
(416)-675-3870

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Air Quality Research: Measurement and Literature Surveys**

B.C. Research is a not-for-profit contract research organization which carries out applied research in a variety of areas, for government and industrial clients.

The atmospheric environment group has been involved in a number of indoor air quality research projects:

- o computer modelling of gas appliance venting and combustion air makeup in buildings (mainly residential), to address problems of carbon monoxide backup of heating appliances and determine the factors controlling it (involving literature search of existing models, selection of best features and creation of new model) (Gas Safety Branch, Ministry of Labour Canada); and
- o measurements and literature surveys, re air quality generally, and specific air pollutants and their sources in homes (Health and Welfare Canada, B.C. Government Ministries, Crown Corporations).

B.C. Research has well-equipped laboratory facilities, including a broad range of conventional and state-of-the-art sampling and analytical capabilities.

Research Organization:

B. C. Research

Dr. John Leach / Gordon Esplin
Division of Environment and Health
B. C. Research
3650 Wesbrook Mall
Vancouver, B.C.
V6S 2L2
(604)-224-4331

Funding Organization:

Gas appliance venting: Ministry of Labour Canada, Gas Safety Branch
Indoor air pollutant surveys: Health and Welfare Canada

Publications:

B.C. Research, 1982. "A Study of Residential Combustion Air Requirements and Air Supplies". For Department of Labour, Gas Safety Branch. Inquire Labour Canada Publications, Ottawa K1A 0J2.

B.C. Research. "Criteria Reviews of Indoor Air Quality: 1) Aldehydes, other than Formaldehyde; 2) Oxidants. For Monitoring and Criteria Division, Health and Welfare Canada, Tunney's Pasture, Ottawa.

Activity and Description:

Indoor Carbon Dioxide Monitoring

During the period November 1981 to February 1982, the British Columbia Ministry of Environment studied carbon dioxide levels in the Ministry of Environment Building, 810 Blanshard St., Victoria.

Research Organization:

British Columbia Ministry of Environment

Mr. Barid Manna
Manager, Air Emissions Management
Ministry of Environment
810 Blanshard St.
Victoria, B.C.
V8V 1X5
(604)-387-4321

Associate researcher: Dave Lockhart

Funding Organization:

Same as above

Publication:

In-house correspondence only. Not published.

Activity and Description:**Literature Review on Indoor Air Pollution and Housing Technology**

CMHC undertook a literature review to remedy the lack of available information on indoor air quality, especially as it relates to Canadian building practices, habits and climates. The review concludes that many materials and conditions which contribute significantly to indoor air pollution are known to be present in Canadian homes. However, the number of Canadian homes in which air pollution levels present a major problem is presently unknown.

Details are presented as to the sources and possible health effects of various major pollutants, including carbon monoxide, nitrogen oxides, radon gas, formaldehyde, tobacco smoke, ozone, asbestos, dust and moulds, bacteria and viruses, and a host of organic chemical vapours, some of which are known or suspected carcinogens.

Research Organization:

Bruce M. Small and Associates Limited

Bruce M. Small, P.Eng.
Small and Associates
R.R.#1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Funding Organization:

Planning Division, Policy Development and Research Sector
Canada Mortgage and Housing Corporation

Peter Russell
Research Division
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2306

Scientific Authority: Judy Lorimer; Technical Adviser: Peter Russell

Publication:

Bruce M. Small, P.Eng., 1983. "Indoor Air Pollution and Housing Technology". Small and Associates, for Canada Mortgage and Housing Corporation. Research report, Consultant report, 308 pages, ISBN 0-920509-00-2, August 1983. Available from Technology and Health Foundation, R.R.#1, Goodwood, Ontario L0C 1A0.

Activity and Description:

Studies on Indoor Air Quality in Canadian Homes

Small and Associates is undertaking a comprehensive study program on indoor air quality in Canadian homes for Canada Mortgage and Housing Corporation. This work addresses gaps identified in earlier work (see Small and Associates, "Indoor Air Pollution and Housing Technology", August 1983). Four primary areas of study are:

- 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 vulnerable populations - to understand the extent of the Canadian population adversely affected by hazardous contaminants in indoor air, and the nature of the range of vulnerability of the design population for Canadian residences.
- o the regulatory framework - to understand the role of legislation, regulatory powers, and standards, in addressing indoor air pollution problems in Canadian housing;
- 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.

Research Organization:

Bruce M. Small and Associates Limited

Bruce M. Small, P.Eng, President, Small and Associates
R.R.#1, Goodwood, Ontario, L0C 1A0
(416)-294-3531

Funding Organization:

Canada Mortgage and Housing Corporation

Jim H. White, Research Division
Canada Mortgage and Housing Corporation
Montreal Road, Ottawa, Ontario K1A 0P7
(613)-748-2309

Project Officer: J. Lorimer; Scientific Authority: J. White

Publication:

Bruce M. Small, P.Eng. 1985. "Indoor Air Quality in Canadian Homes: Research and Information Base". Small and Associates, for Canada Mortgage and Housing Corporation. Inquire Canada Housing and Information Centre, CMHC, Montreal Rd., Ottawa K1A 0P7.

Activity and Description:

Documentary: The Twentieth Century Disease

One-hour filmed documentary on allergy and chemical susceptibility, initially aired March 1983 and re-aired February 28, 1984. The program includes discussions with medical authorities concerning the health effects of indoor pollutants such as urea formaldehyde foam insulation, and documents the use of chemically clean indoor environments as part of a therapeutic program for sensitized individuals.

Research Organization:

Canadian Broadcasting Corporation

Lawrence M. Gosnell, Producer
Canadian Broadcasting Corporation
Current Affairs Division
Box 500, Station A
Toronto, Ontario
M5W 1E6
(416)-925-3311 ext. 2314

Funding Organization:

Same as above

Publication:

Lawrence M. Gosnell, 1983. "The Twentieth Century Disease". Canadian Broadcasting Corporation, 3/4 inch Video-Cassette or film., one hour, March 1983. Inquire L. Gosnell, CBC, (416)-925-3311/ext 2314.

Activity and Description:

State-of-the-Art Review of Indoor Pollution Research

A considerable amount of research on indoor pollution is accompanying the increase in public awareness of problems in buildings (building syndrome, building sickness). The object of the project is to monitor the research findings, with a view to implementing the results (where practicable) in future building projects, as well as the existing building stock, where problems exist.

Alberta Public Works, Supply and Services is also working on the introduction of air quality standards into electronic office design guidelines.

Research Organization:

Alberta Public Works, Supply and Services

Dr. Sam Mattar, Project Manager
Alberta Public Works, Supply and Services
Suite 1001, John J. Bowlen Bldg.
620 - 7th Ave. S.W.
Calgary, Alberta
T2P 0Y8
(403)-297-6367

Funding Organization:

Same as above.

Mr. George Gerencser
Alberta Public Works, Supply and Services
21st floor, College Plaza
8215 - 112 St.
Edmonton, Alberta
T6G 5A9
(403)-422-1675

Activity and Description:**Inquiries Services for Occupational Health and Safety**

The Canadian Centre for Occupational Health and Safety provides an inquiry service regarding occupational health and safety questions. The scope of the centre's work is limited to indoor air in occupational settings only.

Research Organization:

Canadian Centre for Occupational Health and Safety
250 Main St. East
Hamilton, Ontario
L8N 1H6
Tel: (416)-523-2981; Telex: 061-8532

Funding Organization:

Government of Canada

Publications:

Canadian Centre for Occupational Health and Safety, 1983. "Introducing CCOHS". Pamphlet, English and French, available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Atherley, G.R.C., Goldman, N., and Moriarity, W., 1983. "A User-Oriented Service of Information and Advice in Occupational Health and Safety: The Experience of the Canadian Centre for Occupational Health and Safety". Numbers A83-5E (English) and A83-5F (French). Available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Halton, D.M., 1982. "Photocopiers: Do They Pose a Health Hazard?" Numbers P83-1E (English) and P83-1F (French). Available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Halton, D.M., 1983. "Occupational Exposures From Spirit Duplicator Operations". Numbers P84-2E (English) and P84-2F (French). Available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Marha, Karel, 1982. "The State of Knowledge Concerning Radiation Emissions from Video Display Terminals". Numbers A82-4E (English) and A82-4F (French). Available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Marha, Karel, 1983. "VLF - Very Low Frequency Fields Near VDTs And an Example of Their Removal". Numbers P83-5E (English) and P83-5F (French). Available from CCOHS, 250 Main St. E., Hamilton L8N 1H6.

Activity and Description:

Filtering Equipment for Fine Particulates and Gaseous Pollutants

Development and testing of filtering equipment, using chemisorbant and Multi-Mix (R) filtration media, for adsorption, absorption, neutralization, complexation, and oxidation of gaseous pollutants.

Research Organization:

Circul-Aire Inc.

Dr. B. C. Pant
Circul-Aire Inc.
5885 Ouest, Boul. Henri-Bourassa
Montréal, Québec
H4R 1B7
(514)-336-3330

Funding Organization:

Same as above.

Stephen Huza, Vice-President
(514)-336-3330

Publications:

Pant, B.C., 1983. "Filtering Equipment: Gaseous Pollutants". ASHRAE Research and Technical Committee Seminar on Indoor Air Quality, April 4, 1983, Toronto. Reprints available from Circul-Aire Inc., 5885 Henri-Bourassa, Montreal H4R 1B7.

Pant, B.C., 1982. "Formaldehyde in the Indoor Environment: Sources, Health Effects and Control". ASHRAE Seminar, June 27, 1982. Reprints available from Circul-Aire Inc., 5885 Henri-Bourassa, Montréal H4R 1B7

Activity and Description:**Indoor Air Quality Sampling and Analysis**

Clayton Environmental Consultants has capability and experience in both outdoor and indoor air quality sampling and analysis, including asbestos sampling, occupational hygiene samples, and various NIOSH tests.

Clayton's laboratories are equipped for atomic absorption, gas chromatography and spectrophotometry. Accreditation, by the American Industrial Hygiene Association, was approved in January 1984. The firm is associated with Clayton Environmental Consultants in the United States and, through them, has access to two additional accredited laboratories, with similar equipment, as well as facilities for gas chromatography/mass spectrometry (GC/Mass Spec).

Experience in indoor air quality analysis includes formaldehyde measurement in residential situations and analysis of various 'odour complaint' or 'building illness' situations.

Research Organization:

Clayton Environmental Consultants

Douglas S. Smith, Vice-President and General Manager
Clayton Environmental Consultants
400 Huron Church Rd.
Windsor, Ontario
N9C 2J9
(519)-255-9797

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Federal Building Energy Conservation R&D Plan

A planning document, looking at trends, problems, and opportunities in energy use in buildings, for the Federal Building Energy Conservation Sector (BECS) Committee. The paper sets forth a set of research and development needs, and a method for evaluating and ranking research and development proposals. Building energy conservation research programs were divided into six sub-categories, one of which is Indoor Air Quality.

Research Organization:

Energy Mines and Resources Canada
National Research Council of Canada

Doug Walkinshaw
Division of Building Research, M24
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6
(613)-993-8232

Funding Organization:

Energy Mines and Resources Canada

Hamid Mohamed, Secretary
PERD/BECS Committee
Office of Energy Research and Development
Energy Mines and Resources Canada
10th Floor, 580 Booth Street
Ottawa, Ontario
K1A 0E4

Publication:

Report for federal building energy conservation research planning purposes.

Activity and Description:**Evaluation of Radon and Air Quality Control Techniques**

Project was to test methods of soil gas exclusion from houses, and the effectiveness and energy cost of various ventilation techniques, in four houses at Elliot Lake. Measurements were made of formaldehyde, organic vapours, humidity, odours, radon and energy consumption, before and during occupancy. The variation of ventilation rate, with control methods, was measured. Satisfactory control of humidity, odours and radon was achieved, at low forced ventilation rates, via a fresh air intake on the forced air ventilation system.

Research Organization:

DSMA ATCON LTD.* (with Acres Consulting Services Ltd.)

*this company no longer exists; contact researcher directly at the address below:

Mr. A. G. Scott
Arthur Scott and Associates
Box 164
215 Burnamthorpe Rd. W.
Mississauga, Ontario
L5L 3A2
(416)-828-2389

Funding Organization:

Ontario Ministry of Municipal Affairs and Housing
Ontario Ministry of Energy

Publication:

DSMA ATCON, 1983. "Evaluation and Air Quality Control Techniques - Phase III of Collaborative Design Project, Elliot Lake Houses". DSMA Report No. 1283/1292.

Activity and Description:

Development of Alternative Electronic Air Filters

Research and development has been underway to produce alternative, less-expensive methods of electronic air filtration, that will not generate ozone. Home units have been placed on the market; patents applied for in Canada, U.S. and overseas.

Research Organization:

Engineering Dynamics Ltd.

C. J. Joannou / Wm. Pick
Engineering Dynamics Ltd.
Highway 29
Carleton Place, Ontario
K7C 3P1
(613)-257-5450

Funding Organization:

Same as above.

Publication:

Engineering Dynamics Ltd., 1983. "Information on Dynamic Electronic Air Filter". Fact sheet, 7 pages, available from Eng. Dynamics, Hwy. 29, Carleton Place K7C 3P1.

Activity and Description:

Indoor Air Monitoring for Asbestos

Hardy Associates has extensive experience in the monitoring of indoor air for asbestos particles, including measurements during asbestos removal operations. Work has been primarily commercial and government buildings, industrial workshops, schools, and various industries, but has also included some residential measurements.

The company has also performed formaldehyde sampling in homes, as well as testing for nuisance dusts (wood, metal, etc.) in Industrial Arts Laboratories in schools.

Research Organization:

Hardy Associates (1978) Ltd.

Kerry Peters
Hardy Associates (1978) Ltd.
P.O. Box 746
4810 - 93rd St.
Edmonton, Alberta
T5J 2L4
(403)-436-2152

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Information and Support for Persons Susceptible to Indoor Pollutants

The Human Ecology Foundation of Canada is a patient support group designed to provide information and practical assistance to persons with environmentally-related illness, for example, those who are made ill by exposure to various indoor air contaminants.

A quarterly newsletter and various information sheets are available.

The Foundation has branches in Toronto, Ottawa, Kitchener and Hamilton.

Research Organization:

The Human Ecology Foundation of Canada

National Office:

The Human Ecology Foundation of Canada
465 Highway 8
Dundas, Ontario
L9H 4V9

Enquiries:

Mrs. Darlene Koski, President
The Human Ecology Foundation of Canada
c/o Human Ecology Foundation (Toronto)
65 Dolly Varden Blvd.
Scarborough, Ontario
M1H 2K2
(416)-438-9202

Funding Organization:

The Foundation is a federally registered charitable organization. Funding is by memberships and donations.

Publication:

The Human Ecology Foundation of Canada, 1978 to present. "Human Ecology Foundation (Canada) Quarterly". Quarterly publication, inquire H.E.F. Canada, 465 Hwy 8, Dundas, Ontario L9H 4V9.

Activity and Description:

1. Air Infiltration Monitoring
2. Radiation Monitoring
3. Smoke Movement Studies

MacLaren Engineers have considerable experience in air infiltration monitoring, using sulphur hexafluoride tracer gas techniques.

One study, undertaken for the National Research Council of Canada, involved measuring the infiltration rate in 12 electrically heated houses over one full heating season, using a tracer gas technique. This method is considered to give a more accurate reading of infiltration, than alternative fan-door depressurization techniques, and allows monitoring under varying temperature, humidity and wind conditions.

MacLaren Engineers have also been involved in radiation monitoring in residential and commercial buildings in Port Hope and Bancroft, Ontario, for the Atomic Energy Control Board and Atomic Energy of Canada Limited.

A recent study, for the National Research Council of Canada used tracer gas techniques to determine the potential pathways, and relative concentrations of smoke, in a building fire. Measurements were done on the 15-storey Delta Meadowvale Inn in Mississauga, Ontario.

Research Organization:

MacLaren Engineers, Planners and Scientists

George A. Aldworth / Paul J. Manley
MacLaren Engineers, Planners and Scientists
33 Yonge St.
Toronto, Ontario M5E 1E7
(416)-365-7337

Funding Organization:

Tracer gas studies: National Research Council of Canada

George T. Tamura
Division of Building Research
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario K1A 0R6
(613)-993-1231

Publication:

Tamura, G.T., and Manley, P.J., 1984. "Smoke Movement Studies in a 15-Storey Hotel". Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

Program for Monitoring Indoor Air Quality in Homes

Manitoba Environment has a program in which citizens may request monitoring of suspected indoor air quality problems in their homes. The Air Pollution Section of the Department has carbon monoxide and carbon dioxide monitors, ozone and formaldehyde monitors, and Draeger multi-gas detectors.

Typical situations encountered involve ventilation problems, or furnace problems, which are often interconnected. A staff of two handles the investigations and also monitors complaints of noise problems. Ongoing investigations number between 30 and 50 per year.

Previous testing of houses, insulated with urea-formaldehyde foam insulation, involved approximately 2500 homes. No reports were compiled on the UFFI program, other than individual house measurement statements, which are treated as confidential.

Research Organization:

Manitoba Department of Environment

Adrian Jackson
Air Pollution Section
Manitoba Environment
Box 7, Building 2
139 Tuxedo Ave.
Winnipeg, Manitoba
R3N 0H6
(204)-945-7005

Funding Organization:

Same as above

Publication:

Measurements on individual homes are confidential.

Activity and Description:

**Effect of Indoor Environmental Factors on Human Platelets, as Seen
by Transmission Electron Microscopy**

Dr. Jon Gerrard, of the Manitoba Institute of Cell Biology, is planning a study on the effect of positive and negative ion environments on human platelets, to determine whether cellular function is affected by ion concentration in the indoor environment.

Previously Dr. Gerrard has monitored developments in research, relating to the effects of cigarette smoke on human platelets.

Research Organization:

Manitoba Institute of Cell Biology

Dr. Jon Gerrard
Manitoba Institute of Cell Biology
Cell Biology Research Institute
700 Bannatyne Ave.
Winnipeg, Manitoba
R3E 0V9
(204)-787-2112

Funding Organization:

Ion study: to be determined.

Publications:

Inquire Cell Biology Inst., 700 Bannatyne, Winnipeg R3E 0V9

Activity and Description:

**The Urea-Formaldehyde Foam Insulation (UFFI) Home Testing
Program of the Ministry of Health of Ontario**

The program consisted of the testing of homes, on request, for the presence of formaldehyde gas, subsequent to the use of UFFI as an insulating material in the home.

Study period: June 1981 to January 1982

Research Organization:

Health Programs Division, Ontario Ministry of Health, in
collaboration with the Ontario Ministry of Labour and 43 public
health units

Dr. G. Caudwell, with Dr. R. Andreychuk and Dr. L. Smith
Public Health Branch
Ministry of Health
15 Overlea Blvd.
Toronto, Ontario
M4H 1A9
(416)-973-2238

Funding Organization:

Ontario Ministry of Health, Public Health Branch

Dr. G. Caudwell
Public Health Branch
Ministry of Health
15 Overlea Blvd.
Toronto, Ontario
M4H 1A9
(416)-963-2238

Publication:

Ontario Ministry of Health, Health Programs Division, April 1982.
"The Results of the UFFI Home Testing Program of the Ministry of
Health of Ontario." Inquire Min. of Health, 15 Overlea Blvd.,
Toronto M4H 1A9.

Activity and Description:

**Indoor Air Pollution: Experience of the Public Health Branch,
Ontario Ministry of Health**

Indoor air quality is of increasing concern to the Ministry of Health. The local health unit must often assume responsibility for buildings that are not covered by occupational health or environmental legislation. This project will identify the demands made on public health inspectors and the resources needed to handle the problem.

Study period: January to April 1985.

Research Organization:

Disease Control and Epidemiology Service, Public Health Branch
Ontario Ministry of Health

Dr. Madeleine G. Harris
Public Health Branch
Ministry of Health
15 Overlea Blvd.
Toronto, Ontario
M4H 1A9
(416)-963-2238

Funding Organization:

Ministry of Health and the University of Toronto, as the project is in partial fulfillment of an M.Eng. degree in Occupational Health and Safety

Dr. Jim Smith
Chemical Engineering Department
University of Toronto
Toronto, Ontario
M5S 1A1
(416)-978-4467

Publication:

Ministry of Health, ongoing. "The Ontario Disease Surveillance Report" (Weekly Public Health Bulletin). Inquire Min. of Health, 15 Overlea Blvd., Toronto M4H 1A9.

Activity and Description:

Environmental Factors in Chronic Lung Disease

A study to determine environmental factors responsible for the development of chronic lung disease. The research involves a comparison between adolescents who start to smoke and those who don't. The purpose of this work is to identify potentially avoidable factors.

Study period: July 1982 to March 1987.

Research Organization:

McMaster University

C. H. Goldsmith (with A. T. Kerigan and L.D. Pengelly)
Department of Clinical Epidemiology and Biostatistics
and Department of Medicine
McMaster University
1200 Main St. West
Room HSC-3E27
Hamilton, Ontario
L8N 3Z5
(416)-525-9140, ext. 2720

Funding Organization:

Ontario Ministry of Health, Public Health Grant Program
Health and Welfare Canada, National Health Research & Development Program

Pat Stuckless
Policy Analysis & Research Branch
Ontario Ministry of Health
8th floor, Hepburn Block
Queen's Park
Toronto, Ontario
M7A 1R3
(416)-965-5887

Patricia Scotcher
Extramural Research Program
Health Services & Promotion Branch
Jeanne Mance Building
Health and Welfare Canada
Ottawa, Ontario
K1A 1B4
(613)-992-5291

Publication:

Not yet published.

Activity and Description:**Health Effects of Particulates and SO₂ Level in Air Pollution**

This study is intended to determine the relationship between community exposure to air pollution, consisting of particulates and sulphur dioxide, and changes in human respiratory health and development. Indoor exposure to particulates, sulphur dioxide and nitrogen dioxide will also be monitored.

Study period: July 1978 to June 1982.

Research Organization:

McMaster University

C. H. Goldsmith (with A. T. Kerigan, L.D. Pengelly, and B. K. Garside)
Department of Clinical Epidemiology and Biostatistics
and Department of Medicine
McMaster University
1200 Main St. West
Room HSC-3E27
Hamilton, Ontario
L8N 3Z5
(416)-525-9140, ext. 2720

Funding Organization:

Ontario Ministry of Health, Public Health Grant Program
Health and Welfare Canada, National Health Research & Development Program
Ontario Ministry of the Environment, Air Resources Branch

Pat Stuckless
Policy Analysis & Research Branch, Ontario Ministry of Health
8th floor, Hepburn Block, Queen's Park, Toronto, Ontario M7A 1R3
(416)-965-5887

Patricia Scotcher, Extramural Research Program
Health Services & Promotion Branch, Health and Welfare Canada
Ottawa, Ontario K1A 1B4
(613)-992-5291

Dr. Denis Corr, Supervisor, Atmospheric Contaminants
Air Resources Branch, Ontario Ministry of the Environment
880 Bay St., 4th floor, Toronto, Ontario M5S 1Z8
(416)-965-4081

Publication:

"The Hamilton Study: The Role of Environmental Factors in the Respiratory Health of School Children". New England Journal of Medicine. For complete list enquire Dept. of Clinical Epidemiology and Biostatistics, McMaster University, 1200 Main St. W., Hamilton Ontario L8N 3Z5.

Activity and Description:

Self-help Group to Aid Persons with Environmental Allergy

Plainair Environmental Allergy Society is a self-help group formed to help persons who suffer from environmental allergies, mild or severe.

The organization provides information about the management of environmental allergies, with particular reference to studying the environment's effects on all bodily functions. Literature includes consideration of physiological reactions caused by exposure to foods, moulds, other inhalants, and chemicals. These incitants may be found in clothes, foods, cosmetics, home-care products, building materials, business machines, pesticides, and elsewhere.

The society provides members with a regular newsletter, which provides information on sources of chemically-pure foods, home-care products, and other products 'that make life possible for those with environmental allergies'.

The society also encourages research in the field of environmental illnesses, and supports other groups that promote a cleaner, more habitable environment.

Research Organization:

Plainair Environmental Allergy Society

Geri Szczesiak, President
Plainair Environmental Allergy Society
P.O. Box 46633, Stn. "G"
3760 West 10th Avenue
Vancouver, British Columbia
V6R 4K8

Funding Organization:

Funded by memberships, newsletter advertising, fund-raising activities and donations

Publication:

Plainair Environmental Allergy Society, ongoing. "Plainair Waves". Periodical, approximately quarterly; inquire PEAS, Box 46633, Stn. G, Vancouver, B.C. V6R 4K8.

Activity and Description:

Studies in Air Quality Analysis and Building Evaluation Techniques

The Division of Architecture and Building Sciences, of Public Works Canada, has been undertaking a number of activities in the following general areas, related to government buildings:

- o field measurement technology;
- o quantifying chemicals present in buildings;
- o diagnosing pollution migration in buildings; and
- o response of occupants.

Research Organization:

Public Works Canada

Bob Davidge
Architecture and Building Sciences Division
Public Works Canada
700 Industrial Avenue, Unit #5
Ottawa, Ontario
K1G 0Y9

Funding Organization:

Same as above.

Activity and Description:

Office Environment Assessment

"A team of interdisciplinary professionals, who improve employee and employer productivity, by an innovative total approach to human efficiency, comfort, health and safety."

Factors assessed include indoor air quality, ergonomics, lighting, employer-employee relations, and others.

Research Organization:

Synectia Consultants Division, Synectia Productions, Inc.

Dr. Howard Eisenberg
Synectia Consultants Inc.
86 Avenue Rd.
M5R 2H2
(416)-967-6562

Funding Organization

Client funded studies.

Publications:

Synectia Consultants Inc. (Brochure). Inquire Synectia, 86 Avenue Rd., Toronto M5R 2H2.

Eisenberg, Howard, 1982. "Productivity Based on Attention to Worker's Needs". Tomorrow's Office, Sept. 1982, pp. 19,20. For reprints inquire Synectia, 86 Avenue Rd., Toronto M5R 2H2.

Eisenberg, Howard, 1982. "Redesigning the Physical Work Environment to Reduce Stress", The Canadian Podium, January 1982. For reprints inquire Synectia, 86 Avenue Rd., Toronto M5R 2H2.

Activity and Description:**Education and Rehabilitation of Persons Sensitized to Indoor Air Pollutants**

Sunnyhill Research Centre is a 560 m² (6000 sq. ft.) experimental research building, just northeast of Toronto, Ontario, and is designed for the least possible indoor air pollution levels.

It will be used for providing seminars, counselling, and other educational programs, in combination with a therapeutic period in a low-chemical environment. The programs are specifically for persons diagnosed as suffering from widespread chemical susceptibility, specific sensitivity to indoor contaminants, or general 'building illness syndrome'.

Education and rehabilitation programs will be offered, on both a live-in and drop-in basis, to assist persons in adjusting their lifestyles, where necessary, to avoid undesirable chemical overexposures, and to regain some adaptability to environmental exposures that presently trigger or aggravate illness.

The facilities will also be used for various experimental studies, relating to indoor air quality and the effects of exposure to building contaminants on health.

Research Organization:

Sunnyhill Research Centre
(A Division of Bruce M. Small and Associates Limited)

Bruce M. Small and Barbara J. Small, Co-directors
Sunnyhill Research Centre
R.R. #1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Funding Organization:

The Centre is privately owned and funded. Research programs will be undertaken under the auspices of Bruce M. Small and Associates Limited and Foundation for Independent Research on Technology and Health.

Publication:

Bruce and Barbara Small, 1980. "Sunnyhill - The Health Story of the 80's". Small and Associates Publishers, R.R.#1, Goodwood, Ont L0C 1A0.

Bruce M. Small, P.Eng., 1983. "Low Pollution Design and Construction" (Part 2 of "Indoor Air Pollution and Housing Technology"). Small and Associates, for Canada Mortgage and Housing Corporation, funded under Part V of the National Housing Act, August 1983. Available from Technology and Health Foundation, R.R.#1, Goodwood, Ontario L0C 1A0.

Activity and Description:

Indoor Air Quality Databank

The Foundation for Independent Research on Technology and Health is a nonprofit charitable research organization incorporated to provide public information on the relationship between technology and health (both positive and negative).

The Foundation is presently concentrating on the following areas:

- o indoor air pollution from building products and practices; and
- o treatment and rehabilitation of persons adversely affected by environmental exposures.

Major information activities of the Foundation (related to the above topics) include:

- o preparation of a library of relevant information; and
- o creation of a computer-based databank, listing information and materials available.

Individuals and organizations may be placed on a mailing list for ongoing announcements of materials available from the Foundation.

Research Organization:

Foundation for Independent Research on Technology and Health

Bruce M. Small, P.Eng.
Executive Director
Technology and Health Foundation
R.R.#1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Funding Organization:

Federally registered charitable organization. Funded by contracts, grants, donations, and publication sales.

Publication:

Foundation for Independent Research on Technology and Health, March 23, 1983. "Statement of Activities and Programs". Inquire Technology & Health Fdn., Goodwood, Ontario L0C 1A0.

Bruce M. Small, P.Eng., 1983. "Indoor Air Pollution and Housing Technology. Small and Associates, for Canada Mortgage and Housing Corporation, funded under Part V of the National Housing Act, August 1983. Consultant report, 308 pages. Original printing CMHC Cat. No. NH17-23/1983E//ISBN 0-660-11415-1; now ISBN 0-920509-00-2 (Technology & Health Fdn.). Available from Technology and Health Foundation, R.R.#1, Goodwood, Ontario L0C 1A0.

Activity and Description:

- 1. Indoor Air Quality Investigations**
- 2. Building Performance Database**

Theodor D. Sterling Limited is an interdisciplinary research and consulting firm primarily involved in activities overlapping energy, environment, building science, computer systems, health and ergonomics. Expertise, specifically related to indoor air quality, includes indoor air quality investigations, standards evaluations, and building design and retrofit, for energy and environment optimization.

The firm has recently completed a Building Performance Database System (BPD). This computerized database currently is comprised of 170 performance studies of office, commercial and institutional buildings, located in Canada, Japan, the United States, and Western Europe, and catalogs results of epidemiological, hygiene, architectural, engineering and energy investigations. An archive of over 2000 residential buildings is also being collected, and eventually will be added. BPD is user interactive and will be made accessible via the Canadian telecommunications network, Datanet. For further details, manuals, and access instructions, readers are invited to contact TDS Limited at the address following.

Recent or ongoing projects include:

- 1) Preparation of criteria documents for Health and Welfare Canada, on carbon dioxide and water vapour, in order to evaluate the potential health effects of exposure to these substances in indoor air, as well as their influence on other potentially harmful chemical and microbiological contaminants of indoor air.
- 2) Development of performance criteria for energy and environment retrofits of modern buildings.
- 3) A health and comfort survey study of 1100 clerical workers, in 20 office buildings, to determine indoor air quality, building design, lifestyle and occupation factors, related to reported health and comfort problems in the modern office environment.
- 4) Survey, by questionnaire, of building environment conditions, perceived by office occupants of three provincial government buildings, in Victoria, British Columbia, for the British Columbia Buildings Corporation.
- 5) Measurement and evaluation of HVAC system performance and indoor air quality, as a basis for mechanical system improvements for the Canadian Union of Public Employees, Ottawa, Ontario.
- 6) Design, construction and monitoring of two attached townhouse units, incorporating innovative design features, equipment and materials, to control indoor air pollution associated with energy conserving residences.

- 7) Measurement of indoor air pollutants and occupant health and comfort in the Walsall City Hall, in collaboration with the University of Aston, Birmingham, England.
- 8) Measurement of contaminants off-gassed from furnishing, finishing and construction materials, under varying conditions of temperature and radiation typical in modern buildings, for Pacific Bell (in collaboration with the University of California at Berkeley).
- 9) Review of "Thermal Environment Guidelines and Outdoor Air Requirements for Occupied Spaces", proposed by the Real Estate Architects Staff Group of Bell Canada, for the Health and Safety Department.
- 10) Measurement of exposure, to combustion generated contaminants, of apartment tenants using the gas range for supplementary heating (in collaboration with Columbia University School of Public Health).
- 11) Measurement study of indoor/outdoor relationship, of viable particulates, in buildings serviced by window mounted air-conditioning units.
- 12) Carbon monoxide and ventilation measurements inside residences in Vancouver, British Columbia.
- 13) Review of indoor levels of combustion generated contaminants, for the U.S. National Academy of Science, National Research Council.
- 14) Experimental study of the effects of varying ventilation and lighting, on symptoms of Tight Building Syndrome, among office workers in Vancouver, British Columbia.

Research Organization:

Theodor D. Sterling Limited

Elia Sterling
Director of Building Research
Theodor D. Sterling Limited
1507 W. 12th Street
Vancouver, B.C.
V6J 2E2
(604)-733-1348

Funding Organization:

Client funded studies.

Recent Publications:

Sterling, T.D., 1984. "Effects of Restricting and Prohibiting Smoking in Office Environments on Reactions of Office Personnel to Environmental Health and Stress Factors". Simon Fraser University, Burnaby, B.C.. Published in "Indoor Air, Volume 2: Radon, Passive

(continued)

Smoking, Particulates and Housing Epidemiology", pp. 329-334, published by the Swedish Council for Building Research, Stockholm, Sweden, 1984. Presented at Indoor '84: The 3rd International Conference on Indoor Air Quality and Climate, August 20-24, 1984, Stockholm, Sweden.

McIntyre, E.D., Sterling, E., and Sterling, T.D., 1984. "Architectology: An Architectural-Technological Integration for Improved Environmental Quality in Buildings". TDS Limited, Vancouver, and Simon Fraser University, Burnaby, B.C. Published in Indoor Air, Volume 5: Buildings, Ventilation and Thermal Climate, pp. 145-152, published by the Swedish Council for Building Research, Stockholm, Sweden, 1984. Presented at Indoor '84: The 3rd International Conference on Indoor Air Quality and Climate, August 20-24, 1984, Stockholm, Sweden.

Sterling, E., and Sterling, D. A., 1984. "Air Quality in Hospitals and Health Care Facilities". TDS Limited, Vancouver, and University of Texas School of Public Health, Houston, Texas, USA. Published in Indoor Air, Volume 5: Buildings, Ventilation and Thermal Climate, pp. 209-214, published by the Swedish Council for Building Research, Stockholm, Sweden, 1984. Presented at Indoor '84: The 3rd International Conference on Indoor Air Quality and Climate, August 20-24, 1984, Stockholm, Sweden.

Sterling, E., Sterling, T., and McIntyre, D., 1983. "New Health Hazards in Sealed Buildings". TDS Limited. American Institute of Architects Journal, April 1983.

Sterling, T., Sterling, E., and Dimich-Ward, H., 1983. "Building Illness in the White Collar Workplace". Faculty of Interdisciplinary Studies, Simon Fraser University, and TDS Limited, Vancouver, B.C. International Journal of Health Services 13, No. 2, 1983, pp. 277-287.

Sterling, T., and Sterling, E., 1982. "The Epidemiology of Building Illness". Faculty of Interdisciplinary Studies, Simon Fraser University, and TDS Limited, Vancouver, B.C. Presented at the Second International Symposium "Epidemiology in Occupational Health", Montreal, August 23-25, 1982. Reprints available from TDS Limited, #70 - 1507 W. 12th St., Vancouver, B.C. V6J 2E2

Sterling, T.D. et al, 1982. "Indoor Byproduct Levels of Tobacco Smoke: A Critical Review of the Literature". TDS Limited. Air Pollution Control Association Journal 32, March 1982, pp. 20-29.

Sterling, T.D. et al, 1979. "Carbon Monoxide Levels in Kitchens and Homes with Gas Cookers". TDS Limited. Air Pollution Control Association Journal 29, 1979, p. 238.

A full bibliography will be supplied, on request to TDS Limited, at the address given above.

Activity and Description:

Air Quality in Animal Housing

Dr. Brian McQuitty is presently engaged in research on indoor air quality problems in livestock buildings. The concern behind this research is based on both animal health and human occupational health. Combinations of various gases, arising from animal manures with dust in livestock buildings, appear to produce long-term adverse effects on the respiratory system of livestock operators.

Research is underway to measure background levels of selected contaminants (e.g. ammonia, hydrogen sulfide) and to determine means of measuring some of these substances, in commercial livestock operations. Flow rate measurements are being done, in order to examine the rate of production of ammonia, under different livestock management situations.

Research Organization:

University of Alberta

Prof. Brian McQuitty
Dept. of Agricultural Engineering
University of Alberta
Edmonton, Alberta
T6G 2E1
(403)-432-5467

Funding Organization:

Same as above.

Publications:

Nordstrom, G. A., and McQuitty, J. B., 1976. "Manure Gases in the Animal Environment: A Literature Review (With Particular Reference to Cattle Housing)". Research Bulletin 76-1. Department of Agricultural Engineering, University of Alberta, Edmonton Alta. T6G 2E1.

Honey, H.F., and McQuitty, J. B., 1976. "Dust in the Animal Environment". Research Bulletin 76-2. Department of Agricultural Engineering, University of Alberta, Edmonton Alta. T6G 2E1.

Feddes, J.J.R., and McQuitty, J. B., 1983. "Heat and Moisture Loads and Air Quality in Commercial Poultry Laying Houses in Alberta". Department of Agricultural Engineering, University of Alberta, for Engineering and Statistical Research Institute, Agriculture Canada. Research Bulletin 83-1, ERDAF Program Contract File No. OSU81-00304. Available from Canada Institute for Scientific and Technical Information (CISTI), Montreal Rd., Ottawa K1A 0S2.

(continued)

Brannigan, P.G., and McQuitty, J.B., 1972. "Concentration-Temperature Relationships of Atmospheric Gaseous Contaminants". Department of Agricultural Engineering, University of Alberta. Canadian Agricultural Engineering, Vol 14, No. 1, June 1972, pp. 37-41.

Brannigan, P.G., and McQuitty, J.B., 1971. "The Influence of Ventilation on Distribution and Dispersal of Atmospheric Gaseous Contaminants". Department of Agricultural Engineering, University of Alberta. Canadian Agricultural Engineering, Vol 13, No. 2, Dec. 1971, pp. 69-75.

Nordstrom, G.A., and McQuitty, J.B., 1975. "Response of Calves to Atmospheric Hydrogen Sulfide and Ammonia". Department of Agricultural Engineering, University of Alberta. Paper 75-212, presented at the 1975 Annual Meeting of the Canadian Society of Agricultural Engineering, June 22-26, 1975, Brandon, Manitoba. Available from Canadian Society of Agricultural Engineering, c/o School of Engineering, University of Guelph, Guelph, Ontario N1G 2W1.

Feddes, J.J.R., and McQuitty, J.B., 1973. "Effects of Beef Housing Systems on Gaseous Contaminants Removed By Ventilation". Department of Agricultural Engineering, University of Alberta. Canadian Agricultural Engineering, Vol 15, No. 2, Dec. 1973, : pp. 119-123

Feddes, J.J.R., and McQuitty, J.B., 1977. "Data Acquisition System for Measuring Environmental Variables Within Confinement Animal Units". Department of Agricultural Engineering, University of Alberta. Canadian Agricultural Engineering, Vol 19, No. 2, December 1977, pp. 75-77.

Feddes, J.J.R., and McQuitty, J.B., 1978. "WARNING: Manure Gases are Dangerous". Department of Agricultural Engineering, University of Alberta. Agriculture and Forestry Bulletin, Vol. 1, No. 1, 1978, pp. 10-14. Available from Faculty of Agriculture and Forestry, Edmonton, Alberta T6G 2E1.

Honey, L.F., and McQuitty, J.B., 1979. "Some Physical Factors Affecting Dust Concentrations in a Pig Facility". Agricultural Engineering Services Branch, Saskatchewan Dept. of Agriculture, Regina S4S 0B1, and Department of Agricultural Engineering, University of Alberta, Edmonton T6G 2E1. Canadian Agricultural Engineering, Vol 21, No. 1, June 1979, pp. 9-14.

Feddes, J.J.R., Leonard, J.J., and McQuitty, J.B., 1983. "Carbon Dioxide Concentration as a Measure of Air Exchange in Animal Housing". Department of Agricultural Engineering, University of Alberta. Paper 83-414, presented at the 1983 Annual AIC Conference of the Canadian Society of Agricultural Engineering, July 10-13, 1983, Nova Scotia Agricultural College, Truro, N.S. Available from Canadian Society of Agricultural Engineering, c/o U. of Alberta, Edmonton, Alberta T6G 2E1.

Leonard, J.J., Feddes, J.J.R., and McQuitty, J.B., 1983. "Air Quality in Commercial Broiler Housing". Department of Agricultural Engineering, University of Alberta. Paper 83-417, presented at the 1983 Annual AIC Conference of the Canadian Society of Agricultural Engineering, July 10-13, 1983, Nova Scotia Agricultural College, Truro, N.S. Available from Canadian Society of Agricultural Engineering, c/o U. of Alberta, Edmonton, Alberta T6G 2E1

Feddes, J.J.R., and McQuitty, J.B., 1981. "Environmental Monitoring in Animal Housing". Department of Agricultural Engineering, University of Alberta. Paper PNW 81-403, presented at the 1981 Joint Meeting of the American Society of Agricultural Engineering and the Canadian Society of Agricultural Engineering, Sept. 2-4, 1981, Edmonton Inn, Edmonton, Alberta. Available from Canadian Society of Agricultural Engineering, c/o U. of Alberta, Edmonton, Alberta T6G 2E1.

McQuitty, J.B., and Feddes, J.J.R., 1982. "Manure Gases and the Animal Environment". Department of Agricultural Engineering, University of Alberta. Presented at the 1982 Joint Session of the Canadian Society of Agricultural Engineering, Canadian Society of Agronomy, and Canadian Society of Animal Science, 62nd Annual A.I.C. Conference, Vancouver, B.C., July 11-15, 1982. Available from Canadian Society of Agricultural Engineering, c/o U. of Alberta, Edmonton, Alberta T6G 2E1.

Activity and Description:**Exploratory Examination of Hypersensitive Individuals**

Exploratory interviews and histories were taken of three hypersensitive individuals, chosen from a population of 50-100 individuals identified as meeting the following criteria:

- o unable to tolerate a normal habitat without illness; and
- o have major gastrointestinal problems.

This preliminary investigation was undertaken to determine what characteristics may be common among persons with hypersensitivity to environmental factors (foods, particulate inhalants, odours), and to provide a basis for a more comprehensive and detailed description, or definition, of the hypersensitivity phenomenon.

Subsequent stages, which are planned, include development of an epidemiological protocol for the full test population, again in search of a meaningful identification of common characteristics.

Research Organization:

University of Toronto

Heather MacLean (researcher)
Dept. of Nutritional Sciences
Faculty of Medicine
University of Toronto
Toronto, Ontario
M5S 1A1
(416)-978-2134

Dr. Gordon Nikiforuk (coordinator)
Faculty of Dentistry
University of Toronto
124 Edward St.
Toronto, Ontario
M5G 1G6
(416)-978-4414

Funding Organization:

Faculty of Medicine, University of Toronto (initial phase)

Harvey Anderson, Chairman
Dept. of Nutritional Sciences
University of Toronto
Toronto, Ontario
M5S 1A1
(416)-978-2422

Publication:

Not yet published.

Activity and Description:

Ventilation Systems Design, Optimization and Control

Dr. Gordon Bragg, of the Mechanical Engineering Department of the University of Waterloo has been involved extensively in industrial ventilation questions and, more recently, in matters of residential indoor air quality.

Particular expertise is in the area of ventilation systems design, optimization and control, and industrial air measurement. Recent work has concentrated on asbestos fibers, for the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario.

Research Organization:

University of Waterloo

Prof. Gordon Bragg
Department of Mechanical Engineering
University of Waterloo
Waterloo, Ontario
N2L 3G1
(519)-885-1211 ext 3336

Funding Organizations:

Building Engineering Group
Natural Sciences and Engineering Research Council (Canada) (NSERC)
Canada Mortgage and Housing Corporation
Ontario Ministry of Labour
Royal Commission on Matters of Health and Safety Arising from the
Use of Asbestos in Ontario
Asbestos Information Association of North America

Publication:

Bragg, G., 1982. "Technical Feasibility and Cost of Controlling Workplace Exposure to Asbestos Fibers". For Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario. April 1982, ISBN 0-7743-7311-3. Available from Ontario Govt. Bookstore, 880 Bay St., Toronto M7A 1N8.

Bragg, G., 1982. "Ventilation, Air Distribution and Air Quality". Buildings Energy Technology Transfer Program, Report #82-12. Inquire Dept. of Mechanical Engineering, U. of Waterloo, Waterloo N2L 3G1.

Activity and Description:

Indoor Air Quality Sampling, Monitoring and Modelling

The Air Quality Group of the Industrial Research Institute, University of Windsor, has capability and experience in indoor air quality sampling, monitoring, and modelling for both gaseous and particulate pollutants.

Equipment used by the Institute includes personal samplers and related continuous monitors.

Research Organization:

Industrial Research Institute - University of Windsor

Dr. A. W. Gnyp
Air Quality Group
Industrial Research Institute
University of Windsor
Windsor, Ontario
N9B 3P4
(519)-253-4232, ext 2507

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

- 1. Comprehensive Planning, Programming and Evaluation of Interior Environments**
- 2. Environmental Literature Collection**

IUS - Institute for User Studies has capabilities in the area of user requirements and functional programming, i.e. determining and specifying user needs for buildings and other urban facilities, planning and managing the facilities, and evaluating existing environments.

The IUS offices contain one of North America's largest catalogued collections of environmental literature, covering a broad range of topics related to indoor environment. Francoise Szigeti was responsible for the preparation of a selected bibliography of the knowledge base relevant to environmental design research, under contract to the National Research Council of Canada.

Gerald Davis is also chairman of ASTM Subcommittee E6.25 on Overall Performance of Buildings. The subcommittee will recommend procedures and guidelines for assessing overall building performance, referencing indoor air quality as one of numerous factors.

Research Organization:

IUS - Institute for User Studies

IUS - Institute for User Studies
c/o TEAG - Environmental Analysis Group, Ltd.
P.O. Box 1088, Station "B"
Ottawa, Ontario
K1P 5R1

for further information contact:

Gerald Davis, Principal, or
Francoise Szigeti, Manager, IUS
c/o Harbinger Group
17 North Avenue
Norwalk, CT
USA 06851
(203)-849-5040

Publications:

Szigeti, F., TEAG - The Environmental Analysis Group, Ltd., 1983. "Selected Bibliography of the Knowledge Base Relevant to Environmental Design Research". For National Research Council of Canada. Enquire from TEAG at either address above.

Davis, Gerald, and Szigeti, Francoise, June 1983. "Development of a Functional Program for Overall Building Performance". TEAG - Environmental Analysis Group. Conference on People and Physical Environment Research, Wellington, New Zealand, June 1983. Enquire from TEAG at either address above.

Activity and Description:

- 1. Sampling and Analysis of Formaldehyde in UFFI Homes**
- 2. Evaluation of Air Cleaning Devices With Respect to Formaldehyde**

Technitrol Canada has been responsible for sampling and analysis of indoor air for the presence of formaldehyde, in Quebec homes that have been insulated with Urea-Formaldehyde Foam Insulation. Their testing program included over 3000 homes in Quebec, in 1983.

Technitrol also carried out evaluation of air cleaning devices, to determine the relative efficiencies of portable air cleaning devices and furnace filters, for the removal of formaldehyde.

Research Organization:

Technitrol Canada Limited

Dr. Harry Baikowitz
Technitrol Canada Limited
121 Hymus Blvd.
Pointe Claire, Quebec
H9R 1E6

Funding Organization:

Consumer and Corporate Affairs Canada

UFFI Assistance Program
Consumer and Corporate Affairs Canada
Place du Portage, Tower 1
50 Victoria Street
Hull, Quebec
K1A 0C9
(613)-994-0921 or 1-800-567-6870

Publication:

Inquire UFFI Co-ordination Centre, Ottawa K1A 0C9

Activity and Description:

- 1. UFFI Research Program**
- 2. UFFI Centre / Centre sur la MIUF**
- 3. Federal Assistance Program for UFFI Homeowners**

The Urea-Formaldehyde Foam Insulation Centre (UFFI Centre) carries out the federal government's assistance program dealing with UFFI, which provides the following services:

- . co-ordination of UFFI related research
(see list in following pages)
- . advice and assistance, of a technical nature, to homeowners who are encountering problems because they have insulated their dwellings with urea-formaldehyde foam insulation
- . training to, and control over, contractors engaged in UFFI corrective measures
- . reimbursement to registered homeowners, for expenses incurred in the course of implementing corrective measures, including removal, up to a maximum \$5000 per dwelling.
(This latter program expires September 30, 1986).

Research Funding Organizations:

Consumer and Corporate Affairs Canada
Health and Welfare Canada
National Research Council of Canada

UFFI Centre/Centre sur la MIUF
Place du Centre
Hull, Québec
K1A 0C9
1-(800)-567-6870

Research Organizations:

(see list of current and completed research projects in pages following)

Publications

A three page English or French list of publications is available from the UFFI Centre, Place du Centre, Hull, Québec K1A 0C9, 1-800-567-6870.

(continued)

Current Research Projects* - UFFI Research Program

*(Readers will find more complete descriptions of each project by looking up the researcher name or company in the indexes at the end of this volume)

Adverse health effects for UFFI and non-UFFI homes (Albert J. Nantel)
 Comparison of UFFI and non-UFFI residents before and after remedial measures (I. Broder, University of Toronto)
 Epidemiological protocol for investigating health effects of UFFI home occupants (other non-NHRDP contracts)
 Mutagenicity of particulates from indoor air (Geortec)
 Pulmonary response of asthmatics from UFFI and non-UFFI homes (J. Day)
 Immunological studies of asthmatics from UFFI and non-UFFI homes (H. Pross)
 Health records of school children in UFFI homes (G. R. Norman)
 Procedures used in formaldehyde survey (Beak Analytical Services)
 Seasonal effects on formaldehyde emission from UFFI (U. of Western Ontario)
 Development and refinement of a gas source/exposure chamber (Concord Scientific Corporation)
 Continuous monitoring to evaluate seasonal effects on particulate emission from UFFI (University of Western Ontario)
 Evaluation of multidosimeter studies in large buildings (IEC Beak Consultants)
 Laboratory analysis of 2000 dosimeters (IEC Beak)
 Computerized statistical analysis of dosimeter data (IEC Beak)
 Evaluation of detector tubes in a calibrated chamber (Concord Scientific Corporation)
 Evaluation of formaldehyde assay kit (IEC Beak)
 Monitoring effectiveness of sealing techniques (Ontario Research Foundation)
 Evaluating effectiveness of pressurizing (Ontario Research Foundation)
 Evaluating effectiveness of air-to-air heat exchangers as a remedial measure (Ontario Research Foundation)
 Evaluating effectiveness of wet or dry air scrubbers (Ontario Research Foundation)
 Techniques for breaking up in situ UFFI (Ontario Research Foundation)
 Efficiency of chemical agents at neutralizing UFFI residues (Ontario Research Foundation)
 Investigation of efficiency of various remedial measures (Lakehead University)
 UFFI-contaminated masonry products treatment study (Sodexen Inc.)
 Masonry supplement to UFFI Centre's contractor manual (Associated Kellogg Limited)
 Draft chapter on neutralizing UFFI residues on masonry (Associated Kellogg Limited)
 Heat recovery and energy conservation for UFFI remedial measures (Associated Kellogg Limited)
 Modifications to residential heating and ventilation equipment to ensure a supply of fresh air (Associated Kellogg Limited)
 Chemisorbants and particle filters (Associated Kellogg Limited)
 Pressurization and ventilation remedial measures (Associated Kellogg Limited)
 Disposal of removed uffi (Associated Kellogg Limited)
 Safety measures during UFFI remedial work (Associated Kellogg Limited)
 Development of a water spray scrubber (Saskatchewan Research Council)
 Evaluation of air cleaning devices with respect to formaldehyde (Technitrol)
 Administration of the Laboratory Registration Program (Beak Analytical)

Completed Research Projects* - UFFI Research Program

*(Readers will find more complete descriptions of each project by looking up the researcher name or company in the indexes at the end of this volume)

Health examination of UFFI residents in Toronto (James H. Day)
Evaluation and comparison of pulmonary response of UFFI and non-UFFI asthmatics, to UFFI off-gases (Queen's University)
Investigation into inquiries about research on chemical susceptibility and UFFI (Bruce M. Small and Associates Limited)
Reaction of ammonia gas with UFFI (University of Manitoba)
Handbook on sensitizing effects of UFFI (Bruce M. Small and Associates Limited)
Investigation of techniques for UFFI dust sampling (University of Waterloo)
Survey of Weitz residence for formaldehyde, sulphur dioxide and UFFI particulate (Scanada Consultants)
Modelling and quantification of source and sink strength of contaminants (Concord Scientific Corporation)
Study and identification of possible toxic gases evolved from UFFI (University of Manitoba)
Tests of the biological activity of different UFFI's on nematodes (Industrial Technology Centre)
Determination of the toxicity of chemical fractions collected from UFFI, using nematode indicator tests (University of Manitoba)
Procedures for sampling and analysis of soluble and insoluble gases and particulates from UFFI materials (Enchem Development Limited)
Workshop on the toxicology of UFFI (FDC Consultants Inc.)
Workshop on biological indicators for toxic effects of UFFI (FDC Consultants Inc.)
Field studies of formaldehyde in homes - data collection (Ontario Research Foundation)
Feasibility study on the measurement of formaldehyde in living spaces (Concord Scientific Corporation)
Formaldehyde levels in wall cavities and room air (Geortec Limited)
Analysis of formaldehyde dosimeters (IEC Beak Consultants Limited)
Accuracy of formaldehyde dosimeters (Concord Scientific Corporation)
Development and evaluation of passive and active samplers (Oakridge National Laboratory)
Research and development of formaldehyde monitoring (Concord Scientific Corporation)
580nm wavelength absorption of sodium bisulphite solution (Concord Scientific Corporation)
Efficiency of formaldehyde gas collection impingers (Envirocon)
Determining formaldehyde concentration in air using chromatography (Western Research)
Formaldehyde sources, release characteristics, and response to chemical treatment (Dr. C. Van Netten)
Evaluation of formaldehyde assay kit (Kemic Bioresearch Lab. Ltd.)
Investigation into the DACO formaldehyde test kit (Kemic Bioresearch Lab Ltd.)
Novel wall cavity formaldehyde dosimeters (Concord Scientific Corporation)
Electro-optical formaldehyde monitor (Concord Scientific Corporation)
Validation of state-of-the-art technology in UFFI studies (IEC Beak Consultants)
Feasibility of commercializing a novel formaldehyde dosimeter (Concord Scientific Corporation)

(continued)

Testing of formaldehyde and evaluation of dosimeters (Technitrol, Geortec, NTL, Levelton)

Analysis of exposed dosimeters in 200 home dosimeter survey (Concord Scientific Corporation)

Assessment of Kemic Assay Kits for home use (Sodexen Inc.)

Continuous monitoring of formaldehyde in wall cavities (Geortec Ltd.)

Work for multi-dosimeter survey (FTS Contractors)

Chamber study of Draeger formaldehyde detector tubes (Concord Scientific Corp.)

Examination of UFFI conditions and circumstances (Scanada Consultants Ltd.)

Preparation of remedial advice guides for homeowners and contractors (Scanada Consultants Ltd.)

Investigation of circumstances in specific UFFI houses (Clerk Window & Wall Technical Services Ltd.)

Structural effects of UFFI in buildings (Ontario Research Foundation)

Chemical treatment following UFFI removal (Sodexen Inc.)

Effectiveness of sealings and pressurization in UFFI houses (UNIES Limited)

Literature concerning removal of UFFI from masonry structures (Associated Kellogg Limited)

Assessment of homeowner remedial measures for masonry houses (Associated Kellogg Limited)

Electric wiring and outlets affected by UFFI (Associated Kellogg Limited)

Removal document for homeowners and contractors (Charles K. Long)

Updating Building Practice Note 23 (Associated Kellogg Limited)

Evaluation of special sealing measures (Scanada / Canada Mortgage and Housing Corporation)

Evaluation of the effectiveness of sealing (UNIES Limited)

Statistical analysis of 2400 home survey (MacKay, Young)

Trial and demonstration of ENUF-24 to stabilize foam and neutralize formaldehyde (ALX Technical)

Evaluation of remedial measures on 3 homes (Atlantic Airseal Limited)

Performance and installation guidelines for residential air-to-air heat exchange system used for air quality control (Ontario Research Foundation / Saskatchewan Research Council)

Analysis of LBL dosimeters (Beak Analytical)

Testing and analysis of devices used for remedial measures (Beak Analytical)

Sealing and ventilation trial on a UFFI home (Sealox Ltd., N.B.)

Sealing and ventilation trial on a UFFI home (Air Seal Technologies, N.S.)

Monitoring effect of sealing and ventilation on furnace combustion and formaldehyde concentration (Center for Energy Studies, N.S.)

Trial and demonstration of polyvinylidene chloride latex solution (PVDC) as a sealant (Diamond Products Company)

Evaluation of the effectiveness of a dry scrubber (Kleen Air Limited)

Monitoring 14 homes that underwent corrective measures (NTL, Technitrol, Geortec Limited)

Testing and analysis of devices used for remedial measures (Beak Analytical)

Evaluation of HRV's in UFFI homes (Eneraction Inc.)

Activity and Description:

Sampling and Analysis of Formaldehyde in UFFI Homes

The firms listed below have been responsible for sampling and analysis of indoor air, for the presence of formaldehyde, in some 50,000 homes, in Canada, that have been insulated with urea-formaldehyde foam insulation.

Funding Organization:

Consumer and Corporate Affairs Canada

UFFI Centre
Place du Centre
Hull, Québec
K1A 0C9
(819)-994-0921 or 1-800-567-6870

Testing and Analysis Organizations:

Acres Consulting Services Limited
5259 Dorchester Road,
Niagara Falls, Ontario
L2E 6W1

Atlantic Analytical Services Limited
275 City Road
Saint John, New Brunswick

B.H. Levelton & Associates Limited
8805 Osler Street
Vancouver, B.C.
V6P 4G1

Canadian Microanalytical Service Limited
5704 University Boulevard
Vancouver, B.C.
V6T 1K6

Can Test Limited
1323 West Third Avenue
Vancouver, B.C.
V6J 1J8

Clayton Environmental Consultants Limited
400 Huron Church Road
Windsor, Ontario
N8X 1E5

Didak Management Services Inc.
120 Holland Avenue
Ottawa, Ontario
K1Y 0X7

(continued)

Geortec Limited
86 Hamilton Avenue
St. John's, Newfoundland
A1E 1K9

Guelph Management Laboratories Limited
246 SilverCreek Parkway N.
Guelph, Ontario
N1H 1E7

Hazardous Material Consultants Limited
922 Prince Street
Truro, Nova Scotia
B2N 1H3

IEC Beak Consultants Limited
3333 Boulevard Cavendish, Suite 400
Montréal, Québec
H4B 2M5

IEC Beak Consultants Limited
687 Goreway Drive
Mississauga, Ontario
L4V 1L9

IEC Beak Consultants Limited
Suite 120, 10751 Shellbridge Way
Richmond, B.C.
V6X 2W8

J.M. Berry Company Limited
780 East 29th Street
North Vancouver, B.C.
V7K 1B4

National Testing Laboratories
501-C Weston Street
Winnipeg, Manitoba
R3E 3H4

Nova Chem Limited
P.O. Box 1030
Armdale, Nova Scotia
B3L 4K9

Radiation Environmental Management Systems Inc. (REMS)
415 Philip Street
Waterloo, Ontario
N2L 3G1

Research & Productivity Council (RPC)
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

Roche Associés Ltée
2535 Boul. Laurier
Ste. Foy, Québec
G1V 4M3

Scanada Consultants Limited
446 Reynolds Street
Oakville, Ontario
L6J 3M4

Scanada Consultants Limited
436 MacLaren Street
Ottawa, Ontario
K2P 0M8

Seatech Investigation Services Limited
5257 Morris Street
P.O. Box 2161, Station M
Halifax, Nova Scotia
B3J 3C4

Technitrol Canada Limited
121 Hymus Boulevard
Pointe Claire, Quebec
H9R 1E6

The Trow Group Limited
43 Baywood Road
Rexdale, Ontario
M9V 3Y8

U.F. Labs Inc.
43 Railside Road
Don Mills, Ontario
M3A 3L9

Warnock Hersey Professional Services Limited
128 Elmslie Street
LaSalle, Quebec
H8R 1V8

Activity and Description:

1. Biomedical Research and Toxicology
2. Formaldehyde Assay Kit

Kemic Bioresearch is involved primarily in contract biomedical research and consulting, including all aspects of toxicology. Previous work, pertaining to indoor air quality, involved investigation of Urea-Formaldehyde Foam Insulation, funded by the National Research Council of Canada, under the federal UFFI research program. Future work, proposed for this area, involves immunological testing and development of biological indicators, for evaluating health effects of building materials.

Kemic has recently established a scientific instrument and manufacturing division, and is producing a 'formaldehyde assay kit' that can be used by home-owners, as well as for industrial and educational applications. The kit incorporates a solid state colorimeter, developed with financial assistance from the National Research Council.

Dr. Peter Mullen of Kemic organized an advanced study institute on immunotoxicology, at Acadia University Campus, in July 1982, and conducted a seminar, on January 17th, 1984, entitled 'Toxic Chemicals on the Farm'. He is also editor of the International Journal of Immunopharmacology, published by Pergamon Press.

Research Organization:

Kemic Bioresearch Laboratories Limited

Dr. Peter W. Mullen
Kemic Bioresearch Laboratories Limited
7 The Industrial Mall
P.O. Box 878
Kentville, Nova Scotia
B4N 4H8
(902)-678-8195

Publications:

"Kemic Bioresearch Laboratories Limited". Folder with various papers describing research expertise and product specifications. Inquire Kemic Laboratories, Box 878, Kentville, N.S. B4N 4H8.

"International Journal of Immunopharmacology". Mullen, P.W., Editor, and Hadden, J.W., Associate Editor (Kemic Bioresearch Laboratories Ltd., Kentville, Nova Scotia, and Immunopharmacology Program, University of South Florida College of Medicine, Tampa, Florida). Published quarterly by Pergamon Press, Suite 104, 150 Consumers Rd., Willowdale, Ontario M2J 1P9. Annual subscription US \$120.

Activity and Description:

Indoor Air Quality Testing, Odour Measurement and Control

Dr. Nasrat Hijazi has developed considerable expertise in measurement and analytical methodologies for air quality and materials testing, and for odour control indoors and outdoors.

Through TRC Advanced Analytics Canada and TRC Environmental Consultants (U.S.) until 1984, Dr. Hijazi participated in a number of studies of the 'new building syndrome' (energy-efficient office buildings with reported health problems).

His expertise in equipment includes familiarity with the TAGA (Trace Atmospheric Gas Analyzer) mobile mass spectrometer, for identifying and quantifying extremely low levels of contaminants, on a real-time basis. This real-time mobile analyzer is capable of taking gaseous, prepared liquid, or solid samples and providing an immediate analysis, at concentrations down to the parts per trillion range. It is based on atmospheric pressure chemical ionization, coupled with ion detection by mass spectrometry in either single phase (APCI/MS - TAGA 3000) or tandem (APCI/MS/MS - TAGA 6000) configuration.

Research Organization:

Nasrat Hijazi, Ph.D.
153 Douglas Avenue
Toronto, Ontario
M5M 1G7
Tel: (416)-481-2920

Publication:

Hijazi, N., Chai, R., Bradstreet, J.W., Duffee, R.A., Astle, A. and Amster, M., 1983. "Indoor Organic Contaminants in Energy Efficient Buildings". TRC Environmental Consultants, Inc., Connecticut, USA. Inquire c/o Nasrat Hijazi at address listed above.

Activity and Description:**Bi-Monthly Environmental Newsletter**

The Alberta Ministry of Environment publishes a bi-monthly newsmagazine entitled "Environmental Views". Each issue deals with a specific topic from various viewpoints, with the aim of increasing awareness of environmental issues among Albertans. Environment Views is directed by an independent board, with representation from environmental groups, government and industry, and the views expressed are not necessarily those of Alberta Environment.

The August 1983 issue of Environment Views contained feature articles on indoor air quality and the home environment, listed below.

Research Organization:

Alberta Environment

Maryhelen Vicars, Editor
Environment Views
Communications Branch
Alberta Environment
11th Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

Funding Organization:

Alberta Environment (address as above)

Publication:

Wilson, Jim, 1983. "Indoor Air Quality: A 'Chemical Soup' in our Homes and Workplaces". Environment Views 6, No. 4, pp. 12-15, July/August 1983. ISBN 0701-9637, publication available from Alberta Environment, Edmonton T5K 2J6.

Duffy, Ron, 1983. "The Home Environment: Hazards of the Homestead". Environment Views 6, No. 4, pp. 20-22, July/August 1983. ISBN 0701-9637, publication available from Alberta Environment, Edmonton T5K 2J6.

Activity and Description:

Indoor Air Quality Studies, Particularly Radon Emissions

Acres Consulting Services has considerable experience and expertise in radon and methane studies, in residential environments, as well as some experience in general industrial air quality work.

(For more specific outlines of previous radon work done jointly with DSMA ATCON Ltd., see listings under DSMA ATCON)

Research Organization:

Acres Consulting Services Limited

Dr. Gordon Davies
Acres Consulting Services Limited
5259 Dorchester Rd.
P.O. Box 1001
Niagara Falls, Ontario
L2E 6W1
(416)-354-3831
(or via Toronto (416)-595-2000 ext. 201)

David Sampson
Acres Consulting Services
480 University Avenue
Toronto, Ontario
M5G 1V2
(416)-595-2000

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Indoor Air Quality Measurements**

André Marsan and Associates Limited has experience in both outdoor and indoor air quality measurement. Indoor measurements have been predominantly for formaldehyde in residences. Their laboratory is government approved for measurement of formaldehyde, in homes insulated with Urea-Formaldehyde Foam Insulation. Analytical work and instrumentation is done both in-house and by outside lab facilities.

Research Organization:

André Marsan & Associates Limited

Marc Berlin
André Marsan & Associates Limited
1130 West Sherbrooke St.
Montreal, Quebec
H3A 2R5
(514)-288-1332

Funding Organization:

Client funded studies

Publications:

Client reports are confidential.

Activity and Description:

Analysis of Asbestos Samples

The Atlantic Industrial Research Institute specializes in chemical analysis of materials. Primary experience is with analysis of asbestos samples removed from buildings. The analysis is performed in-house with X-ray diffraction equipment. Capability extends to analyzing other building materials.

Research Organization:

Atlantic Industrial Research Institute

Prof. G. Peter Wilson, Director
Atlantic Industrial Research Institute
P.O. Box 1000
Halifax, Nova Scotia
B3J 2X4
(902)-429-8300

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Optimum Air Filter Efficiency Study**

ASHRAE Standard 82-1981, Ventilation for Acceptable Indoor Air Quality, requires much higher outside air volumes for areas where smoking is permitted, compared to non-smoking areas. The Standard also contains a provision that, in smoking areas, some of the outside air may be replaced by suitable filtered, recirculated air.

The purpose of this study, by the British Columbia Buildings Corporation, is to evaluate the life-cycle costs and expected performance of ventilation systems using the specified volume of outside air, compared to those obtained by progressive substitution of recirculated air for outside air, and with the use of air filters of differing efficiencies.

An important element of the study is an attempt to determine how air filter manufacturers are responding to the substitution provision of the standard, by making available efficiency data for the most relevant parameter, namely the removal of tobacco smoke particulates.

Research Organization:

British Columbia Buildings Corporation

C.S. Trueman, P.Eng.
Senior Technical Advisor - Mechanical
British Columbia Buildings Corporation
P.O. Box 1112
Victoria, B.C.
V8W 2T4
Tel: (604)-387-7221
Telex: 049-7439

(street address 3350 Douglas St., Victoria)

Funding Organization:

Same

Publication:

No publication plans.

Activity and Description:

Indoor Air Quality: Industrial

Brian E. Felske & Associates Ltd. has primarily been involved with industrial indoor air quality measurement, particularly for mining companies and the mineral resource industry. Through access to a pool of personnel of different disciplines, the firm can handle related studies. The Toronto office does not have laboratory facilities.

Research Organization:

Brian E. Felske & Associates Ltd.

Lois Marsh
Brian E. Felske & Associates Ltd.
130 Adelaide St. W., Suite 1818
Toronto, Ontario
M5H 3P5
(416)-365-7936

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Environmental Performance of Office Buildings

Architectural Diagnostics has been involved in evaluating various aspects of environmental performance of office buildings, from the point of view of occupancy needs and concerns. Indoor air quality is one factor among many that are taken into consideration.

Research Organization:

Architectural Diagnostics

Pleasantine Drake
Architectural Diagnostics
P.O Box 320, Stn. A
Ottawa, Ontario
K1N 8V3
(613)-234-1284

Funding Organization:

Client funded studies.

Publication:

Client reports are confidential.

Activity and Description:

Programming, Design and Evaluation of Built Environments

Building Diagnostics Inc., includes architects, social scientists, programmers, and landscape architects, involved in programming, designing and evaluating built environments. Particular emphasis is on the occupancy and use of buildings, and the relationship of that to building performance. Building performance means internal conditions such as air quality, lighting and acoustics.

BDI has been developing an ongoing methodology for evaluating emergency departments in hospitals throughout Canada (funded by Health and Welfare Canada, Health Facilities Design). Work was also underway, in 1984, on evaluation of large government office buildings, for the Architecture and Building Science Division, Public Works Canada.

Research Organization:

Building Diagnostics Inc. / Diagnostics Immobiliers Inc.

John Zeisel / John Schreiber
1167 St. Marc
Montreal, Quebec
H3H 2E4
(514)-931-0223

Funding Organizations:

Public Works Canada
Health and Welfare Canada

Architectural and Building Sciences
Public Works Canada
700 Industrial Ave., Unit 5
Ottawa, Ontario K1G 0Y9
(613)-998-4317

T.M. O'Grodnik, Director
Health Facilities Design
Health Resources, H&W Canada
Jeanne Mance Bldg.
de l'Eglantine St.
Ottawa, Ontario K1A 1B4
(613)-992-8471

Publication:

Building Diagnostics Inc., 1984. "Energy and Occupancy: an Analysis of the Harry Hays Building, Calgary". Part of Comprehensive Total Building Performance Study for Public Works Canada. Inquire Public Works Canada, 700 Industrial, #5, Ottawa K1G 0Y9.

Activity and Description:

- 1. Improved Safety of Vented Gas Appliances**
- 2. The Effects of Residential Airtightening**

Consumer's Gas has, for some time, been doing research into the improvement of safety of vented gas appliances. The present work is on the development of safety shut-down devices which would shut off an appliance, in the event a venting failure is detected. This would alert a homeowner to a problem involving insufficient combustion air and exhaust backflow, that may occur under certain exhaust and pressure conditions, particularly in tight houses.

Work in the United States, on the reduction of nitrogen oxides in combustion in gas stoves, is also being monitored.

A project to examine the effects of residential airtightening was also undertaken, with assistance from University of Toronto and funding from the Department of Energy Mines and Resources and from the Ontario Ministry of Energy. The retrofit project involves a random selection of 40 homes, tested for combustion equipment operation and pollution levels. Ten of these homes were 'commercially' airtightened. Fan depressurization tests were then conducted, to locate reverse flows or vent failures, as a function of pressure.

Previous projects, undertaken with assistance from the Ontario Ministry of Energy, include a study of the energy conservation impacts, of combustion air requirements for residential fossil-fuel heating systems.

Research Organization:

Consumer's Gas

Mr. John Rinella
Consumer's Gas
P.O. Box 650, Scarborough, Ontario
M1K 5E3
(416)-492-5000

Funding Organization:

Airtightening and combustion air studies: Ontario Ministry of Energy and Department of Energy, Mines and Resources

Ontario Ministry of Energy
56 Wellesley St. W., 10th floor
Toronto, Ontario
M7A 2B7
(416)-965-1341

Publications:

Not published

Activity and Description:

Modelling the Movement of Radon Through Soil into Houses

A wind tunnel study was carried out to determine the soil surface pressure distribution around a house, as a function of wind direction. This data will be used as input to a three-dimensional, finite-element model of the soil around a house, to calculate the resulting flows of soil gas and radon into the house.

Research Organization:

DSMA ATCON LTD.

Mr. A. G. Scott
DSMA ATCON LTD.
4195 Dundas St. W.
Toronto, Ontario
M8X 1Y4
(416)-239-3011

Funding Organization:

Health and Welfare Canada, Radiation Protection Bureau
DSS Contract 0SV84-00070

Mr. R. G. McGregor
Health and Welfare Canada
Environmental Radiation Hazards Division
Radiation Protection Bureau
Brookfield Road
Ottawa, Ontario
K1A 1C1

Activity and Description:

Future Radon Levels at a Proposed Building Site

The methods available to measure soil permeability, or radon release rate, were reviewed, and laboratory methods were found to be fully adequate to provide the information required to calculate a Radon Index Number for the site, that would be proportional to the radon entry rate into a typical house.

Research Organization:

DSMA ATCON LTD (with Acres Consulting Services Ltd.)

Mr. A. G. Scott
DSMA ATCON LTD.
4195 Dundas St. W.
Toronto, Ontario
M8X 1Y4
(416)-239-3012

Funding Organizations:

Canada Mortgage and Housing Corporation
National Research Council of Canada
Atomic Energy Control Board

Publication:

DSMA ATCON LTD., 1983. "Review of Existing Instrumentation and Evaluation of Possibilities for Research and Development of Instrumentation to Determine Future Levels of Radon at a Proposed Building Site". Report INFO-0096, January 18, 1983, published by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9.

Activity and Description:

Remedial Measures for the Radiation Reduction and Radioactive Contamination of Elliot Lake, Ontario

A now-defunct Federal/Provincial Task Force on Radioactivity (administered by the Atomic Energy Control Board) commissioned a series of studies over the 1978-1982 period, to investigate and implement remedial measures, to reduce radioactive contamination in Elliot Lake, Ontario, including residential environments.

A series of reports was produced over the period, which are noted on the following supplementary pages.

Research Organization:

DSMA ATCON LTD. (with Acres Consulting Services Ltd.)

Mr. A. G. Scott
DSMA ATCON LTD.
4195 Dundas St. W.
Toronto, Ontario
M8X 1Y4
(416)-239-3012

Funding Organization:

Atomic Energy Control Board

Dr. R. S. Eaton
(presently with) Radiation Protection Bureau
Health and Welfare Canada
775 Brookfield Road
Ottawa, Ontario
K1A 1C1
(613)-998-8658

Publications:

Atomic Energy Control Board, 1983. "Publications Catalog 1983/84" April 1983; Supplement #1 July 1983; Supplement #2 October 1983. Published by Atomic Energy Control Board, Office of Public Information PO Box 1046, Ottawa K1P 5S9; (613)-995-5894.

DSMA ATCON LTD. & Acres Consulting Services Ltd., 1978-1981. "Reports on Investigation and Implementation of Remedial Measures for the Radiation Reduction and Radioactive Decontamination of Elliot Lake, Ontario." Report #AECB 1211-1: January 1978, 62 pg.; Report #AECB 1211-2: January 1979, 64 pg.; Report #AECB 1211-3: February 1980, 62 pg.; Report #AECB 1211-4: February 1981, 60 pg. Published by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9.

../continued

(continued)

DSMA ATCON LTD. & Acres Consulting Services Ltd., 1978-1981.
 "Technical Notes for Radon Reduction at Elliot Lake". Reports
 published by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9.
 (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

- AECB 1208-1: Sample Bag Radon Averaging Units; January 1978
- AECB 1208-2: Radon Diffusion Through Concrete; February 1978
- AECB 1208-3: Analysis of Working Levels; May 1978
- AECB 1208-4: Elliot Lake Remedial Demonstration Program, May 1978
- AECB 1208-5: Elliot Lake Remedial Demonstration Program, June 1978
- AECB 1208-6: "Exact" Kusnetz Factors for the Elliot Lake Sampling
Technique; January 1979
- AECB 1208-7: Conversion of Average Radon Concentration to Average
WL; May 1979
- AECB 1208-8: Experience with the Gas Chromatograph at Elliot Lake;
June 1979
- AECB 1208-9: Use of the Rolle Method for WL Estimates in Houses;
August 1979
- AECB 1208-10: Estimating RaA Concentration and WL by the modified
Markov-Rolle method; August 1979
- AECB 1208-11: Field Comparison of Survey Meters in Houses;
October 1979
- AECB 1208-12: Concrete Block Basements, Remedial Action Evaluation
Program; December 1979
- AECB 1208-13: Trial of Bentonite Panels as an Exterior Wall Sealant;
February 1980
- AECB 1208-14: Comparison of Radon and RaA Concentration Estimates;
April 1980
- AECB 1208-15: Radon Concentration Estimates Using the EDA Continuous
Radon Monitor (RDR-511); April 1980
- AECB 1208-16: Check of Theoretical Correction Coefficients for the
RDR-511; April 1980
- AECB 1208-17: Precision of the RD-511 Radon Concentration Estimates;
June 1980
- AECB 1208-18: Revised Radon Concentration Equations for the RDR-511;
August 1980
- AECB 1208-19: In-Situ Performance of an Air-to-Air Heat Exchanger;
April 1981

DSMA ATCON LTD. & Acres Consulting Services Ltd., 1979-1981.
 "Development Program for Radon Reduction at Elliot Lake". Reports
 Published by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9.
 (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

- AECB-1207-1: Isolation Module Tests; September 1979
- AECB-1207-2: Condensation Nuclei Concentration in Occupied
Buildings; October 1978
- AECB-1207-3: Intercomparison Experiment at NRE III; December 1978
- AECB-1207-4: Radon Production Rate of Elliot Lake Soils; January 1979
- AECB-1207-5: Radon Diffusion Barrier Tests on Commercial Paints;
April 1979
- AECB-1207-6: Variation of Radon Concentration in Soil Gas; June 1979
- AECB-1207-7: Natural Radioactivity in Ontario Sands; June 1979

../continued

- AECB-1207-8: Thoron Interference with WL Measurements; August 1979
- AECB-1207-9: Laboratory Tests External Coatings; August 1979
- AECB-1207-10: Intercomparison of EDA and Eberline Radon Measurement Equipment; November 1979
- AECB-1207-11: Concrete Block Fillers; December 1979
- AECB-1207-12: Groundwater Investigation; February 1981
- AECB-1207-13: Variation of Scintillation Cell Count Rate with Time; April 1980
- AECB-1207-14: A Field Method for Measurement of Radon Daughters in Air; September 1981
- AECB-1207-15: Effect of Form Release Oil on the Performance of Two Rubber Base Sealants; September 1981
- AECB-1207-16: Calibration of a Portable Five Channel Scintillometer; November 1981

DSMA ATCON LTD. & Acres Consulting Services Ltd., 1982. "FINAL REPORT, Investigation and Implementation of Remedial Measures for the Radiation Reduction and Radioactive Decontamination of Elliot Lake, Ontario". Published as Report #AECB-1207-17, February 1982, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9. (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

Keith Consulting, 1983. "Report on Investigative and Remedial Measures, Radiation Reduction and Radioactive Contamination in Uranium City, Saskatchewan". Published as Report #AECB-1198, March 1983, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9.

James F. MacLaren Ltd., 1979. "The Reduction of Radioactivity Found in Bancroft Ontario and Its Environs". Published as Report #AECB-1196, February 1979, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9. (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

Federal/Provincial Task Force on Radioactivity, 1979. "Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Reprocessing, Elliot Lake, Ontario". Published as Reports #AECB-1209/AECB-1164-1, March 7, 1979, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9. (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

Federal/Provincial Task Force on Radioactivity, 1979. "Second Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Processing, Bancroft, Ontario." Published as Reports #AECB-1209/AECB-1164-2, March 12, 1979, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9. (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

Federal/Provincial Task Force on Radioactivity, 1980. "Third Workshop on Radon and Radon Daughters in Urban Communities Associated with Uranium Mining and Reprocessing, Port Hope, Ontario". Published as Report #AECB-1209/AECB-1164-3, March 12, 1980, by Atomic Energy Control Board, PO Box 1046, Ottawa K1P 5S9. (Out of Print - may be viewed at AECB Library, Ottawa (613)-995-5894.)

Activity and Description:

R-2000 Low-Energy Home Demonstration Program: Air Quality Monitoring

Energy Mines and Resources Canada initiated an indoor air quality monitoring program, which includes some 300 R-2000 low-energy homes and 100 control homes. The testing will include humidity, formaldehyde, radon, nitrogen dioxide, ventilation system air flows, backdrafting of combustion appliances, and other measurements. Resident questionnaires are also being used to gather further information.

Research Organization:

Energy Mines and Resources Canada

Mark Riley
Super Energy Efficient Home Program
Energy Mines and Resources Canada
580 Booth St.
Ottawa, Ontario
K1A 0E4

Courier Address:
460 O'Connor Street, Rm. 1119
Ottawa, Ontario
K1S 5H3

(613)-995-1118, ext. 297

Funding Organization:

Energy, Mines and Resources Canada

Charles Ficner
Director, Technology Transfer
& Demonstration Program Division
Energy, Mines and Resources Canada
580 Booth St.
Ottawa, Ontario
K1A 0E4

Publication:

Not yet published.

Activity and Description:

HEATLINE Telephone Advisory Service

Energy, Mines and Resources Canada operates HEATLINE, a toll free telephone advisory service for individual Canadians who wish to save energy, but who need help in deciding what to do and what materials and services to choose. Advice covers home insulation, home heating and energy-efficient house design, as well as ventilation requirements for energy-efficient dwellings. Fact sheets are available on various energy-conservation materials and methods.

Research Organization:

Energy Mines and Resources Canada

Heatline Co-ordinator, Home Energy Programs
Energy Conservation & Oil Substitution Branch
Energy Mines and Resources Canada
Ottawa, Ontario
K1A 0E4

from Ottawa-Hull: 995-1801
Yukon & NW Territories: (613)-995-1801 collect
British Columbia: 112-800-267-9563 toll free
Other areas: 1-800-267-9563 toll free

Funding Organization:

Same as above.

Publication:

Energy, Mines and Resources Canada, October 1983. "Your Guide to Savings and Comfort: Home Energy Planning". Fifteen-page booklet Available from EMR HEATLINE 1-800-267-9563.

Activity and Description:

Measurement of Inorganic Contaminants in Indoor Environments

A series of studies was undertaken, to assess the presence and levels of various inorganic contaminants in the indoor environment.

Monitoring has included contaminants such as nitrogen oxides and sulphur dioxide.

Research Organization:

Health and Welfare Canada

J. C. Méranter, Head, Inorganic Chemistry Section
Monitoring and Criteria Division, Bureau of Chemical Hazards
Environmental Health Directorate
Health Protection Branch
Health and Welfare Canada
Environmental Health Centre
de la Colombine Blvd.
Tunney's Pasture
Ottawa, Ontario
K1A 0L2
(613)-992-1388

Funding Organization:

Same as above

Publication:

Inquire Health and Welfare Publications, Ottawa K1A 0L2

Activity and Description:

Indoor Air Quality Analysis: Polycyclic Aromatic Hydrocarbons

A project was undertaken to determine the occurrence of selected polycyclic aromatic hydrocarbons (PAH) in the air of nine homes roughly categorized according to airtightness, woodburning, and cigarette smoking.

The purpose of this preliminary study was largely to investigate sampling and analytical methods.

Other studies, presently underway by Eco-Research, are generally in the area of industrial hygiene.

Research Organization:

Eco-Research Inc.

Dr. Tom Adley
Eco-Research Inc.
121 Hymus Blvd.
Pointe Claire, Quebec
H9R 1E6
(514)-697-3273

Funding Organization:

Health and Welfare Canada

Rein Otson
Organic Chemistry Section, Monitoring and Criteria Division
Bureau of Chemical Hazards, Environmental Health Directorate
Health Protection Branch
Health and Welfare Canada
Room B 19, Environmental Health Centre
de la Colombine Blvd.
Tunney's Pasture
Ottawa, Ontario
K1A 0L2
(613)-992-6812

Publication:

Not yet published.

Activity and Description:

Measurement of Organic Contaminants in Indoor Environments

A series of studies was undertaken, to assess the presence and levels of various organic contaminants in the office and home environment.

Potential sources, such as fabric protectors, solvents and various other volatile products, are being identified.

Some measurement of formaldehyde levels has also been done on houses insulated with Urea-Formaldehyde Foam Insulation.

Research Organization:

Health and Welfare Canada

Rein Otson
Organic Chemistry Section, Monitoring and Criteria Division
Bureau of Chemical Hazards, Environmental Health Directorate
Health Protection Branch
Health and Welfare Canada
Room B 19, Environmental Health Centre
de la Colombine Blvd.
Tunney's Pasture
Ottawa, Ontario
K1A 0L2
(613)-992-6812

Funding Organization:

Same as above

Publication:

Inquire Health and Welfare Publications, Ottawa K1A 0L2

Activity and Description:

Federal-Provincial Working Group on Indoor Air Quality

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, active 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 exposures 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.

Research Organization:

Federal-Provincial Working Group on Indoor Air Quality

Secretariat:

c/o Dr. Vic Armstrong, Head, Criteria Section
Monitoring and Criteria Division, Bureau of Chemical Hazards
Environmental Health Directorate, Health Protection Branch
Health and Welfare Canada
Environmental Health Centre
de la Colombine Blvd., Tunney's Pasture
Ottawa, Ontario K1A 0L2
(613)-990-8982

**Federal-Provincial Advisory Committee on
Environmental and Occupational Health**

c/o Dr. Ann Robinson, Asst. Deputy Minister
Occupational Health and Safety Division
Ontario Ministry of Labour
400 University Avenue
Toronto, Ontario M7A 1T7
(416)-965-6605

Publications:

Not yet published.

Activity and Description:**Measurement of Radon and Radon Daughters in Canadian Homes**

Measurements of radon and radon daughters were carried out, in 14 Canadian cities, on a total of 9999 homes selected in a statistically random manner. The survey was carried out between June and August of 1977 and 1978, in the following cities: Calgary, Charlottetown, Fredericton, Halifax, Montreal, Quebec, Saint John, Sherbrooke, St. John's, St. Lawrence, Sudbury, Thunder Bay, Toronto and Vancouver.

The geometric means of the different cities varied from 0.14 to 0.88 pCi/l (pico-Curies per litre) for radon and 0.0009 to 0.0036 Working Levels for radon daughters. About 64% of all homes had radon concentrations of 1 pCi/l or less, and about 95% had radon daughter concentrations of 0.1 Working Level or less. The highest concentrations of radon daughters was 75 pCi/l measured in St. Lawrence, Nfld.; the highest concentration of radon daughters was 0.233 Working Levels in Sherbrooke, Quebec. The radon originates from natural radioactivity in the soil surrounding the homes.

The researchers concluded that the majority of Canadian homes surveyed showed very low concentrations of radon and radon daughters. They noted that there is, however, a small but significant minority of homes, in distinct cities where increased concentrations of radon and radon daughters are observed, although it was not known whether these concentrations have any health significance. The results of the study showed the possibility that the concentrations specified in regulations, applying to contaminated building materials or uranium mining areas, may be more stringent than concentrations which are naturally occurring across the country.

Research Organization:

Health and Welfare Canada

R. G. McGregor, Environmental Radiation Hazards Division
Radiation Protection Bureau, Environmental Health Directorate
Health and Welfare Canada
Brookfield Road, Confederation Heights
Ottawa, Ontario K1A 1C1
(613)-998-8658

Publication:

McGregor, R.G., Vasudev, P., Letourneau, E.G., McCullough, R.S., Prantl, F.A., and Taniguchi, H., (Health and Welfare Canada) 1980. "Background Concentrations of Radon and Radon Daughters in Canadian Homes". Health Physics Vol. 39, pp. 285-289, August 1980 (Pergamon Press, U.S.A.).

Activity and Description:

Expert Advisory Committee on Dioxins

A report was recently released by the Minister's Expert Advisory Committee on Dioxins, prepared by a committee specially appointed by the Minister of Health and the Minister of Environment.

The committee noted evidence that dioxins could be produced by woodstoves. Although there are many unanswered questions concerning dioxins and woodstoves, evidence was available to the committee which indicated that airtight stoves, which don't have as high a combustion temperature as others, could produce higher dioxin levels.

Research Organization:

Minister's Expert Advisory Committee on Dioxins

Robert F. Willes, Chairman
c/o F.D.C. Consultants Incorporated
R.R.#1
Orono, Ontario
L0B 1N0
(416)-983-5465

Publication:

Health and Welfare Canada, 1983. "Report of the Minister's Expert Advisory Committee on Dioxins", December 1983 NO: Inquire Health and Welfare Information, Ottawa K1A 1B4; Tel:(613)-996-1545.

Activity and Description:

1. **Workshop on Development of Biological Indicators for the Effects of Urea-Formaldehyde Foam Insulation: December 1983**
2. **Workshop on the Toxicology of UFFI: September 1982**

F.D.C. Consultants has prepared transcripts of a workshop, held September 29, 1982, which was arranged to provide the National Research Council of Canada with advice and expertise in the field of toxicology of UFFI.

The company also organized and is documenting a second Workshop, held December 1983 for the National Research Council of Canada, to discuss and exchange technical and scientific information on the development of biological indicators for screening potential health effects of Urea-Formaldehyde Foam Insulation.

A transcript of the proceedings, and a summary report on the feasibility of developing biological indicators, is being prepared.

Research Organization:

F.D.C. Consultants Incorporated

Robert F. Willes

F.D.C. Consultants Incorporated

R.R.#1

Orono, Ontario

L0B 1N0

(416)-983-5465

Funding Organization:

National Research Council of Canada

Cliff Shirtliffe

Division of Building Research

National Research Council of Canada

Montreal Rd.

Ottawa, Ontario

K1A 0R6

(613)-993-1821

Publication:

F.D.C. Consultants Inc., 1984. "Feasibility Report and Transcript: NRC Workshop on Biological Indicators for U.F.F.I. (Dec. 83)". For National Research Council of Canada. Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

Transcription of the Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; October 1982

Workshop held October 1982, by National Research Council of Canada, to present and exchange technical and scientific information on Urea-Formaldehyde Foam Insulation.

Research Organization:

F.D.C. Consultants Incorporated

Robert F. Willes
F.D.C. Consultants Incorporated
R.R.#1
Orono, Ontario
L0B 1N0
(416)-983-5465

Funding Organization:

National Research Council of Canada
NRC Contract 19SR-31155-2-4486 (OSR82-00147)

Cliff Shirtliffe
Division of Building Research
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6
(613)-993-1231

Publication:

F.D.C. Consultants Inc., 1982. "UFFI Workshop (Oct. 82): Synopsis, Interpretations and Recommendations". For National Research Council of Canada. Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

F.D.C. Consultants Inc., 1984. "Transcript of Proceedings: UFFI Workshop October 1982". For National Research Council of Canada. Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

**Projet de recherche sur la qualité du milieu de travail dans les
édifices à bureaux
(Research Project on the Quality of the Working Environment in
Office Buildings)**

Staff at the Hopital du Saint Sacrement have undertaken a research project on the quality of the working environment in office buildings.

Research Organization:

Departement de santé communautaire
Hôpital du Saint Sacrement

Charles Guertin
Hôpital du Saint Sacrement
1050, chemin Ste-Foy
Québec G1S 4L8
(418)-688-3688

Funding Organization:

Ministère des Affaires Sociales
Direction de la santé communautaire

Ginette Leclair
1075, chemin Ste-Foy
Québec G1S 2M1
(418)-643-2884

Publication:

Not yet published.

Activity and Description:

**Analyse des éventuelles réactions d'hypersensibilité a la mousse isolante d'urée-formaldehyde et a ses sous-produits
(Analysis of Possible Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts)**

Étude ches les adults dont les maisons sont isolées à la MIUF afin de déterminer si ce produit peut déclencher des réactions d'hypersensibilité chez l'homme et si elles existent, ses mécanismes de production.

Study of adults whose homes were insulated with UFFI, in order to determine if this product can trigger hypersensitivity reactions, and if so, the mechanisms by which they are produced.

Septembre 1983 a décembre 1984.

September 1983 to December 1984.

Research Organization:

Département de santé communautaire
Hôpital Général de Montréal et l'Hôpital Royal Victoria

Dr. J. Del Carpio, avec Dr. N. Gilmore, Dr. C.K. Osterland,
et Dr. John Hoey
Hôpital Général de Montréal
1597 ouest, avenue des Pins
Montréal, Québec
H3G 1B3
(514)-937-9231

Funding Organization:

Ministère des Affaires Sociales
Direction de la santé communautaire

Dr. Jean-Paul Fortin, Directeur
1075, chemin Ste-Foy
Québec G1S 2M1
(418)-643-7656

Publication:

Aucune.

Activity and Description:

Organisation d'une conférence de consensus sur les problèmes de santé potentiellement reliés à la mousse isolante d'urée-formaldehyde les 23 et 24 juillet, 1983.

(Organization of a Consensus Conference on Health Problems Potentially Related to Urea Formaldehyde Foam Insulation, July 23 and 24, 1983.)

Les experts qui ont participé à la réunion sont parvenus à un consensus sur tous les problèmes de santé discutés. Bien qu'il n'ait pas été prouvé que les syndromes d'irritation et respiratoires soient directement attribuables à la MIUF, cette possibilité est suggérée par l'expérience acquise avec d'autres gaz toxiques. En dehors de la dermatite de contact, des réactions qui soient véritablement immunitaires sont peu probables. Quand elles surviennent chez des personnes exposées à la MIUF, on devrait rechercher d'autres allergènes. Les risques de cancer, de malformations congénitales ou bien d'effets néfastes sur la reproduction sont probablement négligeables, sinon trop petit pour être décelables.

The experts who participated in the meeting came to a consensus on all the health problems discussed. Although it has not been proven that respiratory and irritation syndromes are directly attributable to UFFI, this possibility is suggested by experience with other toxic gases. Aside from contact dermatitis, true immune reactions are not likely. When they do arise in people exposed to UFFI, other allergens should be investigated. The risks of cancer, birth defects, or harmful effects on reproduction are probably negligible.

Research Organization:

Département de santé communautaire, Hôpital Général de Montréal

Dr. John Hoey, chef du DSC, avec. Mme Suzanne Couët, M.Sc.
DSC, Hôpital Général de Montréal
1597 ouest, avenues des pins
Montréal, Québec H3G 1B3
(514)-937-9231 ou 849-3621

Funding Organization:

Ministère des Affaires Sociales, Direction de la santé communautaire

Dr. Jean-Paul Fortin, directeur
1075, chemin Ste-Foy
Québec G1S 2M1
(418)-643-7656

Publication:

Bulletin de la Corporation professionnelle des médecins du Québec, 1983. "Déclarations d'experts sur les risques pour la santé de la mousse isolante d'urée-formaldehyde". Volume XXIII, Numéro 3, Novembre/décembre 1983.

Canadian Medical Association Journal. Editorial, January 1984.

Activity and Description:

Trace Organic Laboratory for Analyzing Indoor Air Quality

Mann Testing Laboratories has fully equipped lab facilities for analysis of trace organic contaminants in indoor air samples. Equipment includes two Mass Spectrometers that are coupled with an Incos Data System, having a library of some 33,000 organic compounds. Sampling is done using tubes packed with charcoal, ambersorb and tenax, so that the entire range of organics can be covered. The laboratory has also set up an HPLC method to carry out analysis of midget impinger samples for isocyanates, in response to their recent addition to the Occupational Safety and Health Act - Designated Substances.

Recent projects include a number of studies on the identification of air contaminants in office buildings and industrial workplaces.

Research Organization:

Mann Testing Laboratories Ltd.

Wm. Burgess
Mann Testing Laboratories Ltd.
5550 McAdam Rd.
Mississauga, Ontario
L4Z 1P1
(416)-848-5550

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Brochures on professional analytical services can be obtained by inquiry to Mann Laboratories, at the above address.

Activity and Description:**Emissions from Polyurethane Foam Insulation on Domestic Storage Tank Water Heaters**

Since emission levels from polyurethane foam insulation (PUFI) increase greatly with temperature, the introduction of polyurethane-foam-insulated domestic water heaters (PUDWH) has raised concern. Emissions from PUFI, from PUDWH's, were characterized at 18 and 60 degrees Celsius, by headspace analysis. Pollutants, which may have adverse health effects, were detected and identified. Equilibrium concentrations and emission rates of these, and dominant pollutants released by PUDWH's, will be determined at simulated service conditions.

Research Organization:

National Research Council of Canada

R.S. Yamasaki
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:

Indoor Emissions from Polyurethane Foam

Emissions from nine board and sprayed-in-situ polyurethane foams were characterized by headspace analysis. A large increase in emission levels was found as the foam temperature was raised above ambient. Preparations were made to carry out chamber studies of emissions from polyurethane foam insulation.

Research Organization:

National Research Council of Canada

R.S. Yamasaki
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:

Air Quality in Houses

The objective of this project is to establish the range of concentrations of some common contaminants in houses, and to establish the relationship between contaminant concentrations and air change rate.

Air change rates and contaminant concentrations were measured on a weekly basis, in ten heat pump heated houses in Ottawa, during the 1982/83 heating season. Air change rates were measured using the grab sampling technique.

Research Organization:

National Research Council of Canada

George T. Tamura
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

MacLaren Engineers, 1982. "A Study to Determine Contaminant Buildup in Houses". Contract 0SR81-00023, April 1982.

A Building Practice Note on the above study is being prepared. Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6.

Activity and Description:

Carbon Dioxide Controlled Outside Air Supply

The objective of this study is to determine the energy that could be saved by modulating the ventilation rate of buildings on the basis of carbon dioxide (CO₂) concentrations.

Research Organization:

National Research Council of Canada

George T. Tamura
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Tamura, G.T. "Carbon Dioxide in Buildings". Prepared for inclusion in Canadian Building Digest. Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6.

Activity and Description:**Contaminant Emissions From Gas Stoves**

The objective of this study is to determine the emission rates of combustion products from gas stove operation, and to determine how the levels of these products vary with air infiltration rates and kitchen hood operation. Combustion products being considered are nitric oxide (NO), nitrogen dioxide (NO₂), carbon monoxide (CO) and carbon dioxide (CO₂).

Products of combustion, in the kitchen, living room, and bedroom of the test house, were measured with top burners and oven in operation, and with and without kitchen hood operation.

The study also includes collection of NO₂, CO₂, CO and air infiltration rate data, in gas stove houses in Alberta.

Research Organization:

National Research Council of Canada

George T. Tamura
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Goto, Y., and Tamura, G.T., 1984. "Measurements of Levels of Combustion Products from Gas Cooking Stove in a Two-Storey House." Presented at Air Pollution Control Association Symposium, San Francisco, California, June 1984. Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6.

Activity and Description:

Contaminant Emissions From Kerosene Heaters

The objective of this study is to determine the emission rates of combustion products from kerosene space heater operation, and to determine the levels of these products within the house, with various air infiltration rates, heater types and heater locations. Combustion products being considered are nitric oxide (NO), nitrogen dioxide (NO₂), carbon monoxide (CO), carbon dioxide (CO₂) and sulphur dioxide (SO₂).

Preliminary tests were first conducted with kerosene space heaters in the test house. The instrumentation and data acquisition system were prepared for the test.

Subsequently, a series of tests were conducted with radiative and convective type radiant space heaters in the test house, and the combustion products were monitored in the kitchen, livingroom and bedrooms. Emission rates were measured either in the CSA (Canadian Standards Association) test chamber, or in a room isolated from the remainder of the test house.

Research Organization:

National Research Council of Canada

George T. Tamura
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:**Field Study of Formaldehyde Emissions from ParticleBoard**

The objectives of this study are: 1) to quantify particleboard-based formaldehyde sources, with emphasis on the differentiation of source effects among floor underlay, shelving and fixed furniture; 2) to gain more knowledge about formaldehyde contamination of other materials, in typical building construction; and 3) to develop practical treatment and rehabilitation procedures.

The research and experimental procedures for an apartment study were established, for contract work which started in August 1983. The contractor monitored the formaldehyde concentrations, and quantified specific emission sources, by the elimination procedure. DBR staff monitored the air exchange rate.

Subsequently, work continued to determine individual source contributions to formaldehyde levels in the apartment. Samples from primary emission sources, and from contaminated materials, were analyzed in the laboratory. Simple chemical or physical treatment procedures, for contaminated and primary source materials, are being developed and tested. Periodic measurements will be conducted over a period of a year, to monitor the effectiveness of the decontamination procedures.

National Research Council of Canada

P. C. Gaudert
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:

Methods for Field Measurement of Material Off-Gassing

The objective of this study is to identify, or develop, simple but reliable measurement techniques for the identification, and quantification of, air contaminant emissions from building materials in the field.

Information on various methodologies for measuring formaldehyde emissions have been reviewed. Prototype box enclosures have been developed and tried, with various board-samples and installations. Extraction techniques, for air samples from porous composite panels, have been tried and found potentially practical, for determining emissions from edges of overlaid panels. Proprietary detector tubes have been found useful, not only for formaldehyde concentration measurements but also for determining the relative humidity in the enclosure boxes. A report describing the approach, and comparing it with alternative and existing measurement techniques, is in preparation.

National Research Council of Canada

P. C. Gaudert
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:**Dynamic Emission Chamber**

The objective of this study is to develop dynamic chamber facilities for measuring emission rates of contaminants from building materials, in controlled exposure and/or application situations.

Information on the theory, design and experimental results of dynamic chamber tests has been gathered, by visiting or contacting research laboratories in Europe, USA and Canada. The underlying theoretical concepts have been summarized in a report presented to the Technical Sub-Committee of the Canadian Formaldehyde Council.

The study includes: 1) development of a new chamber, in which the precise control of air velocities over the specimen surface is achieved by circular rotation of the test specimen; 2) verification of Hoetjer's theory, ie., the straight line of the I/C vs. N/L plot, allows interpolation, or extrapolation, to any air exchange and material loading condition, regardless of chamber size; 3) evaluation of the effect of air velocity; 4) evaluation of material combinations; and 5) evaluation of barrier coatings and overlays.

National Research Council of Canada

P. C. Gaudert
Division of Building Research
National Research Council of Canada
Montreal Rd., M-20
Ottawa, Ontario
K1A 0R6
(613)-993-1421

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:

Air Infiltration Characteristics of Houses

The objective of this study is to find air infiltration rates in a number of houses, by tracer gas measurement, and to relate it to the type of house and the weather conditions.

A nitrous oxide infrared gas analyzer was purchased and tested. Air infiltration measurements were made in 45 houses, using a tracer gas decay technique, as part of a study on air quality. Pressure test readings were also made on these houses.

Research Organization:

National Research Council of Canada

R. S. Dumont
Prairie Regional Station
Division of Building Research
National Research Council of Canada
Saskatoon, Saskatchewan
S7N 0W9

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:**Air Quality in Low Energy Houses**

The objective of this study is to perform field studies of air contaminant levels in prairie houses.

Radon, formaldehyde, nitrogen dioxide and relative humidity measurements were made on a group of 46 well-sealed houses, located in Saskatoon. A report was prepared listing these readings. Some analysis was undertaken, relating elevated pollutant levels to high source strengths, and to air change and humidity levels.

The study included remedial action, on a group of approximately 10 houses which exhibited high levels of pollutants, and further surveys on pollutant levels, and their relationship with air change rates and source strengths, involving about 30 houses.

Research Organization:

National Research Council of Canada

R. S. Dumont
Prairie Regional Station
Division of Building Research
National Research Council of Canada
Saskatoon, Saskatchewan
S7N 0W9

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
(613)-992-8232

Publication:

Dumont, R.S., 1984. "Air Quality Measurements in a Group of Low Leakage Houses". DBR Building Research Note No. 218. Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:

- 1. The Estimation of Total Human Exposure to Pollutants**
- 2. Models for Indoor and Outdoor Exposure to Air Pollutants**

The objectives of these studies include:

- 1) Development of a series of integrated models, for the determination of human exposure to indoor and outdoor pollutants, as a function of continuing space and time.
- 2) Development of models for the determination of human exposure to pollutants occurring in a multiple media (i.e. air, water, food).
- 3) Development of "user friendly" computer programs, whereby operators (e.g. building designers) may obtain numerical quantification of human exposure, using given sets of input data (i.e. practical application).

Information on spatial and temporal distribution of four air pollutants (carbon monoxide, nitrogen oxides, radon, formaldehyde) has been compiled and critically assessed. Historical and current models of human exposure have also been identified and critically assessed. Using information from these activities, preliminary models, for the estimation of individual exposure to air pollutants occurring in the indoor and outdoor environment, have been developed. These models are being refined, as current information on pollution distribution in time and space becomes available.

Research Organization:

National Research Council of Canada

Dr. Ronald Pierce
Environmental Secretariat
Division of Biological Sciences
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6

Funding Organization:

Same as above.

Publication:

Inquire DBR Publications, NRC M-20, Montreal Rd., Ottawa K1A 0R6.

Activity and Description:**Building Science Seminars: Humidity, Condensation and Ventilation in Houses**

During the Fall of 1983, the Division of Building Research, of the National Research Council, presented 'Building Insight 83', in a number of Canadian cities. The subject matter - humidity, condensation and ventilation in houses - was timely in that damages due to moisture on walls and windows, in wall cavities and in attics, are becoming more prevalent in Canada.

The program featured a critical look at humidity problems in houses, and identified sources of moisture within a dwelling and means of its control. Signs of pending humidity problems were reviewed and corrective measures suggested. Guidelines for new residential construction were discussed.

Research Organizations:

National Research Council of Canada

R. C. Biggs / G. O. Handegord
Division of Building Research
Montreal Rd., Ottawa, Ontario K1A 0R6
(613)-993-1231

Canada Mortgage and Housing Corporation

Jim H. White
Research Division, Canada Mortgage and Housing Corporation
Montreal Rd., Ottawa, Ontario K1A 0P7
(613)-748-2309

Funding Organization:

National Research Council of Canada
Canada Mortgage and Housing Corporation

B. F. Stafford
Division of Building Research, M20
National Research Council of Canada
Montreal Rd., Ottawa, Ontario K1A 0R6
(613)-993-2607

Publication:

Division of Building Research, National Research Council of Canada, 1984. "Proceedings and Supplementary Information: Humidity, Condensation and Ventilation in Houses". DBR Proceedings No. 7, NRCC 23293. Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6.

Scott, D.L., 1984. "Field Visits to Moisture Troubled Housing in a Maritime Climate". DBR Building Practice Note No. 49, September 1984. Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6.

Activity and Description:

Performance of Passive Ventilation Systems

Air change rates were measured in one two-storey detached house, with five basic types of passive ventilation systems: an intake vent in the basement wall; an outdoor air supply ducted to the existing forced air heating system; an exhaust stack extending from the basement to the roof; and two combinations of the supply systems and the exhaust stack.

An expression was developed for estimating house air change rate, from house airtightness, neutral pressure level and indoor-outdoor air temperature difference. Good agreement was obtained, for the test house, between the predicted and the measured air exchange rates. The effects of furnace fan operation, air distribution system, and size and location of vent openings, on house air change rates, are also discussed.

Research Organization:

National Research Council of Canada

C. Y. Shaw
Division of Building Research
National Research Council of Canada
Montreal Road
Ottawa, Ontario
K1A 0R6

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
Tel: (416)-992-8232

Publication:

Shaw, C.Y. and Kim, A., 1984. "Performance of Passive Ventilation Systems in a Two-Storey House". Division of Building Research, National Research Council of Canada. Published in the Proceedings, 5th AIC Conference, Reno, Nevada, USA. Inquire DBR Publication, NRC Ottawa, K1A 0R6.

Activity and Description:**Mechanical Fresh-Air Ventilation Systems in Detached Houses**

Air change rates were measured in a two-storey detached house (HUDAC Mk. XI), with operation of various types of mechanical fresh-air ventilation systems. Four systems were studied, including two balanced systems and two exhaust-only systems. The forced ventilation rate was controlled at 0.15, 0.25, 0.4 or 0.5 air changes per hour. Expressions were developed, for the test house, relating the house air change rate, under winter conditions, to the forced ventilation rate and the infiltration rate due to wind and stack action.

Research Organization:

National Research Council of Canada

C. Y. Shaw
Division of Building Research
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6

Funding Organization:

National Research Council of Canada

Dr. D. S. Walkinshaw
Division of Building Research
National Research Council of Canada
Montreal Road, M-24
Ottawa, Ontario
K1A 0R6
Tel: (416)-992-8232

Publication:

Shaw, C.Y., 1983. "The Effect of Mechanical Ventilation on the Air Leakage Characteristics of a Two-Storey Detached House". National Research Council of Canada, DBR Building Research Note 204. Inquire DBR Publication, NRC-M20, Ottawa K1A 0R6.

Activity and Description:

Chemical Susceptibility and Urea-Formaldehyde Foam Insulation

Experience of physicians treating people who are generally more susceptible, than most, to low level chemical exposure, suggests that exposure to formaldehyde, and other UFFI gases, may constitute an added health risk, and that, for such people, exposure should be avoided if at all possible.

Preliminary evidence indicates that some people who are exposed to UFFI gases, and who have no previous indication of chemical susceptibility, may become generally chemically susceptible, as a result of the exposure.

The degree of chemical susceptibility, of each person exposed to UFFI gases, is an important factor to be taken into account when deciding the type, extent, and urgency of remedial measures that may be required to reduce a family's exposure. Care must be taken, during any reconstruction, to avoid introducing further chemical exposures that may aggravate or perpetuate health problems.

Research Organization:

Bruce M. Small and Associates Limited

Bruce M. Small, P.Eng.
Small and Associates
R.R.#1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Funding Organization:

National Research Council of Canada
Contract DSS 17SR 31155-1-4411

Cliff Shirliffe
Division of Building Research
National Research Council of Canada
Ottawa, Ontario K1A 0R6
(613)-993-1821

Publication:

Small, Bruce M., P.Eng., 1982. "Chemical Susceptibility and Urea-Formaldehyde Foam Insulation". Bruce M.Small and Associates Limited for National Research Council of Canada, February 1982. Published in softcover as 'The Susceptibility Report', by Deco-Plan, Longueuil, Quebec, 1982, ISBN 0-919039-28-6. Available from Small and Associates, R.R.#1, Goodwood, Ont. L0C 1A0.

Activity and Description:

Transcription of the Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; May 17/18, 1983

Workshop held May 17/18 1983, by National Research Council of Canada, to present and exchange technical and scientific information on Urea-Formaldehyde Foam Insulation.

Research Organization:

DIDAK Corporation

David Tait
DIDAK Corporation
120 Holland Avenue
Ottawa, Ontario
K1Y 0X7
(613)-729-2430

Funding Organization:

National Research Council of Canada
NRC Contract 19SR-31944-3-0009 (OSR83-00012)

Cliff Shirtliffe
Division of Building Research
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6
(613)-993-1821

Publication:

DIDAK Corporation, 1983. "NRC Workshop on Urea-Formaldehyde Foam Insulation, May 1983". National Research Council of Canada. Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

**Technical Support for the Investigation of Problems Associated
with Urea-formaldehyde Foam Insulation**

The purpose of this series of studies was to provide technical support for the investigation and solution of problems associated with the installation and removal of urea-formaldehyde foam insulation (UFFI), and to provide technical support for studies of other materials from which formaldehyde out-gassing may occur.

Study components included:

Field investigations, at the request of home and building owners, or as parts of larger studies, using either NRC staff or consultants;

Technical support and advice to federal and provincial departments and agencies involved in UFFI-related remedial and other measures;

Development of effective measures for the reduction in exposure of home occupants to UFFI emissions, and for the removal of UFFI from homes;

Understanding the characteristics of the substances emitted by the foams in place, and development of test methods to measure these characteristics; and

Development of economical methods for monitoring air contaminant levels over prolonged periods; development of methods for monitoring the level and rate of contaminant production; and development and evaluation of chemical and mechanical methods for the control of contaminants in indoor air.

Research Organization:

National Research Council of Canada

Cliff Shirliffe
Division of Building Research
National Research Council of Canada
Montreal Rd. Ottawa, Ontario K1A 0R6
(613)-993-1821

Funding Organization:

Same as above.

Publication:

Inquire DBR Publications, NRC, Montreal Rd., Ottawa, Ontario K1A 0R6.

Activity and Description:

- 1. Chemistry and Monitoring of Indoor Air Contaminants**
- 2. Investigations into Various Formaldehyde Monitoring Devices**

Concord Scientific Corporation has been developing and refining a gas source/exposure chamber for formaldehyde gas experiments, under the federal government's UFFI research program. The chamber will be used as a primary standard for formaldehyde (HCHO) gas experiments, including the final development of solid-sorbent, diffusion-tube samplers (passive dosimeters) for formaldehyde. The intent is to produce a very accurate standard gas chamber, for the development of both room air and wall cavity dosimeters. It will be used as a standard for other dosimeters as well.

Additional studies include the evaluation of the performance of Gastec, Drager 0.2/a and Drager 0.5/a detector tubes, in the calibrated chamber.

Previously completed projects in this area included:

The design of modelling systems for air pollutants. Source and sink strengths of contaminants were investigated and quantified, as well as ventilation, in an effort to better understand formaldehyde, and other toxic gaseous contaminants, in the indoor environment.

A feasibility study on the measurement of formaldehyde in living spaces.

Analysis of Dupont C-60 formaldehyde dosimeters, and further investigations of the accuracy and precision of this device, for measure low levels of formaldehyde.

580nm Wavelength absorption of sodium bisulphite solution, for determination of the blanks, for the 2400 homes survey. The report of this study was used as an aid to determine the significance of the results of the 2400 homes survey.

Development of novel wall cavity formaldehyde dosimeters, and investigation into their calibration, sensitivity, correlation with other commercially available devices, and field testing. Manufacturing requirements and costs were examined, to facilitate future production. The intent of the study was to develop a Canadian wall cavity formaldehyde dosimeter.

Design, fabrication and testing of a prototype electro-optical formaldehyde monitor, to facilitate more accurate formaldehyde monitoring. The purpose of this work was to aid in the development of a highly accurate formaldehyde measuring instrument.

Investigation into the feasibility of commercializing a novel formaldehyde dosimeter. Specifications, consistent with the requirements of the National Testing Programme and National Research Council of Canada, were considered in the design and manufacture of wall cavity and room air dosimeters.

../ continued

200 Home Dosimeter Survey. 1000 wall cavity dosimeters and 1000 room air dosimeters were purchased. The formaldehyde concentration in exposed devices was analyzed.

A chamber study of old and new production lots of Draeger formaldehyde detection tubes.

Research Organization:

Concord Scientific Corp.

R. Catton / John Chandler
Concord Scientific Corp.
2 Tippet Rd.
Downsview, Ontario
M3H 2V2
(416)-630-6331

Funding Organization:

National Research Council of Canada
Consumer and Corporate Affairs Canada

Cliff Shirliffe
Division of Building Research
National Research Council of Canada
Montreal Rd.
Ottawa, Ontario
K1A 0R6
(613)-993-1821

UFFI Centre/Centre sur la MIUF
Place du Centre
Hull, Québec
K1A 0C9
1-800-567-6870

Publication:

Concord Scientific Corp., 1983. "A Sourcebook for Evaluating the Chemistry of Indoor Air Pollutants". For National Research Council of Canada. Inquire DBR Publications, NRC-M20, Ottawa, Ontario K1A 0R6.

Activity and Description:**Testing and Analysis of Formaldehyde in UFFI Homes**

Proctor & Redfern Limited tested 19 homes, insulated with urea formaldehyde foam insulation (UFFI), for airborne formaldehyde, from February to July 1981 (through a then-subsiary company known as United Technology and Science Inc.). The air sampling was carried out in accordance with methods established by the National Institute for Occupational Safety and Health (NIOSH) of the United States, and the National Research Council of Canada, Building Research Division.

Proctor and Redfern also has the capability to evaluate indoor air quality. Office and home inspections include:

- o a walk-through, to look for sources of contamination;
- o measurement of comfort parameters, such as temperature, humidity, and air movement;
- o measurement of carbon dioxide, formaldehyde, carbon monoxide, ozone and respirable particles; and
- o examination of the ventilation system, for causes for poor distribution, including biological organism tests.

Research Organization:

Proctor & Redfern Limited

Tom Branny
Proctor & Redfern Limited
45 Green Belt Dr.
Don Mills, Ontario
M3C 3K3
(416)-445-3600

Funding Organization:

Consumer and Corporate Affairs Canada

Publications:

United Technology and Science Inc., 1981. "Report and Analysis of Data Obtained from Homes With Urea Formaldehyde Foam Insulation". For Consumer and Corporate Affairs Canada, Project E.O. 81937, July 1981. Inquire UFFI Centre, Ottawa K1A 0C9.

Suarez, Joe and Rogers, Mike, United Technology and Science Inc., 1982. "Concern for Indoor Air Quality Creates New Market for Consultants". Canadian Consulting Engineer Vol 24, No. 4, pp. 57-59, April 1982.

Activity and Description:

Indoor Air Quality Measurements for Offices and Residences

Independent Measurement and Technology Inc. (IMET) carries out indoor air quality measurements and investigations for office and residential environments. Gases measured include carbon monoxide (CO), carbon dioxide (CO₂), oxygen (O₂), formaldehyde, and trace organics. Particulate sampling includes asbestos.

The company stresses the importance of providing adequate ventilation, based on an engineering analysis which takes into account working area, numbers of people, and other factors.

Research Organization:

Independent Measurement and Technology Inc. (IMET)

John Trought
Independent Measurement and Technology Inc. (IMET)
Unit 58, 1271 Denison St.
Markham, Ontario
L3R 4B5
(416)-477-4638

Funding Organization:

Client-funded studies.

Publication:

Client reports are confidential.

Activity and Description:

Efficiency of Formaldehyde Gas Collection Impingers

Envirocon undertook a study to assess the efficiency of two formaldehyde gas collection impingers. The study assisted in determining the accuracy of the impinger method of measuring formaldehyde levels, which was to be used in a 2400 home survey.

Envirocon provides general environmental research services.

Research Organization:

Envirocon Ltd.

Envirocon Ltd.
300-475 West Georgia St.
Vancouver, B.C.
V6B 4M9
(604)-687-7588

Funding Organization:

Client-funded studies.

Publication:

Not published.

Activity and Description:

Home Energy Leakage Project (H.E.L.P.)

The New Brunswick Housing Corporation is attempting, through the Home Energy Leakage Project, to establish a data base relative to the uncontrolled air leakage rates of houses of various age groupings. The Corporation hopes to make some assessment relative to air quality and humidity control.

Research Organization:

New Brunswick Housing Corporation

Robert Clarke
New Brunswick Housing Corporation
P.O. Box 611
Fredericton, New Brunswick
E3B 5B2
(506)-454-5563

Funding Organization:

New Brunswick Energy Secretariat

Darwin Curtis
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1
(506)-453-8354

Publication:

Inquire New Brunswick Housing Corporation at address above.

Activity and Description:

- 1. Response to Inquiries on Fuel Combustion and Ventilation**
- 2. Fuel-fired Appliances: Combustion Air Requirements Regulations**

The Ontario Ministry of Consumer and Commercial Relations, Fuels Safety Branch, has provided general response to consumer inquiries regarding heating and ventilating problems, and in some cases, high humidity.

The Branch is also involved in a review of the requirement for regulations dealing with combustion air requirements for fuel-fired appliances.

Organization:

Ontario Ministry of Consumer and Commercial Relations

Len Gilbert, Don Beck
Fuels Safety Branch
Technical Standards Division
Ontario Ministry of Consumer and Commercial Relations
3300 Bloor St. W.
Toronto, Ontario
M8X 2X4
(416)-239-1297 (L. Gilbert - response to inquiries)
(416)-239-2948 (Don Beck - combustion air regulations)

Funding Organization:

Same as above

Publications

Ontario Regulations. Inquire at address above.

Activity and Description:

Impact of Energy Conservation on Indoor Air Quality

A literature review, on indoor air quality in tight homes, was undertaken as an adjunct to a larger energy conservation project, involving 60 demonstration homes, supporting the Ontario Ministry of Municipal Affairs and Housing's program to encourage weatherstripping, sealing and insulation of houses in Ontario.

The report concludes that air sealing can reduce indoor air pollution levels from pollutant sources that are outside of the living space, such as radon from surrounding soil and formaldehyde from urea formaldehyde foam insulation. Air sealing can increase indoor pollution levels, if it reduces the level of ventilation, and there is no corresponding reduction made in the source strength of the indoor pollutants.

Research Organization:

Literature Review: Ecology House / Pollution Probe Foundation

David Coon
Ecology House
12 Madison Avenue
Toronto, Ontario
M5R 2S1
(416)-967-3762

Funding Organization:

Ontario Ministry of Municipal Affairs and Housing

Sue Corke / David Peters
Housing Renovation & Energy Conservation Unit
Ontario Ministry of Municipal Affairs and Housing
777 Bay St., 2nd floor
Toronto, Ontario
M5G 2E5
(416)-585-6502 / 585-6501 respectively

Publication:

Coon, David, Ecology House, 1984. "Indoor Air Quality in Tight Houses: A Literature Review." For Ontario Ministry of Municipal Affairs and Housing. Inquire Energy Conservation Unit, MAH, 777 Bay St., Toronto M5G 2E5.

Activity and Description:**Household Pollutants and Householder Education**

Research began in 1982, and continued throughout 1983, on identifying potential household pollutants and potential health hazards associated with their use. A literature survey is being conducted for the Ministry of Municipal Affairs and Housing Ontario (see entry under Ontario MAH).

Ecology House staff will be giving seminars, and responding to inquiries regarding indoor air quality problems, and means of dealing with them.

One project presently underway is the writing of a book on household pollutants, including a section on air quality and toxic chemicals in the home.

Research Organization:

David Coon
Pollution Probe Foundation
12 Madison Avenue
Toronto, Ontario
M5R 2S1
(416)-967-3762

Funding Organization:

Pollution Probe Foundation
Ontario Ministry of Municipal Affairs and Housing

Publications:

Inquire Pollution Probe Foundation, 12 Madison Ave., Toronto M5R 2S1

Activity and Description:

**Comité sur la qualité de l'air dans les habitations
(Committee on Residential Air Quality)**

Le gouvernement québécois a adopté, en 1981, une loi sur l'économie d'énergie dans les nouveaux bâtiments, dont le règlement est en vigueur depuis le mois d'août 1983. Ce règlement prévoit certaines normes d'étanchéité, à respecter et consacre une chapitre au chauffage, à la ventilation et au refroidissement des édifices.

En novembre 1983, le Ministère de l'habitation et de la protection du consommateur (MHPC), et le Ministère de l'énergie et des ressources (MER), ont mis sur pied un comité sur la qualité de l'air dans les habitations. Le mandat du comité est le suivant:

- o définir la problématique;
- o faire les recommandations appropriées au gouvernement en le matière; et
- o Créer une banque d'informations pour les agents spécialisés et pour les consommateurs.

In 1981, the Government of Quebec adopted a law on energy conservation in new buildings, for which regulations have been in effect since August 1983. These regulations provide for certain standards of building tightness, and dedicate a chapter to heating, ventilating and air conditioning of buildings.

In November 1983, the Minister of Housing and Consumer Protection and the Minister of Energy and Resources, established a Committee on Air Quality in Housing. The Committee's mandate is as follows:

- o define the problem;
- o make appropriate recommendations; and
- o create an information bank for building specialists and for consumers.

Research Organization:

Ministère de l'habitation et de la protection du consommateur
et le Bureau des économies d'énergie, Ministère de l'énergie et des ressources, Gouvernement du Québec

Pierre Sauvé, ingénieur,
Directeur de l'économie de l'énergie dans les nouveaux bâtiments
Ministère de l'habitation et de la protection du consommateur
425, rue Saint-Amble, Québec. P.Q. G1R 4Z1

Jean-Pierre Roy
Bureau des économies d'énergie
Ministère de l'énergie et des ressources
425, av. Viger ouest, 6e étage, Montréal, Québec H2Z 1W9
(514)-873-5463

Activity and Description:**Controlled Exposure of Asthma Patients to UFFI Gases and Formaldehyde**

One of the fears that has been expressed concerning urea-formaldehyde foam insulation, is that asthmatic patients, with irritable airways, might respond adversely to accidental exposures to low formaldehyde and UFFI off-gas, in buildings insulated with the product. In a series of controlled exposures to formaldehyde and UFFI off-gases, Day et al. found no change, in lung function values, of nine people with no history of allergy or chronic respiratory disease, after they had been exposed to 1 ppm formaldehyde for 90 minutes and 1.2 ppm formaldehyde in off-gases for 30 minutes. Nine patients, similarly exposed and known to have severe asthma, also demonstrated no reduction in FVC and FEV1.

This Queen's University study is part of a series of studies funded through the federal UFFI research program, to evaluate and compare the pulmonary response of asthmatics, from UFFI and non-UFFI homes, to UFFI particles and off-gasses. Dr. H. Pross is carrying out an immunological study of participants, in the third phase of Dr. Day's work.

Research Organization:

Queen's University

Dr. James H. Day, with Drs. R. E. M. Lees and R. H. Clark
Department of Allergy and Immunology
Queen's University
Kingston, Ontario
K7L 5E9

(613)-547-3309

Funding Organization:

Health and Welfare Canada
Consumer and Corporate Affairs Canada

UFFI Centre/Centre de la MIUF
Place du Centre
Hull, Québec
K1A 0C9
1-800-567-6870

Publications:

Lees, R.E.M., 1983. "Formaldehyde in Insulation: Villain or Innocent Bystander?". Queen's University, Kingston, Ontario. Canadian Family Physician 29,1983,1127-1131, June 1983. Reprint requests to Hotel Dieu Family Medicine Centre, Queen's University, 220 Bagot St., P.O. Bag 8888, Kingston, Ont. K7L 5E9.

(continued)

Day, J.H., Lees, R.E.M., Clark, R.H., 1982. "Report on the Study of the Effect of Different Concentrations of Formaldehyde on Subjects Alleged to Have Symptoms Related to Urea Formaldehyde Foam Insulation". Queen's University, Kingston, Ontario, October, 1982. Requests to Hotel Dieu Family Medicine Centre, Queen's University 220 Bagot St., P.O. Bag 8888, Kingston, Ont. K7L 5E9.

Day, J.H., Lees, R.E.M., Clark, R.H., 1983. "Urea Formaldehyde Foam and Formaldehyde Exposures". Queen's University, Kingston, Ontario. Requests to Hotel Dieu Family Medicine Centre, Queen's University 220 Bagot St., P.O. Bag 8888, Kingston, Ont. K7L 5E9.

Day, J.H., Lees, R.E.M., Clark, R.H., 1983. "Effects of Urea-Formaldehyde Foam Off-gases and Formaldehyde on the Respiratory Function of Asthmatic Subjects". Queen's University, Kingston, Ontario. Requests to Hotel Dieu Family Medicine Centre, Queen's University 220 Bagot St., P.O. Bag 8888, Kingston, Ont. K7L 5E9.

Activity and Description:**Relationship Between Indoor Air Quality and Weathersealing**

Resource Integration Systems is a Toronto-based waste management and energy consulting firm, which operates The Conservation Store, Toronto's first integrated weathersealing and environmental product retail centre. R.I.S. also has considerable experience in public education techniques, and are combining this, and their energy conservation expertise, in developing ways of informing people about the kinds of steps that must be taken, concurrent with weathersealing and other conservation measures, to ensure that indoor air quality remains acceptable.

Research Organization:

Resource Integration Systems Ltd.

Art Mercer, Senior Consultant
Resource Integration Systems Ltd.
467 Richmond St. E.
Toronto, Ontario
M5A 1R1
(416)-366-2578

Funding Organization:

Client-funded studies.

Publication:

Client reports are confidential.

Activity and Description:

Custom Electronic Instrumentation

Scientific Instrumentation Ltd. is not directly involved with indoor air quality measurement, but rather develops custom electronic instrumentation that can be applied to such tasks as pollution monitoring. For example, the firm has developed instrumentation for Environment Canada's high altitude balloon and rocket surveys of atmospheric ozone concentrations.

Possible applications would include continuous monitoring of indoor air pollutants. Services generally include design and development, through to manufacturing of small volume instrumentation, to a customer's requirement.

Research Organization:

Scientific Instrumentation Ltd.

Larry Cooper
P.O. Box 1562
Saskatoon, Saskatchewan
S7K 3R3
(306)-329-4353

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:**Environmental Analysis Using Gas Chromatography and Mass Spectrometry**

Shrader Analytical opened a Canadian-owned and operated analytical facility during 1984, in Windsor, Ontario, under the supervision of Dr. Stephen R. Shrader. The laboratory will include a High Resolution AEI MS-30 Mass Spectrometer and Integrated Gas Chromatograph. The GC/MS unit will utilize a Shrader-developed MicroComputer Data Acquisition System, to aid in data interpretation and reporting.

The company has some twelve years of experience in the field of environmental analyses, using gas chromatography and mass spectrometry. Areas of application include:

- o pesticides and herbicides;
- o PCB's and PPB's;
- o priority pollutants;
- o solvents; and
- o air analyses.

Research Organization:

Shrader Analytical & Consulting Laboratories (Canada) Ltd.

G. B. Slein, Business Manager
Shrader Analytical and Consulting
Laboratories (Canada) Ltd.
3418 Mississauga Rd.
Mississauga, Ontario
L5C 1T8
(416)-277-9488

Dr. Stephen R. Shrader
Shrader Analytical Laboratory
1737 Walker Road
Windsor, Ontario
N8W 3P2

Funding Organization:

Client funded studies.

Publication:

Client reports are confidential.

Activity and Description:

Project Management and Research in Indoor Air Quality

Ashton and Associates Limited has had considerable experience in assisting government agencies in project management and research in the field of indoor air quality. In particular, Judy Lorimer, the firm's principal, has worked most recently as project manager for a number of studies funded by Canada Mortgage and Housing Corporation, concerning indoor air quality, including:

- o Indoor Air Pollution and Housing Technology, a comprehensive review of the indoor air quality literature, carried out by Bruce M. Small and Associates Limited;
- o Indoor Air Quality in Canadian Homes, a series of followup studies, carried out by Bruce M. Small and Associates Limited, concerning research, information access, physical problems and solutions, and people affected by indoor air quality in Canadian homes;
- o Residential Combustion Safety Checklist, a study carried out by Sheltair Limited, into the matter of failures of combustion systems in Canadian homes. This study looked at the possibility of carbon monoxide episodes, involving competition among combustion devices and other exhaust devices (e.g. fans), for intake air, leading to backdrafting or incomplete exhaustion of combustion products; and
- o Thermal and Flow Performance of Chimney Flues in Houses, a study carried out by Scanada Consultants, as a theoretical counterpart to the previous study, analyzing the performance of a house with combustion devices, and their interaction with air sealing, fans, and fireplace operation.

Judy Lorimer is also a member of the Subcommittee on Air of the Associate Committee on Scientific Criteria for Environmental Quality, National Research Council of Canada.

Research Organization:

Ashton and Associates Limited

Judy Lorimer
Ashton and Associates Limited
55 Glengarry Rd.
Ottawa, Ontario K1S 0L4
(613)-234-8309

Funding Organization:

Canada Mortgage and Housing Corporation
Panel for Energy Research and Development (PERD)

Jim H. White, Research Division
Canada Mortgage and Housing Corporation
Montreal Rd., Ottawa, Ontario K1A 0P7
(613)-748-2309

Activity and Description:

Facilities Design for Air Cleaning and Monitoring

SNC Inc. has commercial and industrial experience in the engineering design of facilities for air cleaning and monitoring. The company has no laboratory facilities in-house, but rather works with outside labs for jobs involving air quality sampling.

Research Organization:

SNC Inc.

Guy Racine
SNC Inc.
1 Complex Désjardins
P.O. Box 10
Montréal, Québec
H5B 1C8
(514)-282-9551

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

1. Indoor Air Pollution Monitoring
2. Energy Conservation and Indoor Air Quality

UNIES Ltd., Consulting Engineers, have been involved in residential energy conservation projects. Indoor air quality considerations play an important part in their work.

UNIES carried out studies of the effectiveness of sealing and pressurization of houses insulated with urea-formaldehyde foam insulation.

Pressurization and wall sealing were being investigated as a means of reducing indoor formaldehyde concentration. Twenty-nine houses were monitored in the study.

Research Organization:

UNIES Ltd.

Gary Proskiw, P.Eng.
UNIES Ltd., Consulting Engineers
1666 Dublin Ave.
Winnipeg, Manitoba
R3H 0H1
(204)-633-6363

Funding Organization:

Client-funded studies.

Publication:

Client reports are confidential.

Activity and Description:**Occupational and Environmental Health Unit**

Undergraduate and graduate training, as well as research programs in toxicology, medicine, industrial hygiene and epidemiology, are supervised and conducted by academic and support staff, often in co-operation with government, industry, unions and other groups within and outside the University of Toronto.

Primary emphasis is on the wide range of interactions between work, health, and disease, including the role of the body's defence mechanisms.

Laboratory equipment, relevant to indoor air quality analysis, includes a gas chromatograph, atomic absorption spectrophotometer, dust samplers/detectors, gas/vapour samplers and detectors.

Facilities are available, through the Information Service, for computerized literature searches (Tel: (416)-978-4522)

Research Organization:

University of Toronto

Occupational and Environmental Health Unit
Faculty of Medicine
Fitzgerald Building, 150 College St.
Toronto, Ontario
M5S 1A8
(416)-978-4353

Funding Organization:

Ontario Ministry of Labour (grant)

Publication:

Faculty of Medicine, University of Toronto, 1983. "Occupational and Environmental Health Unit". Pamphlet, available from Faculty of Medicine, University of Toronto, Toronto M5S 1A8.

Activity and Description:

Working Group on Environmental Monitoring (1982)

The World Health Organization (WHO) undertook a pilot study on human exposures to air pollution, in several cities around the world. In the Toronto component, volunteers carried personal air pollution monitors, and samplers were operated concurrently in homes and back gardens. In the Hamilton component, monitors were placed inside and on the roofs of schools. A draft final report was reviewed at a WHO Working Group in August 1982.

Following completion of the WHO Report, the IES Working Group on Environmental Monitoring was deactivated. However, Ph.D. student A. Maarouf examined the data sets collected in more detail, with advice provided by R. E. Munn, Frances Silverman and Paul Corey (1983).

Research Organization:

Institute for Environmental Studies (U. of Toronto), in collaboration with:

World Health Organization
Gage Research Institute (U. of Toronto)
Department of Preventive Medicine and Biostatistics (U. of Toronto)
Health Sciences Urban Air Environment Group (McMaster University)
Air Resources Branch, Ontario Ministry of the Environment
Health and Welfare Canada

R. E. Munn
Institute for Environmental Studies
University of Toronto
Toronto, Ontario
M5S 1A4

To carry out the Toronto-Hamilton studies, an IES Working Group was formed consisting of R. E. Munn (IES - Coordinator), F. Silverman (Gage), Sheldon Mintz (Gage), H. Roland Hosein (U of T Medicine), P. Corey (U of T Medicine), L. D. Pengelly (McMaster), C. H. Goldsmith (McMaster), L. Shenfeld (MOE), M. Somers (Health and Welfare), E. Pickett (Industrial Engineering). The IES Working Group is presently inactive.

Funding Organization:

World Health Organization (WHO)

Publication:

World Health Organization, 1982. "Human Exposure to SO₂, NO₂ and Suspended Particulate Matter in Toronto, Canada". WHO Report WHO EFP/82.38, available from IES Resource Centre, U. of Toronto, Toronto M5S 1A4.

(continued)

Munn, R.E., 1982. "The Design of Health-related Air Quality Monitoring Systems: Update." World Health Organization, Geneva, Offset Publ. 69. Available from IES Resource Centre, U. of Toronto, Toronto M5S 1A4.

Institute for Environmental Studies, R. E. Munn, Ed., 1983. "Annual Report 1982-1983". University of Toronto, October 1983. Available from IES Resource Centre, U. of Toronto, Toronto M5S 1A4.

Activity and Description:

Physiological Reactions to the Sum of all Indoor Problems

The firm of Vit-Vitaille-Viron has a particular interest and capability in the area of physiological (toxicological) reactions in humans (or animals) to the sum of all indoor problems, including:

- o lack of ventilation;
- o contaminant production; and
- o pathogen production,

and more specifically in the area of pathological effects in humans.

Through SNC Inc., Dr. La Roche has been assisting Canada Mortgage and Housing Corporation in the analysis of documentation relating to urea-formaldehyde foam insulation, as well as that relating to indoor air quality more generally.

Research Organization:

Vit-Vitaille-Viron Inc. (Triple-V)

Dr. Gilles La Roche, President
Vit-Vitaille-Viron Inc. (Triple-V)
3940, Chemin de la Côte-des-Neiges
Suite B-53
Montréal, Québec
H3H 1W2
(514)-282-9551 ext. 3181 / messages (514)-937-2409

Funding Organization:

Canada Mortgage and Housing Corporation

Claude Poirier-Defoy
Director, Legal Division
Canada Mortgage and Housing Corporation
Montreal Road
Ottawa, Ontario
K1A 0P7

Publication:

Inquire Vit-Vitaille-Viron Inc. at the address above.

Activity and Description:

Literature Review Capability: Indoor Air Quality

Washburn & Gillis has analyzed the literature on indoor air quality, as part of a review for the Alberta Department of Education.

Additional work for government clients, related to city space heating needs, also involved consideration of indoor air quality factors.

Research Organization:

Washburn & Gillis Assoc. Ltd.

Owen Washburn, President
Washburn & Gillis Assoc. Ltd.
70 York St.
Fredericton, N.B.
E3B 3N5
(506)-454-0213

Funding Organization:

Client funded studies

Publication:

Client reports are confidential.

Activity and Description:

Facts and Policy Issues Regarding Indoor Air Quality

Matthew B. Van Hook provides counsel on environmental, health and safety regulation matters, for government and industry clients.

His emphasis is on the regulation of air pollution, and recent work has included investigation of facts and policy issues regarding indoor air quality, for industry clients. He provides a source of information for Canadians, on the activities of American industry or government agencies in this field.

Research Organization:

Matthew B. Van Hook
1133 North Harrison St.
Arlington, VA
USA 22205

Funding Organization:

Client-funded studies.

Publication:

Client reports are confidential.

Activity and Description:**Chemical and Mutagenic Activity of Adsorbed Polycyclic Aromatic Hydrocarbons**

Polycyclic aromatic hydrocarbons (PAH) are produced by the combustion of all types of fossil fuels and organic matter. These substances are associated with soot, fly ash and other particulate matter in the ambient atmosphere, and with woodburning furnaces and cigarette smoke in the indoor environment. Many individual PAH are known to be potent carcinogens, tumor promoters and mutagens in animal tests.

Studies have been performed, by Dr. Morris Katz and Dr. E. Lee-Ruff of the Department of Chemistry at York University, Toronto, to determine the chemical and photochemical reactions of PAH adsorbed on the surfaces of small particles in the respirable size range.

The results of these ongoing studies are expected to provide knowledge that will aid in the formulation of criteria for improvement of air quality, and for safeguarding public health.

Research Organization:

York University

Dr. Morris Katz and Dr. E. Lee-Ruff
Department of Chemistry
York University
4700 Keele Street
Toronto, Ontario
M3J 1P3
(416)-667-3446

Funding Organization:

Natural Sciences and Engineering Research Council of Canada

Marilyn A. Taylor
Assistant Director, Communications
Natural Sciences and Engineering
Research Council of Canada
Ottawa, Ontario
K1A 0R6

Publication:

Inquire Dept. of Chemistry, York University at address above.

Activity and Description:

Canadian Issues and Opportunities in Indoor Air Quality

The Institute of Occupational Health and Safety of McGill University acted as the facilitator for the planning, holding and reporting of a workshop on Indoor Air Quality, which was held February 25-26, 1985 in Ottawa, Ontario.

The purpose of this workshop was to address the far-ranging implications of the internationally-emerging issues of indoor air quality, and possible strategies for ensuring appropriate Canadian participation in their resolution.

These issues related to public concerns, knowledge gaps and industrial opportunities in the areas of human comfort, health and safety indoors, as well as the functional integrity of buildings and their contents. Issues which were addressed included:

- a) socio-economic aspects of IAQ concerns including:
 - . increased rates of lung and other respiratory disorders;
 - . new health services requirements, for individuals sensitive to pollutants associated with the so-called twentieth century disease and the tight building syndrome;
 - . property value changes, such as occurred with UFFI;
 - . implications of possible regulatory measures on the development and introduction of new products;
 - . increased space heating and cooling expenditures;
 - . new engineering and architectural IAQ-related services in building design and trouble-shooting;
 - . the necessity for the design, manufacture and installation of fail-safe combustion-based space heating and cooling systems; and
 - . emerging markets for low emission materials, pollutant monitoring sensors, and improved ventilation, air cleaning and humidity control systems;
- b) the priority IAQ concerns requiring building science, engineering and health studies;
- c) recommendations for an optimum approach for organizing and managing IAQ research and development in Canada, including addressing the needs for centres of excellence and regional distribution of expertise; and

(continued)

- d) mechanisms for promoting co-operative R&D, and for information sharing among Canadian industry, universities and government, and with bodies in the United States and other countries with similar interests.

Research Organization:

McGill University

J. P. Farant, Ph.D., McGill University

A. Grant Wilson, P.Eng., Consultant

Institute of Occupational Health and Safety

McGill University

Frank Dawson Adams Building

3450 University Street

Montreal, Quebec

H3A 2A7

(514)-392-4609

Funding Organization:

National Research Council of Canada

Dr. Douglas S. Walkinshaw

Division of Building Research

National Research Council of Canada

Montreal Rd., Bldg. M-24

Ottawa, Ontario

K1A 0P7

(613)-993-8232

Publication:

Inquire DBR Publications, NRC-M20, Ottawa, Ontario K1A 0R6.

Activity and Description:

**International Specialty Conference on Indoor Air Quality in Cold
Climates: Hazards and Abatement Measures**

The Air Pollution Control Association's TT-7 Committee held a specialty conference on Indoor Air Quality in Cold Climates in Ottawa, April 29-May 1st, 1985.

Concern about the quality of indoor air, as it affects human health, has grown rapidly in the last few years, with special problems in cold climates. Specifically, there is concern about the day-to-day exposure of people to airborne contaminants in the office, school, and home -- places where a large number of people spend the largest portion of their time. Potentially hazardous gases, such as carbon monoxide, nitrogen oxides, radon and formaldehyde, respirable suspended particles, such as those from tobacco smoke and asbestos insulation, and viable particles, such as fungi spores and micro-organisms from cultures in stagnant water, plumbing systems and wet building materials, and from plants, animals and people, can be generated and trapped indoors, at levels significantly higher than those occurring outdoors.

In recent years, there have been compelling financial and energy conservation incentives, in cold climates, for tightening the enclosures of buildings, reducing ventilation rates, lowering hot water temperatures, and switching from oil to other fuels. These factors, combined with the introduction of certain building materials, furnishings and consumer products, have raised serious concerns as to whether there is a general deterioration of indoor air quality, including humidity factors, as it affects human health. Changes in lifestyle and attitudes serve to confound this issue.

These concerns were addressed in the specialty conference. Papers identified health hazards and pollutant sources on the one hand, and measures to control pollutant levels through building design, and systems and component selection and operation on the other. Emphasis was on field and laboratory studies, along with analytical modelling. Research strategies of industry and governments, to address these indoor air quality issues, were also featured.

Research Organization:

Air Pollution Control Association

Dr. Douglas S. Walkinshaw
Technical Program Chairman
Division of Building Research
National Research Council of Canada
Montreal Road, Bldg. M-24, Ottawa, Ontario K1A 0R6
(613)-993-8232

Publication:

Inquire DBR Publications, NRC-M20, Ottawa K1A 0R6, re proceedings.

Activity and Description:**Hazardous Heating and Ventilating Conditions in Housing**

Under certain circumstances, hazardous heating and ventilating conditions have been created in Canadian housing, by the inadequate exhaustion of combustion products from fuel-burning equipment. Over 200 deaths, from incomplete combustion of domestic fuels, have been reported over the period 1973 to 1983.

The study investigated these conditions, and documents contributing factors. The authors note that continuing steps towards airtight housing may cause more episodes of chimney downdrafting.

Research Organization:

Hatch Associates Ltd.

Tom J. Robinson, M.Eng.
Hatch Associates Limited
21 St. Clair Ave. E.
Toronto, Ontario
M4T 1L9
(416)-962-6350

Funding Organization:

Canada Mortgage and Housing Corporation, Research Division,
Policy Development and Research Sector
Energy Mines and Resources Canada, Canadian Combustion Research
Laboratory ERL/CANMET
Health and Welfare Canada, Bureau of Epidemiology,
Health Protection Branch

Peter Russell
Research Division
Canada Mortgage and Housing Corporation
National Office, Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2306

Publication:

Robinson, T.J., Hatch Associates Ltd., 1984. "Hazardous Heating and Ventilating Conditions in Housing". For Canada Mortgage and Housing Corporation. Inquire CMHC Housing Information Centre, Montreal Rd., Ottawa K1A 0P7.

Activity and Description:

Ventilation Standards for Areas North of the Tree Line

Work was undertaken to develop improved building standards, including residential ventilation standards, for areas north of the tree line.

Research Organization:

Canada Mortgage and Housing Corporation

Funding Organization:

Canada Mortgage and Housing Corporation

Lorne Finley
Implementation Division
Canada Mortgage and Housing Corporation
Montreal Road
Ottawa, Ontario
K1A 0P7
(613)-748-2347

Publication:

Not yet published.

Activity and Description:**Evaluation of Remedial Measures in UFFI Homes**

The Ontario Research Foundation has participated, for a number of years, in the federal government's UFFI research program. Early projects included data collection, in field studies of formaldehyde gas in homes, investigation of structural effects of UFFI in buildings, and performance and installation guidelines for residential air-to-air heat exchangers.

More recent projects, under the federal UFFI program, include:

- o Monitoring the effect of sealing techniques to prevent UFFI gases from entering living spaces. Formaldehyde levels were monitored for several months, before and after implementation of remedial measures, in a masonry house in the Toronto area;
- o Evaluating the effectiveness of pressurizing, as a remedial measure in urea-formaldehyde foam insulated homes;
- o Testing of the effectiveness of an air-to-air heat exchanger, as a remedial measure in a masonry house in Toronto;
- o Testing the effectiveness of wet or dry air scrubbers, as a remedial measure in a masonry house in Toronto;
- o Investigating a number of mechanical and physical techniques for breaking up in situ UFFI, and removing the broken down product from the wall cavities; and
- o Providing laboratory support for removal techniques, including investigation of the efficiency of a variety of chemical agents at neutralization of UFFI residues on contaminated building materials. The aim is to develop alternative treatment to sodium bisulphite spraying, or a list of possible techniques, for treatment of a wider range of materials.

Research Organization:

Ontario Research Foundation

Syd Barton, Asst. Director, Air Quality Division
with Peter Piersol and Pascal Dranitsaris

Ontario Research Foundation
Sheridan Park Research Community
Mississauga, Ontario
L5K 1B3
(416)-822-4111

Funding Organization:

Client-funded studies.

Activity and Description:

Ventilation for Humidity Control

During the winter season in Canada, excess moisture in a residence is a common occurrence, and can lead to condensation and moisture related problems, such as mold, mildew and rot. This research report, by Jim H. White of the Research Division of Canada Mortgage and Housing Corporation, examines the use of ventilation as a means to control moisture in homes. It attempts to provide further insight into the relationship that exists between building thermal performance, moisture flow, ventilation, energy consumption and air quality concerns in general.

The house structure, the environment, plus the occupants and their lifestyles, introduce water into the interior of the building envelope. A limited number of ways are available to remove this moisture: reduce the production at the source, use dehumidifiers, or carry out the moisture with the ventilation air.

Ventilation has been, and will probably continue to be, the most effective way to remove reasonable amounts of moisture generated within the building envelope. Because of the energy cost of evaporating the water, heating the ventilation air, and moving it and the water vapour out of the envelope, it is desirable to maintain the rate of ventilation at the minimum rate sufficient to prevent excessive condensation.

Research Organization:

Canada Mortgage and Housing Corporation

Jim H. White
Research Division
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2309

Publication:

White, Jim H., 1984. "Ventilation for Humidity Control". Research Division, Canada Mortgage and Housing Corporation, Research Report, March 1984. Available from Canada Housing Information Centre, CMHC, Montreal Rd., Ottawa K1A 0P7.

Activity and Description:**Indoor Air Quality Effects of Heat Recovery Ventilators**

To date, testing of heat recovery ventilators, both in the laboratory and in actual residential installations, has focussed primarily on airflows and temperatures, in assessments of ventilation rates and operating efficiencies from an energy point of view.

Two areas will be assessed in this project. Firstly, there is a concern that heat recovery ventilators may contribute to indoor air pollution, by providing an environment conducive to the growth of mould and bacteria, under certain operating conditions. This concern also extends to dust and inorganic particulates, as well as to gases potentially derived from the glues or sealants used in the manufacturing of the device.

Secondly, the general question: "do heat recovery ventilators improve indoor air quality, and to what degree", remains unanswered. The actual installation, air distribution system and occupant behaviour may have considerable effect on the replacement of air, and the corresponding level of air quality. Empirical evidence of actual pollutant reduction, through the use of the device, has not been established, and a series of time-averaged air quality tests are to be performed to address this gap.

Funding Organization:

Canada Mortgage and Housing Corporation

Terry Robinson, Project Manager
Project Implementation Division
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2347

Activity and Description:

Assessment of Medium Efficiency Air Filtration

This project will investigate the following aspects of the use of medium efficiency filtration, to reduce particulate indoor air pollution in homes:

- o field efficiencies;
- o ability to reduce fine smoke particles;
- o pressure drops and effects on furnace and fan operation; and
- o performance when nearing the end of useable lifespan (i.e. clogged).

Research Organization:

Canada Mortgage and Housing Corporation

Terry Robinson, Project Manager
Project Implementation Division
Canada Mortgage and Housing Corporation
Montreal Rd.
Ottawa, Ontario
K1A 0P7
(613)-748-2347

Funding Organization

Same.

Publication

Not yet published.

Activity and Description:

Testing Air Quality in Weatherized Homes

A study was performed to test air quality in 20 homes made more airtight, to assess the type of indoor environment.

Leakage measurements were taken before and after applying appropriate sealing techniques on the demonstration homes. Indoor air quality measurements were taken following the sealing of the homes.

Earlier work included assessment of condensation in well-insulated buildings.

Research Organization:

Ministry of Municipal Affairs and Housing, with I.E.C. Beak Consultants

Andrew Zdanowicz / Don Ball
Research and Development Section
Ministry of Municipal Affairs and Housing
777 Bay St., 2nd floor
Toronto, Ontario
M5G 2E5
(416)-585-6452

I.E.C. Beak Consultants Limited
6870 Goreway Drive
Mississauga, Ontario
L4V 1P1
(416)-671-2600

Funding Organization:

Ontario Ministry of Energy

Mr. P. Goldbic
Ontario Ministry of Energy
56 Wellesley St. W., 10th floor
Toronto, Ontario
M7A 2B7
(416)-965-1341

Publication:

"Indoor Air Quality: Cambridge Sealed Houses". Inquire Ministry of Municipal Affairs and Housing, Research & Development Section at the address above.

Activity and Description:

- 1. Changes in Air Exchange Guidelines: Ontario Building Code 1983**
- 2. Evaluation of Air Exchange Levels (Elliot Lake)**

Research Organization:

Ministry of Municipal Affairs and Housing

Don Beveridge
Ministry of Municipal Affairs and Housing
777 Bay St., 2nd floor
Toronto, Ontario
M5G 2E5
(416)-585-6653

Funding Organization:

Ontario Ministry of Energy

Ontario Ministry of Energy
56 Wellesley St. W., 10th floor
Toronto, Ontario
M7A 2B7
(416)-965-1341

Publication:

Inquire Ministry of Municipal Affairs and Housing, Building Code Branch, at the address above.

Activity and Description:

- 1. Remedial Measures Advice for UFFI Homeowners and Contractors**
- 2. Richmond Hill Demonstration Project: An Air Sealing Study**
- 3. Thermal and Flow Performance of Chimney Flues**

Scanada Consultants has participated, for a number of years, in various federal government research programs concerning indoor air quality.

Studies carried out under the UFFI research program include:

- o preliminary examinations of UFFI conditions and circumstances, followed by the preparation of a set of eight remedial-advice-guides for use by the homeowner and the contractor. The guides covered all aspects of remedial advice, from measurement of formaldehyde levels through to complete removal;
- o management of the 2300 home UFFI National Testing Survey in 1981 in association with Technitrol Canada Ltd. Actual physical and data collection undertaken by Scanada included approx. 700 houses; and
- o with CMHC, the demonstration and evaluation of special sealing measures, to correct moderate UFFI house conditions. Further development of both visible and hidden leak sealing techniques, including assessment of efficiency of a ventilation bypass procedure.

Scanada has also carried out various studies of infiltration, using fan depressurization and tracer gas techniques, for National Research Council of Canada, Canada Mortgage and Housing Corporation, and other clients.

The Richmond Hill Demonstration Project determined the cost effectiveness and practicability of recognized air sealing techniques. The project involved fifteen existing single houses in Richmond Hill, Ontario. In addition to energy savings, the effects of air tightening on indoor air quality were examined. Measurements of contaminants included carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, radon and formaldehyde.

Recent work, funded by Canada Mortgage and Housing Corporation, includes a study on the thermal and flow performance of chimney flues in houses. This study analyses the performance of a house with combustion devices, and the interaction of these devices with air sealing, fans, and fireplace operation. Phase I included a state-of-the-art review and research design; Phase II included model development and implementation.

Research Organization:

Scanada Consultants Limited
 446 Reynolds St., Oakville, Ontario L6J 3M4
 (416)-842-3633

Funding Organization:

Richmond Hill Demonstration Project:

Energy Mines and Resources Canada
Buildings Energy Technology Transfer Program (BETT)

Thermal and Flow Performance: Canada Mortgage and Housing Corporation

Jim H. White, Research Division, CMHC
Montreal Rd., Ottawa, Ontario K1A 0P7
(613)-748-2309

Activity and Description:**1. Analysis of Formaldehyde Dosimeters****2. Laboratory Registration Program**

IEC Beak Consultants Ltd./ Beak Analytical Services have participated, for a number of years, in various government research programs concerning indoor air quality. Studies carried out under the federal UFFI research program include:

- o analysis of Dupont C-60 formaldehyde dosimeters and DNPH solutions;
- o development and validation of state-of-the-art technology used in UFFI studies;
- o analysis of AQR and other dosimeters, establishing test conditions, providing for testing of formaldehyde, in active and passive devices; and
- o special studies and services to review and validate methods and procedures used in formaldehyde surveys, in order to improve reliability of dosimeters and to evaluate their lab and field performance.

More recent formaldehyde-related studies include:

- o evaluation of multidosimeter studies in large buildings, including the collection, documentation and reporting of UFFI/HCHO methodology information for the preparation of presentations and literature;
- o a 200 home dosimeter survey. Laboratory analysis of 5000 assorted dosimeters (NAE/NRC, AQR, Concord). Laboratory analysis of 1200 Dupont reference dosimeters. Data collection includes weather variables and other factors. Computerized statistical analysis of all data was done;
- o evaluation of formaldehyde assay kit manufactured by Kemic Bioresearch Laboratories Ltd.; and
- o administration of the Laboratory Registration Program:
 - analysis of dosimeters from different production lots;
 - investigation of problems with dosimeters;
 - review and evaluation of analytical procedures;
 - determination whether foam samples are UFFI;
 - evaluating testing devices; and
 - providing technical advice.
- o laboratory testing of urea-formaldehyde foam (emissions, hydrolysis, pyrolysis, composition)
- o acting as consultants and expert witness to the Quebec Supreme Court in the on-going trial involving six owners of UFFI houses.

Beak Consultants have also carried out evaluations of indoor air quality and industrial hygiene in office buildings. The company has offices in six Canadian cities, and has fully equipped analytical laboratories. These environmental laboratory facilities are capable of analyzing organics, trace metals, and radon, as well as all other common indoor air pollutants.

Research Organization:

IEC Beak Consultants Limited & Beak Analytical Services
6870 Goreway Drive
Mississauga, Ontario
L4V 1P1
(416)-671-2600

Contacts: Mr. John Sliwinski and Mr. Petro Oh

Funding Organization:

UFFI studies: Consumer and Corporate Affairs Canada and
National Research Council of Canada

Stephen Hall, Consumer and Corporate Affairs Canada
UFFI Centre/Centre de la MIUF
Place du Centre, 200 Promenade du Portage
Hull, Québec
K1A 0C9
1-800-567-6870

Cliff Shirtliffe
Division of Building Research
National Research Council of Canada
Montreal Road, Ottawa, Ontario
K1A 0R6
(613)-993-1821

Publications:

Inquire UFFI Centre, NRC, or IEC Beak at addresses above.

Activity and Description:**Energy Conservation Studies**

Con-Serve Group Ltd. has many years of experience in research and development of energy conservation technology. The firm acted as national co-ordinator for the house inspection phase of the federal government's CHIP evaluation study.

The company assisted the Department of Energy Mines and Resources and the National Research Council of Canada, in the preparation of a five-year research and development plan, for the Building Energy Conservation Sector Committee (BECS). This plan included indoor air quality considerations, as one area of potential impact of energy conservation measures.

The company is also involved in the design of several carbon dioxide monitoring and control systems for office and laboratory environments.

Research Organization:

Con-Serve Group Ltd.

Tom Lanczi
Con-Serve Group Ltd.
P.O. Box 216, Stn. A
Willowdale, Ontario
M2N 5S8
(416)-229-2320

Funding Organization:

National Research Council of Canada
Energy Mines and Resources Canada

Hamid Mohamed, Secretary
PERD/BECS Committee
Office of Energy Research and Development
Energy Mines and Resources Canada
10th Floor, 580 Booth Street
Ottawa, Ontario
K1A 0E4

Publication:

Not published.

Activity and Description:

Development of a Water Spray Air Scrubber

Under the federal UFFI research program, the Saskatchewan Research Council studied the feasibility of developing and building a water spray air scrubber, for UFFI residential application, for safe removal of gas/particulate pollutants.

The equipment consists of a spray system, plus dehumidifier, working in a furnace return air flow. The expected efficiency for formaldehyde removal is 50% to 70%, at 1/5 the operating cost of an air-to-air heat exchanger.

The work included testing and evaluation of the prototype scrubber. Funding by the UFFI Centre was terminated after the feasibility stage, since the scrubber was not considered practical.

Research Organization:

Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

Funding Organization:

Consumer and Corporate Affairs Canada

UFFI Centre/Centre de la MIUF
Place du Centre
Hull, Québec
K1A 0C9
1-800-567-6870

Publication:

Inquire UFFI Centre at address above.

Activity and Description:

Adverse Health Effects from Urea-Formaldehyde Foam Insulation

The Centre de Toxicologie du Québec has been carrying out a number of studies of adverse health effects and environmental parameters, for both UFFI and non-UFFI homes. Part of this work has been funded under the federal UFFI research program.

Research Organization:

Centre de Toxicologie du Québec

Albert J. Nantel, M.D.
Centre de Toxicologie du Québec
Le Centre Hospitalier de L'Université Laval
2705, Boul. Laurier
Québec, P.Q.
G1V 4G2
(418)-656-8326

Funding Organization:

Health and Welfare Canada

Publication:

Inquire Centre de Toxicologie du Québec at address above.

Activity and Description:

**Comparison of UFFI and Non-UFFI Residents Before and After
Remedial Measures**

The Gage Institute, at the University of Toronto, undertook a comparison of health status of UFFI and non-UFFI residents, before and after remedial measures on UFFI homes. Approximately 250 homes, in each of the following categories, were involved in the study:

1. Non-UFFI homes;
2. UFFI homes with no remedial measures;
3. UFFI homes with foam removal; and
4. UFFI homes with measures other than removal.

Research Organization:

Gage Research Institute

I. Broder, M.D.
Gage Research Institute
University of Toronto
223 College Street
Toronto, Ontario
M5T 1R4
(416)-978-1495

Funding Organization:

Health and Welfare Canada

Publication:

Inquire Gage Research Institute at address above.

Activity and Description:**Historic Health Records of School Children in UFFI Homes**

Dr. G. R. Norman, at McMaster University in Hamilton, Ontario, has undertaken an evaluation of historical health records of school children, in Hamilton, living in UFFI homes. The study was funded under the federal UFFI research program.

Both Dr. Norman, and his colleague Dr. M. T. Newhouse, have been actively involved in research on the effects of formaldehyde on health.

Research Organization:

McMaster University

G. R. Norman, Ph.D.
St. Joseph's Hospital
c/o McMaster University
1200 Main St. W.
Hamilton, Ontario
L8N 3Z5

Funding Organization:

Consumer and Corporate Affairs Canada
Health and Welfare Canada

UFFI Centre/Centre de la MIUF
Place du Centre
Hull, Québec
K1A 0C9
1-800-567-6870

Publication:

Newhouse, M.T., and Norman, G.R., 1982. "Health Effects of Foam Insulation: A Critical Re-Appraisal". Presented at the Conference 'Formaldehyde: The Facts', Corpus Forum, Toronto May 3-4, 1982. Inquire McMaster University at address above.

Norman, G.R., Pengelly, D.L., Kerigan, A.T., and Goldsmith, C.H., 1985. "Respiratory Function of Children in Homes Insulated With Urea-Formaldehyde Foam Insulation". Final Report to the UFFI Centre, Sept. 1984. Submitted to the Canadian Medical Association Journal, March 1985.

Activity and Description:

Removal of Urea-Formaldehyde Foam Insulation from Masonry Structures

Associated Kellogg has carried out a number of studies involving the removal and treatment of urea-formaldehyde foam insulation, in masonry structures, under the federal UFFI research program. A number of documents, or chapters of documents, were prepared, both for the UFFI Centre's contractor training program and for the National Research Council (Building Practice Notes).

The documents included consideration of: removal procedures; use of neutralizing agents on UFFI residues in masonry houses; heat recovery; energy conservation for UFFI remedial measures; modifications to residential heating and ventilation equipment, to ensure a supply of fresh air; chemisorbants and particle filters; pressurization and ventilation remedial measures; disposal of removed UFFI; interaction of electrical wiring and outlets affected by UFFI; and safety measures during UFFI remedial work.

Research Organization:

Associated Kellogg Ltd.
2200 Lakeshore Blvd. W.
Toronto, Ontario
M8V 1A4
(416)-252-9527

Funding Organization:

National Research Council of Canada

Cliff Shirtliffe
Division of Building Research
National Research Council of Canada
Montreal Road, Ottawa, Ontario
K1A 0R6
(613)-993-1821

Publication:

Inquire Associated Kellogg Ltd. at address above.

Activity and Description:

Identification of Formaldehyde Sources and Emission Rates

Under the federal UFFI research Program, Dr. C. Van Netten undertook studies to identify formaldehyde sources, their release characteristics, and their response to chemical treatment. The object of this work was to develop a testing chamber for determination of low background formaldehyde levels, and emission rates of building materials.

Research Organization:

C. Van Netten, M.Sc., Ph.D.
Consulting Services in Environmental Toxicology
11666 Wilson Road
Ruskin, B.C.
V0M 1R0
(604)-462-9476 or (604)-253-4188

Funding Organization:

Client-funded studies.

Publication:

Inquire C. Van Netten at address above.

Activity and Description:

Factors that Influence Assessments of Health Effects of Air Pollution

Scientists at the Gage Research Institute, Toronto, and the University of Toronto, examined the health effects of air pollution, in asthmatics and healthy non-asthmatics.

The study took into account the fact that the indoor environment may be a modifier of human exposure to air pollution, by using small, portable, multi-pollutant samplers for nitrogen dioxide, sulphur dioxide and particulate matter. The samplers were carried by the study subjects, and also placed in a downtown Toronto air pollution monitoring station (GAGE MOE).

Subjects were visited, on up to twenty days each. Pulmonary function was assessed (by spirometry) in the morning, at the beginning of the sampling, and again at the end of the day, when the sampling was terminated. A questionnaire was completed, documenting symptoms, medications, daily activities, and exposure to potential irritants.

Research Organization:

Gage Research Institute
University of Toronto

Dr. Frances Silverman, with Drs. Paul Corey, Sheldon Mintz,
and H. Roland Hosein
Gage Research Institute
University of Toronto
223 College Street
Toronto, Ontario
M5T 1R4
(416)-978-1495

Funding Organization:

Same as above.

Publication:

Silverman, F., Corey, P., Mintz, S., Hosein, R.H., 1984.
"Factors that Influence Assessments of Health Effects of Air Pollution". Presented at the 3rd International Conference on Indoor Air Quality and Climate, held in Stockholm, Sweden, August 20-24, 1984. Proceedings Volume 4: Chemical Characterization and Personal Exposure, pp. 123-127. For reprints inquire Gage Research Institute at address above.

Activity and Description:**Health and Safety Advisory Panel**

With the assistance of Health and Welfare Canada, the Canadian General Standards Board has established a new Advisory Panel on Health and Safety. The purpose of the Panel is to review standards, in order to determine if a potential threat exists, to the health and safety of persons manufacturing, providing or using, the product or service.

When standards or issues are referred to the Panel for advice, selected members are sent relevant information, and asked if they wish to participate in the particular issue involved. If they indicate they wish to participate they are asked to indicate if they wish either:

- a) to be added to the committee mailing list; or
- b) to be added to the committee membership; or
- c) to nominate others to committee membership.

The mission of CGSB is to support the National Standards System, to be an effective standards writing organization, and to support the application of standards, by the qualification and certification listing of products and services, when necessary.

CGSB is accredited, by the Standards Council of Canada, as a standards writing organization, with responsibility for the development of the National Standards of Canada, in more than 70 subject areas. CGSB provides administrative expertise and support, to the public and private sectors, on standards, specifications, qualification and certification listing matters.

The development of CGSB standards is by the voluntary consensus process, utilizing over 300 technical committees, comprised of over 3500 committee members, representing the three levels of government, manufacturers and suppliers, consumer and labour interests, research organizations - in fact any one affected by the standard. An annual Catalogue is published, listing all of the 1700 standards currently on issue. CGSB policy requires a review of all published standards, at least once every five years.

Organization:

Canadian General Standards Board

Peter M. Jones, Director, Standards and Specifications Branch
Canadian General Standards Board
Ottawa, Ontario K1A 1G6
(613)-997-5710

Funding Organization:

The Canadian General Standards Board receives funding from sponsors of standards activities, including the private sector and all three levels of government. Revenue is also received from the sale of standards, and from qualification and certification listing programs.

Publications:

Inquire at the address above.

Activity and Description:

Safety Evaluation of Unvented Kerosene Heaters

In February 1983, the Canadian market was surveyed, at the retail level and at the importation/distribution level, to choose a representative group of portable kerosene heaters, for a test program to determine the hazards, if any, arising from their use. In consultation with officials from Consumer and Corporate Affairs Canada, 10 heaters were chosen which had a popular power rating of around 1500 W, and 2 heaters were chosen which had a power rating of 4400 W, the largest recommended for residential use by CSA Standard B140.9.3-M1979.

The test program focused on the measurements of the products of combustion, heater surface temperatures, and parameters related to fire safety. The products of combustion measured were carbon monoxide, carbon dioxide, and nitrogen oxides. Results lead the researchers to the conclusion that kerosene heaters, can, under certain conditions, produce significant levels of carbon monoxide, carbon dioxide and nitrogen oxides, though the tests were indefinite as to the level of hazard that this implies.

Research Organization:

Consumer's Association of Canada

C. J. Seccombe
Director of Testing
Consumer's Association of Canada
703 - 251 Laurier Ave. W.
Ottawa, Ontario K1P 5J6
(613)-232-9661

Funding Organization:

Consumer and Corporate Affairs Canada

R. Viau, Ph.D., Chief, Flammability Hazards Division
Consumer and Corporate Affairs Canada
Place du Portage I, 16th floor, Zone 5
50 Victoria St.
Hull, Quebec K1A 0C9
(613)-997-1194

Publication:

Seccombe, C.J., 1983. "Safety Evaluation: Unvented Kerosene Heaters". Consumer's Association of Canada, March 31, 1983. Published by Consumer and Corporate Affairs Canada. Inquire CAC Publications, 251 Laurier Ave. W., Ottawa K1P 5J6.

Activity and Description:**Testing of Unvented Kerosene Heaters**

Consumer and Corporate Affairs Canada tested eight unvented kerosene heaters, in the living room and a bedroom of a house in Orleans, Ontario. The fuel consumption rate, room temperatures, heater surface temperatures, and levels of oxides of nitrogen (NOx), carbon monoxide and carbon dioxide produced, were measured for each heater.

These tests show that adequate ventilation is necessary, to prevent buildup of carbon monoxide, carbon dioxide and oxides of nitrogen, when the heaters are used.

Research Organization:

Consumer and Corporate Affairs Canada

K. A. Mehkeri, Chief
Scientific and Laboratory Services Division
Consumer and Corporate Affairs Canada
Standards Building
Tunney's Pasture, Holland Ave.
Ottawa, Ontario
K1A 0C9
(613)-990-8603

Funding Organization:

Consumer and Corporate Affairs Canada

R. Viau, Ph.D., Chief
Flammability Hazards Division
Product Safety Branch
Consumer and Corporate Affairs Canada
Place du Portage I, 16th floor, Zone 5
50 Victoria St.
Hull, Quebec
K1A 0C9
(613)-997-1194

Publication:

Scientific and Laboratory Sciences Division, Consumer and Corporate Affairs Canada, 1983. "Report on the Testing of Unvented Kerosene Heaters in a House in Orleans". Inquire CCA at address above.

Activity and Description:

Sampling and Evaluation of Interior Environments

The Centre for Occupational Health and Safety, of the University of Waterloo, provides a full range of services for evaluation of working conditions in all occupational fields, as well as in public buildings and residences.

Many types of environment have been investigated, with many different problems, including varieties of mists, gases, fumes, particulates, as well as physical agents such as noise, vibration, heat, cold, ionizing and non-ionizing radiation, and ergonomics.

These investigations have included, in particular, a study of approximately 200 houses insulated with urea formaldehyde foam insulation.

The Centre has a wide variety of sampling and monitoring equipment in its own laboratory, including personal sampling pumps and ancillary equipment, as well as specific sampling and test devices of various kinds, including a portable infrared spectrophotometer. For analysis, the Centre uses some of the facilities in its own laboratories, such as a polarizing microscope, but also has access to all the wet chemical and other analytical processes found in other university laboratories, including an electron microscope.

Research Organization:

Centre for Occupational Health and Safety
University of Waterloo

T. Morris Fraser, M.D., M.Sc., P.Eng.
Director, Centre for Occupational Health and Safety
University of Waterloo
Waterloo, Ontario
N2L 3G1
(519)-885-1211, ext. 2865

Funding Organization:

Client-funded studies.

Publication:

Abstracts of projects are available from the Centre for Occupational Health and Safety, at the address above.

Activity and Description:**Investigation of Air Quality in Sick Buildings**

Over the past several years, the Occupational Health Section within the Ontario Research Foundation has investigated over thirty "sick buildings", i.e. buildings in which occupants have complained of headaches, drowsiness, nosebleeds, eye irritation and other symptoms of discomfort. ORF's approach to solving indoor air quality problems in sick buildings is as follows:

- o identification of sources of contaminant emission;
- o quantification of contaminants levels including formaldehyde, carbon dioxide, airborne microorganisms, paraffins, olefins, aromatics, particulates, etc.;
- o assessment of ventilation system as per current standards; and
- o recommendation of remedial measures.

Research Organization:

Ontario Research Foundation

Syd Barton, Asst. Director, Air Quality Division
with Peter Piersol and Pascal Dranitsaris
Ontario Research Foundation
Sheridan Park Research Community
Mississauga, Ontario
L5K 1B3
(416)-822-4111

Activity and Description:

Investigation of Air Quality in Energy Efficient Homes

The Ontario Research Foundation is actively involved in the identification, measurement, and evaluation of indoor air quality in energy efficient homes. Various programs have been undertaken. The Energy Mines and Resources Canada, R-2000 Monitoring Program, is an on-going study, which involves approximately 350 homes across Canada. The following tasks have been conducted as the initial part of the R-2000 program:

- o a review of available radon/radon daughter monitoring equipment for use in the program. An active time-integrating track-etch radon daughter monitoring technique was selected;
- o procurement and distribution of radon, formaldehyde, nitrogen dioxide and passive air filtration sampling equipment, to the 350 homes located across Canada;
- o analysis of the samples, with timely reporting of results;
- o provision of overall co-ordination, training and technical indoor air quality expertise, to Energy Mines and Resources staff, in Ottawa and the 12 regional offices; and
- o a literature review of radon levels in homes.

Four additional R-2000 projects are also underway. Ontario Research Foundation contacts are noted after each project:

1. heat recovery ventilator testing, as to heat recovery efficiency, air flows, defrosting and air cross leakage, as per the Canadian Standards Association Preliminary Standard C439-M1985, "Standard Methods of Test for Rating the Performance of Heat Recovery Ventilators". (Mr. Colin McGugen)
2. biological testing of installed heat recovery ventilators, in a small sample of R-2000 homes, to determine any bacteria and/or fungal accumulation. (Mr. Peter Piersol)
3. testing of a low cost carbon monoxide and carbon dioxide sensing switch, to activate ventilation system operating speeds. (Mr. Peter Piersol)
4. temperature breakdown of sprayed-in-place polyurethane, to determine temperature effects of wiring and lighting fixtures, and high temperature offgassing potentials. (Mr. Bill Alderson)

In addition, the R-2000 homes and a sample of control homes, will be monitored seasonally for a number of years, for indoor air pollutants and ventilation system performance.

(continued)

Research Organization:

Ontario Research Foundation

Syd Barton, Asst. Director, Air Quality Division
with Peter Piersol and Pascal Dranitsaris

Ontario Research Foundation

Sheridan Park Research Community

Mississauga, Ontario

L5K 1B3

(416)-822-4111

Funding Organization

Charles Ficner

Director, Technology Transfer

& Demonstration Program Division

Energy Mines and Resources Canada

580 Booth St.

Ottawa, Ontario

K1A 0E4

Activity and Description:

1. Investigations Into Cost Effective UFFI Removal Techniques

2. Techniques to Reduce Formaldehyde Levels

Formtek Technologies Inc. has conducted investigations, to determine cost effective removal techniques for urea-formaldehyde foam insulation. The company has also been involved in the investigation of techniques to reduce formaldehyde levels.

Along with Encontek Research Ltd., Formtek has participated in design improvements to the 'Tectonic' system of polyurethane insulating wall sheathing.

Research Organization:

Formtek Technologies Inc.

Dr. P.V.L. Barrett
Vice-President, Research and Development
Formtek Technologies Inc.
Suite 1207 - 345 Quebec St.
P.O. Box 906
Victoria, B.C.
V8W 2R9
(604)-385-7755

Publications

"UF Foam - The Current Situation". Insulation Journal, October 1982.
"UF Foam". Surveyor, December 1983.
"UF Foam in New Construction". New Buildings, February 1984.

Activity and Description:

Heating and Ventilation of Residences

The Canadian Gas Research Institute has been involved in the development of an integrated appliance, for heating and ventilating residences.

Research Organization:

Canadian Gas Research Institute

Dr. F.K. Besik
Canadian Gas Research Institute
55 Scarsdale Rd.
Don Mills, Ontario
M3B 2R3

Activity and Description:

**Energy Implications of Various Outdoor Air Ventilation Standards
for Office Buildings**

Rose Technology Group Limited conducted an in-depth study into two large office buildings, managed by the Ontario region of Public Works Canada. Outside air and exhaust airflow rates were carefully measured, and controls were adjusted, to simulate the effects of changing outdoor air temperatures. The potential contribution of outside air infiltration, through the building envelope, was determined, in order to estimate the existing outside air supply, per building occupant.

The effects on heating, cooling, humidification and fan energy use, of varying the outside air flow rates, from 3 litres/sec/person to 30 litres/sec/person, were then determined, by computer simulation.

Recommended methods of increasing the outside airflow quantities, with a minimal impact on energy use, were described, in a summary of this work, presented at the International Specialty Conference on Indoor Air Quality in Cold Climates, held in Ottawa, April 1985.

Research Organization:

Rose Technology Group Ltd.

J.D. Cowan
Rose Technology Group Ltd.
Suite 803
55 Eglinton Ave. E.
Toronto, Ontario
M4P 1G8

Funding Organization

Public Works Canada

Publications

Jarvis, I., 1985. "Implications of Providing Required Outside Air Quantities in Office Buildings". Presented at the International Specialty Conference on Indoor Air Quality in Cold Climates, Ottawa, April 29-May 1, 1985. APCA 2C-6. Inquire address above for reprints.

Activity and Description:

1. Thermal Envelope Upgrading
2. Ventilation Studies

The Ontario Hydro Research Division has conducted studies in the following areas:

- o Energy, demand and air quality assessment of retrofits, in sixteen houses;
- o Reports were prepared including state-of-the-arts on indoor air quality and condensation;
- o Field diagnostics were undertaken concerning indoor air quality, air-to-air heat exchangers, air change rates, and chimney integrity;
- o Participation in the Canadian Home Builders' Association Technical Review Committee, dealing with residential ventilation guidelines; and
- o Planning research, concerning air movement, mixing, tempering, etc., in residential forced warm/fresh air systems.

Research Organization:

Ontario Hydro Research Division

W.R. Jones
Ontario Hydro Research Division
800 Kipling Ave., KR263
Toronto, Ontario
M8Z 5S4
(416)-231-4111 ext 6253

Funding Organization

Canadian Electrical Association
Ontario Ministry of Energy

H. Douglas
Canadian Electrical Association
1 Westmount Square, Suite 580
Montreal, Quebec

Publications

CEA Ventilation SOA, 1980.

Ontario Hydro Research Division Reports. Inquire Ontario Hydro at address above.

Activity and Description:

Structure of Airflow in Rooms

Analytic and experimental determination of mechanisms of air distribution in buildings.

Research Organization:

University of Waterloo

Richard Lay, P.Eng.
Graduate Office
Dept. of Mechanical Engineering
University of Waterloo
Waterloo, Ontario
N2L 3G1

Publications

Inquire at address above.

Activity and Description:

Air Quality Monitoring

Oboe Engineering Ltd. is engaged in the monitoring of existing building air contamination, air movement and distribution. This service is coupled with offering recommendations for, and carrying out redesign of, ventilation and other mechanical systems.

Research Organization:

Oboe Engineering Ltd.

Leo McCuaig, P.Eng.
Oboe Engineering Ltd.
404-251 Laurier Ave. W.
Ottawa, Ontario
K1P 5J6
(613)-239-2664

Funding Organization

Client reports are confidential.

Activity and Description:

Field Research on Indoor Air Quality

Northern Scientific, Inc. has conducted field research on indoor air quality, including radon and formaldehyde investigations.

The company markets state-of-the-art radon daughter monitoring and measuring equipment, unique 60-minute formaldehyde testing equipment, and household air change test equipment.

Research Organization:

Northern Scientific, Inc.

Dennis Regoza
Northern Scientific, Inc.
2114 Robinson St.
Regina, Saskatchewan
S47 2P7

Publications

Inquire at address above.

Activity and Description:**Indoor/Outdoor Air Quality Relationships for Homes and Elementary Schools**

During 1981 and 1982, McMaster University researchers carried out a preliminary study of indoor and outdoor pollutant levels, at 20 homes and 16 elementary schools in Hamilton, Ontario, Canada. Sampling was carried out in both heating and non-heating seasons. Multipollutant samplers were used, to sample for suspended particulate matter, sulphur dioxide, and nitrogen dioxide, for 24 hours at a time, both inside and outside each building.

Research Organization:

McMaster University

S.A. Toplack, Manager, U.A.E. Group
with researchers L.D. Pengelly, W.F. Furlong, C.H. Goldsmith,
and A.T. Kerigan
McMaster University
Room HSC-3E27
1200 Main St. W.
Hamilton, Ontario
L8N 3Z5
(416)-525-9140, ext. 2694

Publications

Inquire at address above.

Activity and Description:

Identifying Ventilation-Troubled Houses

This study assembles various airtightness studies, by the National Research Council of Canada, Energy Mines and Resources Canada, and others, as of 1982.

A very large spread of airtightness results is typical of the various series of tests, whether in a given city, over time, or cross-country, for houses built in a given year.

The theory of venting of combustion appliances was developed, in an embryonic form, and competition between exhaust devices (such as fans, fireplaces, furnaces, and water heaters), was studied, to determine the house airtightness levels at which various types of venting failures would be expected. When the various methods are used to predict the possibility of venting problems, for the houses tested in the different test programs, a significant number of houses is included in the troubled zone.

A draft backdraft test is proposed (and has been further developed by Sheltair Scientific Ltd., under contract to CMHC).

Research Organization:

Canada Mortgage and Housing Corporation

Jim H. White
Research Division
Canada Mortgage and Housing Corporation
682 Montreal Road
Ottawa, Ontario
K1A 0P7
(613)-748-2309

Funding Organization

Canada Mortgage and Housing Corporation

Publication

White, Jim H., Canada Mortgage and Housing Corporation, "Identifying Ventilation-Troubled Houses". Inquire at address above.

Activity and Description:**Pollution and Education in Toronto**

The Pollution and Education Review Group was formed by the Board of Education for the City of Toronto, in September 1984, to advise the Board on present scientific and practical knowledge concerning the effects of polluted school environments, both indoor and outdoor, on the health, well-being and educational performance of students and staff, and to recommend action programs to address any problems discovered.

The report of the Review Group, published in May, 1985, concluded that the staff and students in the Toronto school system are exposed to many pollutants which originate both within their schools and in the neighbouring communities. Many of these pollutants can affect brain function, learning ability, behaviour, and hence education.

Research Organization:

Bruce M. Small and Associates Limited

Bruce M. Small
Small and Associates
R.R.#1
Goodwood, Ontario
L0C 1A0
(416)-294-3531

Researcher: Wendy Priesnitz

Funding Organization

The Board of Education for the City of Toronto

Ron Halford
Associate Director of Education - Operations
The Board of Education for the City of Toronto
155 College Street
Toronto, Ontario
M5T 1P6
(416)-598-4931

Publication

Small, Bruce M., "Recommendations for Action on Pollution and Education in Toronto", May 1985. Inquire Otto Langmark, Research Division, Toronto Board of Education, at address above, or by phone at (416)-591-8307.

TABLE OF CONTENTS

PART 2: INFORMATION BASE	240
2.1 Introduction	241
2.2 Periodicals	243
2.3 Library Holdings	246
2.4 Bibliographies, Update Service & Newsletters	251
2.5 Using Canadian & U.S. Data Base Systems	255
2.6 Libraries with Data Access Facilities	265
2.7 Direct Access to Computer Data Bases	272
2.8 Getting Hard Copy of Desired Articles	275
2.9 Accessing Other Computer Data Bases	277

Part 2: Information Base

PART 2: INFORMATION BASE

2.1 Introduction

This section is intended as an ongoing reference document, and as a discussion paper to aid interested persons in considering the kind of information systems that would be desirable in the field of residential indoor air quality.

The question this section seeks to answer is as follows:

"What information is available to those working on or interested in indoor air quality problems in Canada, and how can they keep up to date?"

Two kinds of information are available to people in Canada interested in indoor air quality. One type is published information, which is found in libraries across the country. The other is unpublished information, which resides in the many desk drawers, filing cabinets, and sharp minds of the researchers.

To function well in the field, most researchers need both types of information. Part 1 of this report attempts to provide researchers with access to unpublished information, through contact with their peers. Part 2 of the report presents a guide for obtaining published information.

The following points describe the state, in Canada in 1984, of published information in the indoor air quality field:

a. There is an extensive literature on indoor air quality problems:

There is a great deal written in the scientific literature, that is relevant to problems of indoor air quality. However, this information is distributed sparsely among a large number of professional journals, conference proceedings, and texts.

b. There are few good library collections on indoor air quality:

Most major libraries in Canada do not yet have many hard copy holdings of texts and proceedings that deal directly with indoor air quality. Researchers cannot adequately keep up by browsing the libraries.

2.1 Introduction

c. Computer databases list what is published:

Most major libraries in Canada have access to computer-searchable data on the holdings in this field. Requesting regular updates of computer searches represents a practical means of determining what has been published in the field.

d. Interlibrary loans provide access to references:

Most major libraries have access to texts and conference proceedings, through interlibrary loans. Reprints of reports and single papers can be ordered through computer databases. Although this requires time, the system can, in theory, provide researchers across the country with access to most of the literature on indoor air quality.

In short, the researcher in this field cannot expect to visit the local university library and find, on the shelves, all that he or she needs, to keep up with published information in this field. The relevant holdings of individual libraries are so few, and the number of journals in which relevant articles appear is so large, that the researcher must rely on database search systems to find out what has been written, and on conventional or computerized interlibrary loan systems, in order to obtain hard copy with which to work.

The remainder of this section describes the relevant periodicals, library holdings, databases available, and the procedures required to keep abreast of new developments published in the scientific literature.

What may be of equal importance are the information needs that cannot be filled by the means described in this report. From personal experience, and from informal contact with others to date, this author feels that there are few formal means by which Canadian researchers in this field are regularly keeping up-to-date on current activities relating to indoor air quality. There is no ongoing means, for example, for non-government researchers to stay fully informed of government activities in this area. A number of contacts have also expressed the need for more information about possible sources of funding for further research.

It is hoped that this information base report will help others to think about the future information needs of the indoor air quality research community. Readers are invited to comment on these, and other ideas about information needs, by writing to the author of this report.

2.2 Periodicals

2.2 Periodicals Containing Articles Relating to Indoor Air Quality

A large number of scientific, medical and popular periodicals have published papers and articles dealing with indoor air quality, directly or indirectly. The following list was extracted from recent bibliographies on indoor air quality. It is intended only to illustrate how many there are, and may not include all journals that have dealt with indoor air.

The researcher wishing to 'keep up' with the field might subscribe to a small selection of these journals, but it is unrealistic to expect anyone to subscribe to more than a few. Again, regular updates from database systems would signal a researcher when a new paper has been published, and where it has appeared.

- Acta Derm. Venercol.
- Aerospace Medicine
- AMA Archives of Industrial Health
- American Industrial Hygiene Association Journal
- American Journal of Epidemiology
- American Journal of Public Health
- American Journal of Otolaryngology
- American Review of Respiratory Disease
- Anesth. Analg.
- Annals of Allergy
- Annals of Internal Medicine
- Annals of the New York Academy of Sciences
- Archives of Environmental Health
- Archives of Industrial Hygiene and Occupational Medicine
- ASHRAE Journal
- ASHRAE Transactions
- Atmospheric Environment
- Biochimica et Biophysica Acta
- Biological Psychiatry
- British Journal of Industrial Medicine
- British Journal of Preventive Social Medicine
- British Medical Bulletin
- British Medical Journal
- Building
- Bulletin of Environmental Contamination and Toxicology
- Bulletin Européen de Physiopathologie Respiratoire
- Bulletin of the National Institute of Hygiene Science (Tokyo)
- Bulletin of the New York Academy of Medicine
- Cancer
- Chemical Reviews
- Chest
- Chronic Diseases in Canada
- Clinical Allergy
- Clinical Ecology
- Clinical Experimental Immunology
- Clinical Otolaryngology

2.2 Periodicals (continued)

Clinical Physiology
Clinical Toxicology
Consumer Reports
Contact Dermatitis
Continuing Education
CRC Critical Reviews of Toxicology
Cutis
Energy and Buildings
Environmental Guardian
Environmental Health Perspectives
Environmental Health and Safety News
Environmental Research
Environmental Science and Technology
Environment and Behaviour
Environment International
EPA Journal
Experientia
Experimental and Molecular Pathology
Federation Proceedings
Federal Register
Fiziologicheskii Zhurnal (Kiev)
Gigiena I Sanitariya (Moscow)
Gigiena Truda I Professional'nye Zabolevaniya'
Hazard Identification and Analysis
Health Physics
Human Ecology Foundation (Canada) Quarterly
Human Ecology Foundation (Toronto) Quarterly
Human Factors
Immunology and Allergy Practice
International Archives of Occupation and Environmental Health
International Journal of Epidemiology
Journal AOA
Journal of the Air Pollution Control Association
Journal of Allergy and Immunology
JAMA (Journal of the American Medical Association)
Journal of Biological Chemistry
J.C.E.O.R.L. and Allergy
Journal of Clinical Investigation
Journal of Environmental Health
Journal of Epidemiology and Community Health
Journal of Immunology
Journal of Infectious Diseases
Journal of the Japan Air Cleaning Association
Journal of Laboratory and Clinical Medicine
Journal of the National Cancer Institute
Journal of Occupational Medicine
Journal of Orthomolecular Psychiatry
Journal of Toxicology
Journal of Toxicology and Environmental Health
Laboratornoe Delo.

2.2 Periodicals (continued)

Lancet
Medical Hypotheses
Modern Medicine in Canada
Morphol. Embryol. (Bucur)
Mutation Research
Nature
Neurobehavioural Toxicity and Teratology
New England Journal of Medicine
Occupational Health and Safety
Pediatric Clinician in North America
Pediatrics
Preventive Medicine
Progressive Architecture
Psychol. Rep.
Psychology Today
Review of Environmental Health
Royal Society of Health Journal
Scandinavian Journal of Work Environment and Health
Science
Science of the Total Environment
Thorax
Toxic. Applic. Pharmacolog.
Toxicology Letters
Transactions of the Missouri Academy of Science
Vestnik Dermatologii I Venerologii
Wisconsin Epidemiology Bulletin
Yale Journal of Biology and Medicine
Zhurnal Nevrophatologii i Psikhiatrii Imeni S.S. Korsakova

2.3 Library Holdings in Indoor Air Quality

2.3 Library Holdings in Indoor Air Quality

A simple poll was conducted, at the beginning of 1984, as part of this study, among more than 80 university and other libraries across Canada. The librarians were simply asked to list all library holdings pertaining to indoor air pollution or indoor air quality. The results were clear - most libraries in Canada had, at that time, at most one or two textbooks or conference proceedings on indoor air quality.

The most comprehensive library set of such texts was held by the Canada Institute for Scientific and Technical Information (CISTI) in Ottawa. The following references were listed in a computer search of the OON (CISTI Catalogue Online) database, (which is also discussed in more detail in a later section):

(a) 15 references obtained as a result of a search on the words indoor, air, and pollution in the title or keyword sections

- TI - PREDICTING INDOOR AIR POLLUTION LEVELS.
- AU - PARKER, G. B.; DROPPO, J. G.; OWCZARSKI, P. C.

- TI - CONTROLLING IN-PLANT AIRBORNE CONTAMINANTS : SYSTEMS DESIGN AND CALCULATIONS.
- AU - CONSTANCE, JOHN DENNIS,

- TI - INDOOR AIR POLLUTION AND HOUSING TECHNOLOGY.
- AU - SMALL, BRUCE M.; LORIMER, JUDY.; RUSSELL, PETER.

- TI - INDOOR AIR POLLUTION (JUN 76, 1982) : CITATIONS FROM THE ENERGY DATA BASE.
- OR - UNITED STATES. NATIONAL TECHNICAL INFORMATION SERVICE. NEW ENGLAND RESEARCH APPLICATIONS CENTER.

- TI - INDOOR AIR QUALITY HANDBOOK FOR DESIGNERS, BUILDERS, AND USERS OF ENERGY EFFICIENT RESIDENCES.
- OR - ANACHEM, INC. ENVIRONMENTAL STUDIES DIVISION. SANDIA NATIONAL LABORATORIES. ENVIRONMENTAL RESEARCH DIVISION. UNITED STATES. DEPT. OF ENERGY. OFFICE OF ENVIRONMENTAL PROGRAMS.

- TI - THE STATUS OF INDOOR AIR POLLUTION RESEARCH, 1976.
- AU - SHEARER, S. DAVID.

- TI - INDOOR AIR QUALITY.
- AU - MEYER, BEAT.

- TI - INDOOR AIR POLLUTION : PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON INDOOR AIR POLLUTION, HEALTH AND ENERGY CONSERVATION, AMHERST, MASSACHUSETTS, 13-16 OCTOBER 1981.
- AU - SPENGLER, JOHN.

2.3 Library Holdings in Indoor Air Quality (continued)

TI - INDOOR AIR POLLUTION : CHARACTERIZATION, PREDICTION, AND CONTROL.
AU - WADDEN, RICHARD A.; SCHEFF, PETER A.

TI - SYMPOSIUM ON HEALTH ASPECTS OF INDOOR AIR POLLUTION.
OR - NEW YORK ACADEMY OF MEDICINE. NEW YORK ACADEMY OF MEDICINE.
SUBCOMMITTEE ON ENVIRONMENTAL HEALTH.

TI - REPORT OF AD HOC TASK FORCE ON INDOOR AIR POLLUTION.
AU - DUDNEY, C. S.; WALSH, P. J.

TI - HEALTH ASPECTS RELATED TO INDOOR AIR QUALITY : REPORT ON A WHO
WORKING GROUP, BILTHOVEN, 3-6 APRIL 1979.
OR - WORLD HEALTH ORGANIZATION. WORKING GROUP ON HEALTH ASPECTS
RELATED TO INDOOR AIR QUALITY.

TI - COMBUSTION-GENERATED INDOOR AIR POLLUTION.
AU - HOLLOWELL, CRAIG D.; TRAYNOR, G. W.

TI - A NOTE OF THE RELATIONSHIP BETWEEN OUTDOOR AND INDOOR EXPOSURE
INTEGRALS FOR AIR POLLUTION OF OUTDOOR ORIGIN.
AU - GJOERUP, H.L.; ROED, JOERN.

(b) additional references containing the words indoor, air, and
quality in the title or keyword sections (list not complete)

TI - COMPUTING TRANSIENT INDOOR AIR QUALITY
AU - ALLWINE, K.J.; OWCZARSKI, P.C.

TI - INFILTRATION AND INDOOR AIR QUALITY IN A SAMPLE OF PASSIVE-SOLAR
AND SUPER-INSULATED HOUSES
AU - WAGNER, BARBARA S.; ROSENFELD, ARTHUR H.

TI - RESIDENTIAL AIR-LEAKAGE AND INDOOR AIR QUALITY IN ROCHESTER, NY.
AU - OFFERMAN, F. J.

TI - BUILDING VENTILATION AND INDOOR AIR QUALITY.
AU - HOLLOWELL, C. D.

TI - ENERGY EFFICIENT DOMESTIC VENTILATION SYSTEMS FOR ACHIEVING
ACCEPTABLE INDOOR AIR QUALITY : 3RD AIC CONFERENCE : (HELD AT
THE PARK COURT HOTEL, LONDON, U.K., 20-23 SEPTEMBER 1982) :
PROCEEDINGS.

TI - ENERGY EFFICIENT DOMESTIC VENTILATION SYSTEMS FOR ACHIEVING
ACCEPTABLE INDOOR AIR QUALITY : 3RD AIC CONFERENCE : (HELD AT
THE PARK COURT HOTEL, LONDON, U.K., 20-23 SEPTEMBER 1982) :
SUPPLEMENT TO PROCEEDINGS.

2.3 Library Holdings in Indoor Air Quality (continued)

TI - VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY

TI - PUBLIC ADMINISTRATION, RESIDENTIAL WEATHERIZATION, AND INDOOR AIR QUALITY : A SELECTED BIBLIOGRAPHY

AU - WHITE, ANTHONY G.

TI - FIND AND FIX THE LEAKS : A GUIDE TO AIR INFILTRATION REDUCTION AND INDOOR AIR QUALITY CONTROL.

TI - COMPARISON OF INDOOR AND OUTDOOR AIR QUALITY.

AU - MOSCHANDREAS, D.J.; ZABRANSKY, J.; PELTON, D.J.

TI - SURVEY OF INDOOR AIR QUALITY HEALTH CRITERIA AND STANDARDS

AU - MCFADDEN, JAMES E., MOSCHANDREAS, DEMETRIOS J., BEARD, J. HOWARD

(c) Additional reference containing the words indoor and pollutant in title or keyword sections

TI - INDOOR POLLUTANTS

OR - NATIONAL RESEARCH COUNCIL, (U.S.), COMMITTEE ON INDOOR POLLUTANTS

(d) Additional reference containing the words pollutant or pollution and buildings in title or keyword sections

TI - ASBESTOS-CONTAINING MATERIALS IN SCHOOL BUILDINGS: A GUIDANCE DOCUMENT - SAWYER, ROBERT N.; SPOONER, CHARLES M.

(e) Additional reference containing the words toxicology and dwellings in title or keyword sections

TI - CHEMICAL SUSCEPTIBILITY AND UREA-FORMALDEHYDE FOAM INSULATION

AU - SMALL, BRUCE

(f) Additional reference containing the words air, pollution and health in title or keyword sections

TI - ENVIRONMENTAL HEALTH FACTORS IN FALLING ACCIDENTS

AU - SMALL, BRUCE

(g) Additional references containing the words indoor and air, but not pollution or quality (list not complete)

TI - FORMALDEHYDE INDOOR AIR STANDARDS IN SWEDEN

AU - WAHREN, HAKAN

TI - PAPERS PRESENTED AT THE SYMPOSIUM ON CLEANER INDOOR AIR - PROGRESS & PROBLEMS - AT THE ASHRAE FALL CONFERENCE, OCTOBER 19-22, 1972, CINCINNATI.

2.3 Library Holdings in Indoor Air Quality (continued)

The listing on the previous pages gives the core CISTI holdings (in early 1984) relating to the general topics of indoor air pollution, indoor air quality, and the health effects of same. As can be seen by the additional references, when slight variations in keywords are searched, there can be many more references, usually more specialized, which are also related to the general topic. Sometimes it is worth the time and expense to have an offline printing done of a larger, more inclusive listing (e.g. INDOOR and AIR, rather than INDOOR, AIR and POLLUTION or QUALITY), and to inspect it personally to select references of interest.

Familiarity with the various keywords and titles, in an area of interest, will often yield considerably more references than will be listed under general headings. For example, searching 'environmentally induced disease' also spills out a few additional references that might be relevant to a researcher's work on indoor air quality. This search yielded some 52 additional references, some, but not all of which, would be of interest. A few are listed below, to give a reader some idea of the titles and keywords that may be relevant to indoor air pollution problems.

- TI - ENVIRONMENTAL CARCINOGENS, POLYCYCLIC AROMATIC HYDROCARBONS :
CHEMISTRY, OCCURRENCE, BIOCHEMISTRY, CARCINOGENICITY.
- AU - GRIMMER, GERNOT
- KE - HYDROCARBONS - TOXICOLOGY ; AROMATIC COMPOUNDS - ENVIRONMENTAL
ASPECTS ; CARCINOGENS - ENVIRONMENTAL ASPECTS ; ENVIRONMENTALLY
INDUCED DISEASES - GERMANY (WEST) ; POLYCYCLIC HYDROCARBONS ; AIR
POLLUTANTS ; CARCINOGENS, ENVIRONMENTAL ; EUROPE, WEST GERMANY.

- TI - WHY YOUR HOUSE MAY ENDANGER YOUR HEALTH.
- AU - ZAMM, ALFRED V.; GANNON, ROBERT
- KE - HOUSING AND HEALTH ; ENVIRONMENTALLY INDUCED DISEASES ; DWELLINGS -
ENVIRONMENTAL ENGINEERING

- TI - ANIMALS AS MONITORS OF ENVIRONMENTAL POLLUTANTS.
- OR - NORTHEASTERN RESEARCH CENTER FOR WILDLIFE DISEASES. REGISTRY OF
COMPARATIVE PATHOLOGY. INSTITUTE OF LABORATORY ANIMAL RESOURCES.
- KE - POLLUTION - PHYSIOLOGICAL EFFECT - CONGRESSES ; ENVIRONMENTALLY
INDUCED DISEASES - ANIMAL MODELS - CONGRESSES ; WILDLIFE DISEASES -
CONGRESSES ; VETERINARY PATHOLOGY - CONGRESSES ; INDICATORS
(BIOLOGY) - CONGRESSES

- TI - POLLUTANTS AND HIGH RISK GROUPS : THE BIOLOGICAL BASIS OF INCREASED
HUMAN SUSCEPTIBILITY TO ENVIRONMENTAL AND OCCUPATIONAL POLLUTANTS.
- AU - CALABRESE, EDWARD J.,
- KE - POLLUTION - TOXICOLOGY ; ENVIRONMENTALLY INDUCED DISEASES - ETIOLOGY

- TI - POLYCYCLIC HYDROCARBONS AND CANCER.
- AU - GELBOIN, HARRY V.; TSO, PAUL ON PONG; ANDREWS, LARRY S.
- KE - HYDROCARBONS - TOXICOLOGY ; CARCINOGENESIS ; POLYCYCLIC
COMPOUNDS - TOXICOLOGY ; ENVIRONMENTALLY INDUCED DISEASES ;
HYDROCARBONS - POISONING ; POLYCYCLIC COMPOUNDS - POISONING ;
CARCINOGENS, ENVIRONMENTAL

2.3 Library Holdings in Indoor Air Quality (continued)

Not all libraries will have the full selection of periodicals in which articles relating to indoor air quality have appeared. Subsequent sections will describe the procedure for ordering articles from the Canada Institute for Scientific and Technical Information (CISTI). The UNION computer database, described more fully in a later section, can also be used for determining, when needed, the periodical holdings of libraries across the country.

The following is an example of a listing for the journal 'Environmental Research' in the UNION data base:

```

RE - 662311
NU - LC 76000118; ISSN 0013-9351
TI - ENVIRONMENTAL RESEARCH.
AD - ENVIRON. RES. (NEW YORK).
DA - V. 1- JUNE 1967-; BIMONTHLY
PU - NEW YORK, ACADEMIC PRESS.; V.; (XNYU)
NO - "AN INTERNATIONAL JOURNAL OF ENVIRONMENTAL MEDICINE AND THE
      ENVIRONMENTAL SCIENCES" (VARIES).
LA - ENG
HO - ACU 1- AEU 2- AEUB 4-
      BVAM (1)- BVAS 4- BVAU 1- BVAUW 1- BVIV 1-
      MPW 1-3 MFW 1- MWM 1- MWU 1-
      NBFU 1-26
      NFSM 1-
      NSHDM 1- NSHF 1- NSWA 7-
      OBUC 15- OCKA 1- OHM 7- OHMB 6- OKQ 1- OKQH 1- OLU 1-
      OLUM 2- OOAG 1- OOC V.1- 1967- OOFF 1- OOFI NHG OON 1-
      OONH 1-10 OONHBR 5-8,15- OONHH 1- OOU 1- OSTCB (4) OTDL 1-
      OTDR 1- OTF 4- OTH 3- OTM 6- OTMCL (3-4),9- OTR 1-5,8 OTRM (4)-
      OTU 1- OTY 1- OWTU 1- QLACS 18-21 QMAC 1- QMMM 1- QMU 1-
      QMUM 1-14 QMUP 1- QMUQ 1- QQLAS 1(2)- QQUIE 1- SRU (4) SSUM 2-
  
```

The codes shown above under 'HO' (Library Holdings) indicate the libraries which hold copies of Environmental Research, and the volume numbers of the journal which are held. Libraries offering search services have a full translation of the library codes.

2.4 Bibliographies, Update Services and Newsletters

2.4 Bibliographies, Update Services and Newsletters

There are a number of ways, other than computer searching, that persons in Canada can learn of new papers, articles, or activities in the field of indoor air quality. Several are discussed below. Readers are invited to suggest additional sources.

Peer Contact

Nothing can beat a phone call or meeting with others working in the field, to trade ideas and new references. Part 1 of this report lists research activities undertaken, and technical services available, in Canada, in the field of indoor air quality analysis (with emphasis on residential situations). Telephone numbers and addresses are provided to make contact easy. Readers are invited to suggest additional listings that could be included in subsequent editions of this report.

Published Texts and Reports

Many published reports and texts contain extensive bibliographies, and can be used as a starting point for reviewing available information. Three such texts, that may be more commonly available than others in Canadian university and public libraries, include texts by Wadden and Scheff (1983) and Meyer (1983), as well as CMHC's summary report 'Indoor Air Pollution and Housing Technology' (1983).

Proceedings of a 1981 International Symposium in Amherst, Massachusetts, a 1981 National Research Council (U.S.) report, and Proceedings of an August 1984 International Conference on Indoor Air Quality and Climate held in Stockholm, Sweden, also contain references to a wide variety of issues in indoor air quality, but may take longer to obtain by interlibrary loan, since there are fewer copies available in Canada. The bibliographic detail for these references is given below.

Wadden, R. A. and Scheff, P.A., 1983. "Indoor Air Pollution: Characterization, Prediction and Control". J. Wiley and Sons, New York.

Meyer, C. Beat, 1983. "Indoor Air Quality". Addison-Wesley, Reading, Mass.

Small, Bruce M., 1983. "Indoor Air Pollution and Housing Technology" For Canada Mortgage and Housing Corporation. Available from Technology and Health Foundation, R.R.#1, Goodwood, Ontario L0C 1A0.

Spengler, J., Hollowell, C., Moschandreas, D. and Fanger, O., eds., 1982. "Proceedings of the International Symposium on Indoor Air Pollution, Health and Energy Conservation, Amherst, MA, October 1981". Environment International, Vol. 8, No. 1-6 (Special Issue on Indoor Air Pollution)

2.4 Bibliographies, Update Services and Newsletters (continued)

National Research Council, (U.S.), Committee on Indoor Pollutants, 1981. "Indoor Pollutants". National Academy Press, Washington, D.C.

Berglund, B., Lindvall, T., and Sundell, J., editors, 1984. "Proceedings of the 3rd International Conference on Indoor Air Quality and Climate, Stockholm, Sweden, August 20-24, 1984". Swedish Council for Building Research, Stockholm.

Air Infiltration Review and Additions to AIRBASE

The International Energy Agency's Air Infiltration and Ventilation Centre (AIVC), in Berkshire, England, presently produces a variety of publications which include information on indoor air quality, including a quarterly newsletter (Air Infiltration and Ventilation Review) and an update listing for AIRBASE, the Air Infiltration and Ventilation Centre's comprehensive library on the subject.

Air Infiltration and Ventilation Review includes brief articles on air infiltration and related research, announcements of conferences, and recent additions to the Air Infiltration and Ventilation Centre Library. The AIVC sponsored a special conference on 'Energy Efficient Domestic Ventilation Systems for Achieving Acceptable Indoor Air Quality', in September 1982.

Computer searches in AIRBASE may be requested, and AIVC will fill photocopy requests for material listed. AIRBASE searches, subscription information and other publications may be requested by telex (848288 BSRIAC G), by telephone (+44 344 53123), or by mail to:

Air Infiltration and Ventilation Centre
Old Bracknell Lane West
Bracknell
Berkshire RG12 4AH
Great Britain

Indoor Air Quality Research Notes

Lawrence Berkeley Laboratory staff, in Berkeley, California, have begun to publish a bimonthly newsletter entitled 'Indoor Air Quality Research Notes', for the indoor air research community. A pilot issue was sent out to a select mailing list in the summer of 1983, and Volume 1, No. 1 was prepared in the fall of 1983.

The newsletter is intended to keep subscribers up to date on conferences and hearings, activities of ASHRAE working groups, newly published articles on indoor air quality, and other news of interest.

2.4 Bibliographies, Update Services and Newsletters (continued)

IAQ's pilot issue points out the need for this kind of publication, as a means of communication within the research community. The authors note that "the diversity of work in this area is so extreme, and the background of researchers so varied, that it is difficult to define an indoor air quality 'community'".

The pilot issue (Vol. 1, No. 0, May/June 1983) contained a listing of approximately 60 new references, including texts and articles in various refereed journals, since the beginning of 1983.

The initial subscription rate is \$15/yr. For further subscription information and inquiries about LBL bibliographies, readers may write to:

IAQ Research Notes
c/o Building Ventilation and Indoor Air Quality Program
Building 90 - Room 3058
Lawrence Berkeley Laboratory
Berkeley, CA
USA 94720

Canada Mortgage and Housing Corporation

Canada Mortgage and Housing Corporation is establishing a mailing list of persons interested in residential indoor air quality problems. Periodic mailings may be undertaken to announce the availability of background reports such as this, which may be used as resource documents.

Readers who have not already received a notice about the availability of this, and other CMHC research publications relating to indoor air quality, are invited to send their name and address to:

Indoor Air Quality
c/o Research Division
Canada Mortgage and Housing Corporation
National Office, Montreal Rd.
Ottawa, Ontario
K1A 0P7

Foundation for Independent Research on Technology and Health

This author is presently developing a computerized databank of reference information on indoor air quality issues, through the Foundation for Independent Research on Technology and Health, a recently incorporated Canadian charitable organization. Subject areas, of interest to readers, include indoor air quality, and diagnosis and treatment of environmentally related illness.

2.4 Bibliographies, Update Services and Newsletters (continued)

The goal of the Technology and Health Foundation is to address the gap between application and development of new technologies and the understanding of their effects, both positive and negative. Often there is a significant lag between proliferation of new devices and methods, and dissemination of information about their effects. In some cases, major problems have arisen during the period required to have scientific papers reviewed and published through the usual channels.

The Foundation's data collections will, therefore, include current information, such as conference announcements, abstracts of research underway, and names of research contacts, as well as bibliographic references such as texts and journal articles. The references themselves will not be confined to articles in refereed journals, in order to signal early warnings of problems that may not have been fully analyzed yet by the scientific community, despite their potential validity.

To provide a perspective on information contained in the Foundation's collections, reviewers will be invited to comment on issues covered, and to critique information filed in the collection. All such comments will, in turn, be filed in the collection, and will be tagged to that particular subject or reference. In this manner, data bank users will be alerted to the existence, nature, and extent of controversy, and the information service can, itself, provide a neutral forum for scientific debate.

The data collection is presently being gathered and entered onto computer media. Readers are invited to submit bibliographies, papers and other material for inclusion, and may place their name on the mailing list for further announcements by writing to:

Foundation for Independent Research
on Technology and Health
R.R.#1, Goodwood, Ontario
Canada L0C 1A0

2.5 Using Major Canadian and U.S. Computer Data Base Systems

2.5 Using Major Canadian and U.S. Computer Data Base Systems

One of the quickest means of keeping up to date on the published literature in indoor air quality is to tap into major computer database systems, and to conduct searches for articles in your particular area of interest. A sample of results in the CISTI Catalogue Online data base (OON), from the CAN/OLE system in Ottawa, has been discussed in a previous section.

Computer data bases are commonly accessed by requesting searches through public, university, or government libraries, or through private information companies offering this service. Searching can also be done on computer terminals accessible directly to the researchers (after account arrangements are made with the system originator).

Major points of access, either through local libraries or by direct hookup, will be listed in sections 2.6 and 2.7 following, respectively. This section will describe the major data services available, and the databases within each, that may be of particular interest to those involved in the indoor air quality field in Canada.

Two major scientific database systems, readily available in Canada, are the CAN/OLE system and the MEDLARS system. Both are available by subscription through the Canada Institute for Scientific and Technical Information (CISTI) in Ottawa. CAN/OLE is run by CISTI in Ottawa, and MEDLARS is run by the National Library of Medicine in Bethesda, Maryland. Canadian libraries, and other subscribers, access them through the Canadian DATAPAC telephone network.

CAN/SDI, the Canadian Service for the Selective Dissemination of Information, can also be used to obtain automatic updates (weekly, bi-weekly, monthly) from many of the databases available on CAN/OLE and MEDLARS. Inquire (613)-993-1210 for further information about SDI's.

The CAN/OLE system has many different data bases, only some of which are relevant to the indoor air quality field. These are listed below, with some comment as to the number and types of references listed as of January 1984, that might be of interest to readers of this report.

BA69 / BA72 / BA79 (Biosis Previews)

The BA69, BA72, and BA79 databases provide worldwide coverage of literature in the life sciences. The databases include items concerned with the study of living things, their identification, processes, environment and applications. Over 85% of the references are from journals. The remainder are from reports, monographs, reviews, meetings, theses and conference proceedings. BA69 covers pre-1969, BA72 covers 1972-1978, and BA79 covers 1979 to the present.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

A January 1984 search, by this author, revealed 24 references listed for the years 1972-78, which have both the words 'indoor' and 'air' in title or keyword sections. Some, but not all, were relevant to this discussion. Examples are:

TI - CHARACTERIZATION OF POTENTIAL INDOOR SOURCES
OF OZONE

AU - ALLEN R J; WADDEN R A; ROSS E D

TI - THE EFFECT OF CENTRAL AIR CONDITIONING AND
METEOROLOGIC FACTORS ON INDOOR SPORE COUNTS

AU - HIRSCH S R; HIRSCH D J; KALBFLEISCH J H

TI - GAS CHROMATOGRAPHIC IDENTIFICATION OF SOME INDOOR AIR
POLLUTANTS USING CORRELATION EQUATIONS

AU - MUCHTAROVA M; DIMOV N

Another January 1984 search, by this author, revealed 116 references listed in BA79 (1979 to the present), which have both the words 'indoor' and 'air' in title or keyword sections. Again, some, but not all, were relevant to this discussion. Examples are:

TI - CARBON MONOXIDE POISONING IN AN INFANT EXPOSED TO A
KEROSENE HEATER

AU - O'SULLIVAN B P

TI - POLY CHLORO DI BENZO-P-DIOXINS IN COMMERCIAL PENTA
CHLOROPHENOL USED IN WOOD PRESERVATION

AU - CULL M R; DOBBS A J; WILLIAMS N

TI - THE HEALTH RISKS OF PASSIVE SMOKING THE GROWING CASE
FOR CONTROL MEASURES IN ENCLOSED ENVIRONMENTS

AU - LEFCOE N M; ASHLEY M J; PEDERSON L L; KEAYS J J

It is also very likely that these databases may have a considerable number of relevant entries with more specialized titles and keywords.

CAC (Chemical Abstracts Condensates)

CAS77 / CAS82 (Chemical Abstracts Search)

The CAC, CAS77 and CAS82 databases cover all aspects of chemistry and chemical engineering. Journals, monographs, patents, proceedings of meetings and symposia, theses, technical reports and government publications are monitored for references to new findings about reactions, chemical substances, materials, techniques, procedures, theories and applications. Searching can be done using CAS Registry numbers and molecular names, as well as controlled vocabulary and natural language terms. CAC covers 1973-1976, CAS77 covers 1977-1981, and CAS82 covers 1982 to the present.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

A January 1984 search, by this author, revealed 15 references listed in CAC, which have both the words 'indoor' and 'air' in title or keyword sections. Some, but not all, were relevant to this discussion. Examples are:

TI - INDOOR AIR POLLUTION DUE TO CHIPBOARD USED AS A
CONSTRUCTION MATERIAL

AU - ANDERSEN, IB; LUNDQVIST, G. R.; MOELHAVE, L.

TI - INDOOR AIR QUALITY

AU - WADE, WILLARD A. III; COTE, WILLIAM A.; YOCOM, JOHN E.

TI - EMISSIONS FROM COMBUSTION OF INDOOR DUST

AU - JOSHI, SATISH; WANNER, HANS U.

TI - RELATION BETWEEN OUTDOOR AND INDOOR AIR POLLUTION

AU - JOSHI, SATISH; WANNER, HANS U.

A January 1984 search, by this author, revealed 234 references listed in CAS77, which have both the words 'indoor' and 'air' in title or keyword sections. Some, but not all, were relevant to this discussion. Examples are:

TI - COMBUSTION OF GAS-AIR MIXTURES IN BURNERS OF
HOUSEHOLD GAS RANGES

AU - STASKEVICH, I. N.

TI - NITROGEN OXIDES IN COMBUSTION PRODUCTS OF GAS RANGES

AU - BENES, MILOS; ZAHOUREK, JIRI

TI - ORGANIC CONTAMINANTS IN INDOOR AIR AND THEIR
RELATION TO OUTDOOR CONTAMINANTS

AU - JARKE, FRANK H.; DRAVNIKS, ANDREW; GORDON, SYDNEY M.

TI - RELATING INDOOR POLLUTANT CONCENTRATIONS OF OZONE
AND SULFUR DIOXIDE TO THOSE OUTSIDE: ECONOMIC
REDUCTION OF INDOOR OZONE THROUGH SELECTIVE
FILTRATION OF THE MAKE-UP AIR

AU - SHAIR, FREDRICK H.

TI - RADON AND ALDEHYDE CONCENTRATIONS IN THE INDOOR
ENVIRONMENT

AU - MOSCHANDREAS, D. J.; RECTOR, H. E.

A January 1984 search, by this author, revealed 169 references listed in CAS82, which have both the words 'indoor' and 'air' in title or keyword sections. Some, but not all, were relevant to this discussion. Examples are:

TI - AIR POLLUTANTS IN INDOOR ENVIRONMENTS

AU - TERKONDA, PURUSH K.; LIAW, SHU LIANG

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

TI - FORMALDEHYDE EMISSION FROM PARTICLEBOARD AND
PLYWOOD PANELLING: MEASUREMENT, MECHANISM AND
PRODUCT STANDARDS
AU - MYERS, GEORGE E.

It is also very likely that these databases may have a considerable number of relevant entries with more specialized titles and keywords.

CODOC (Co-operative Documents Project)

The CODOC database contains the combined government publications holdings of 11 academic libraries in Ontario. Also included are research and technical reports issued by government agencies or sponsored by government grants.

A January 1984 search, by this author, revealed 6 references listed in CODOC, which have both the words 'indoor' and 'air' in title or keyword sections. All were relevant to this discussion. Examples are:

TI - HEALTH ASPECTS RELATED TO INDOOR AIR QUALITY
- REPORT ON A WHO WORKING GROUP: BILTHOVEN,
3-6 APRIL 1979.
AU - WORLD HEALTH ORGANIZATION. REGIONAL OFFICE FOR
EUROPE.

TI - REPORT OF THE AD HOC TASK FORCE ON INDOOR AIR
POLLUTION.
OR - U.S. DEPT. OF ENERGY. OFFICE OF BUILDINGS AND
COMMUNITY SYSTEMS.

It is also possible that this database may have relevant entries with more specialized titles and keywords.

EI (COMPENDEX - Computerized Engineering Index)

The EI database covers all aspects of engineering including mining, chemical engineering, civil engineering, electronic engineering, industrial engineering and mechanical engineering. Reference to pure chemistry, physics, geology, theoretical mathematics, news items, patents, or material on new products, are excluded. Over 3,500 primary sources are covered: journals, reports and special publications of societies, research institutions, industry, government agencies and universities, theses, standards and monographs.

A January 1984 search, by this author, revealed 131 references listed in EI, which have both the words 'indoor' and 'air' in title or keyword sections. These included relevant references such as the following:

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

TI - THE EFFECTS OF PRESSURIZED AEROSOLS ON RESPIRATORY SYMPTOMS AND PHYSIOLOGY

AU - LEBOWITZ, MICHAEL D.

TI - FORMALDEHYDE EMISSION FROM PARTICLEBOARD AND PLYWOOD PANELLING: MEASUREMENT, MECHANISM AND PRODUCT STANDARDS

AU - MYERS, GEORGE E.

TI - INDOOR HOUSE POLLUTION: APPLIANCE EMISSIONS AND INDOOR AMBIENT CONCENTRATIONS.

AU - CACERES, T.; SOTO, H.; LISSI, E.; CISTERNAS, R.

TI - SURVEY OF SELECTED ORGANICS IN OFFICE AIR.

AU - OTSON, REIN; DOYLE, EDWARD E.; WILLIAMS, DAVID T.; BOTHWELL, PETER D.

This database contains abstracts as well as other bibliographic information. An example from 'Indoor House Pollution' follows:

AB - EMISSION RATES FOR CO, NO, NO//2 AND CH//2O FROM SEVERAL GAS AND KEROSENE HEATERS FREQUENTLY EMPLOYED IN DOMESTIC HEATING HAVE BEEN MEASURED. THE INDOOR CONCENTRATIONS GENERATED BY THESE EMISSIONS ARE EVALUATED AND COMPARED TO THOSE DETERMINED IN TYPICAL HOUSES. IT IS FOUND THAT BOTH THE PREDICTED AND MEASURED VALUES EXCEED THE SHORT TERM AIR QUALITY STANDARDS ACCEPTED IN MOST COUNTRIES.

It is also possible that this database may have relevant entries with more specialized titles and keywords.

EIM (Engineering Meetings)

The EIM database complements EI by providing in-depth coverage of 2,000 technical conferences held each year worldwide, and their contribution of 100,000 papers. The database includes references to each individual paper as well as the conference itself. The base covers July 1982 to the present.

A January 1984 search, by this author, revealed 97 references listed in EIM, which have both the words 'indoor' and 'air' in title or keyword sections. These included relevant references such as the following:

TI - WELL INSULATED AIRTIGHT BUILDINGS, ENERGY CONSUMPTION, INDOOR CLIMATE, VENTILATION AND AIR FILTRATION

AU - ELMROTH, ARNE; LOGDBERG, ARNE

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

TI - INDOOR NO_x POLLUTION

AU - BOLEIJ, JAN S. M.; BRUNEKREEF, BERT; LEBRET, ERIK;
BIERSTEKER, KLAAS

TI - MICROORGANISMS IN THE AIR - HEALTH HAZARD?

AU - KUNDSIN, RUTH B.

It is also possible that this database may have relevant entries with more specialized titles and keywords.

ELIAS (Environment Libraries Automated System)

The ELIAS database corresponds to the holdings of 15 libraries participating in the Environment Canada Departmental Library network; also included is a collection from Fisheries and Oceans Canada. The collections include serials, monographs, conference proceedings and technical reports, covering from 1976 to the present.

A January 1984 search, by this author, revealed no references listed in ELIAS, which have both the words 'indoor' and 'air' in title or keyword sections. Two references with the word 'indoor' in the title dealt with indoor climate and might be of interest to some readers. It is also possible that this database may have relevant entries with more specialized titles and keywords (e.g. 'nitrogen oxides', or 'carbon monoxide').

IEC (Directory of Federally Supported Research in Universities)

The IEC database is a compilation of Canadian university based research projects, as reported to the Information Exchange Centre at CISTI, by granting agencies of the federal government. Also included are contracts to Canadian universities, awarded by Supply and Services Canada, on behalf of various federal government departments. The base covers 1971/72 to the present.

MICROLOG

The MICROLOG database provides access to publications of Canadian federal, provincial and local governments, non-government research institutions, professional associations and special interest groups. The subject content of MICROLOG is multidisciplinary, including technical and annual reports, research studies, statistical reviews and financial statements. The base covers 1979 to the present.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

A January 1984 search, by this author, revealed no references listed in MICROLOG, which have both the words 'indoor' and 'air' in title or keyword sections. It is possible, however, that this database may have relevant entries with more specialized titles and keywords (e.g. 'asbestos', or 'formaldehyde').

NTIS (National Technical Information Service U.S.)

The NTIS database covers U.S. government sponsored research, development and engineering reports and machine processable data files and related software. The reports originate from over 300 U.S. government departments and agencies, e.g. NASA, Department of Defense, Department of Energy, Department of Health, Education and Welfare. NTIS is a multidisciplinary database covering science, technology, education, economics, business and social and behavioural sciences. Most of the references are to research reports. The database also includes some government-sponsored translations, foreign language reports and information on U.S. government patents. The base covers 1964 to the present.

A January 1984 search, by this author, revealed 857 references listed in NTIS, which have both the words 'indoor' and 'air' in title or keyword sections. Of these, 831 contained the words 'indoor', 'air', and 'pollution'.

A further more limited search revealed that 215 of the references, in the original 857, were dated 1983. Some, but not all of these, were relevant to our inquiry. Examples include the following:

TI - GUIDELINES FOR MONITORING INDOOR AIR QUALITY.
AU - NAGDA, NIREN L.; RECTOR, HARRY E.

TI - AIR POLLUTION IN HOMES 1: MEASUREMENTS OF CARBON MONOXIDE AND NITROGEN OXIDES IN THREE KITCHENS.
AU - STEVENSON, K. J.; APLING, A. J.; SULLIVAN, E. J.

TI - AIR POLLUTION IN HOMES 2: VALIDATION OF DIFFUSION TUBE MEASUREMENTS OF NITROGEN DIOXIDE.
AU - APLING, A. J.; STEVENSON, K. J.; GOLDSTEIN, B. D.; MELIA, R. J. W.; ATKINS, D. H. F.

TI - AIR POLLUTION IN HOMES 3: MEASUREMENTS OF CARBON MONOXIDE AND NITROGEN OXIDES IN TWO LIVING ROOMS.
AU - STEVENSON, K. J.; APLING, A. J.; SULLIVAN, E. J.

This database also has a considerable number of relevant entries with more specialized titles and keywords.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

OON (CISTI Catalogue Online)

The OON database contains records of conference proceedings, monographs and technical reports in science, technology and medicine, held by the Canada Institute for Scientific and Technical Information, (CISTI), Ottawa. The majority of records date from January 1978.

CISTI holdings relating to indoor air quality, as revealed by OON searching, have been discussed in a previous section of this report.

UNION (Union List of Scientific Serials in Canadian Libraries)

The UNION database provides the locations of scientific serials held by over 250 Canadian libraries. The libraries are continually monitored for new and changed titles and changes in holdings.

The use of the UNION database, to find out which libraries hold copies of a desired periodical, has already been described in a previous section of this report.

The MEDLARS system (Medical Literature Analysis and Retrieval System) has a number of data bases that contain references which will be of interest to researchers in the indoor air quality field. These are listed below, with comments as to the number and types of references listed as of January 1984, that might be relevant.

MEDLINE (MEDLARS Online)

The MEDLINE database contains several million references to biomedical articles, from some 3,500 journals published in the U.S. and 70 other countries. This database is particularly relevant for searching clinical articles dealing with specific health effects of indoor pollutants.

TOXLINE (Toxicology Information Online)

TOXLINE is a collection of almost a million references, from 1974 to the present, on published human and animal toxicity studies, effects of environmental chemicals and pollutants, and adverse drug reactions. TOXLINE includes references taken from the following secondary sources: Biological Abstracts; Chemical Abstracts; International Pharmaceutical Abstracts; and Pesticides Abstracts.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

A January 1984 search, by this author, revealed 679 references listed in TOXLINE, which have both the words 'indoor' and 'air' in title or keyword sections. Of these, 472 contained the words 'indoor', 'air', and 'pollution'. Some, but not all of this listing, were relevant to our inquiry. Examples include:

TI - Formaldehyde Release from Pressed-Wood Products.
AU - Matthews TG; Hawthorne AR; Daffron CR; Reed TJ; Corey MD

TI - Health Effects of Residential Wood-Fuel Use.
AU - Morris SC

TI - Technique for Determining Efficiency of Sorbents in
Diffusion-Type Samplers.
AU - Palmes ED

TDB (Toxicology Data Bank)

TDB contains facts and data for over 2500 substances. Data includes human and animal toxicity values, pharmacodynamics and toxicology, environmental and manufacturing data as well as physical and chemical properties. Data are selected from standard textbooks, handbooks, manuals, etc., and are evaluated by a peer review group of scientists, before inclusion in the file.

RTECS (Registry of Toxic Effects of Chemical Substances)

RTECS is a compilation prepared by the National Institute for Occupational Safety and Health (U.S.). RTECS contains toxicity data for approximately 40,000 substances. Threshold Limit Values (TLVs, recommended standards in air, and aquatic toxicity data are also included in this file.

CHEMLINE (Chemical Dictionary On-Line)

CHEMLINE contains data and information for more than 460,000 chemical compounds, including CAS Registry Numbers, molecular formulas, and various nomenclature and structural fragments.

CATLINE (Catalog Online)

CATLINE contains over 200,000 references to books and serials, catalogued at the National Library of Medicine since 1965. CATLINE gives medical libraries immediate access to authoritative cataloguing information, and is also useful to other libraries for ordering books and journals, and for providing reference and interlibrary loan services.

2.5 Using Major Canadian and U.S. Computer Data Base Systems (cont.)

SERLINE (Serials Online)

SERLINE contains bibliographic information for over 34,000 serial titles held at the National Library of Medicine. SERLINE is used by libraries, to obtain information needed to order journals, and to refer interlibrary loan requests.

2.6 Libraries with Data Access Facilities

2.6 Libraries with Data Access Facilities

Most university libraries, and many public and government office libraries, have computer facilities for accessing major computerized databases in Canada and the United States.

A full listing of those Canadian centres offering search services to external clients, for CAN/OLE and MEDLARS, are given below. Consult CISTI, at the addresses given at the end of this section, for names of organizations in your area that will do searches for you.

In most cases, researchers requesting a search will communicate directly with the library search personnel, by telephone or in person, in order to discuss exactly what type of information is needed, appropriate search words that will be used, etc. Often such a search is more useful if the researcher comes in person and gives feedback during the actual search.

The Canada Institute for Scientific and Technical Information (CISTI) has some 655 Centres accessing the CAN/OLE computer system, as of December 1983. Not all of these offer services external to their particular organizations.

Some 71 centres provide search services, via MEDLARS (National Library of Medicine, U.S.), that are accessible to some or all of the readers of this report, as of August 1983. Many of these centres will also be able to search in CAN/OLE data bases, as well. These include 34 academic centres (universities and colleges), 9 government centres (libraries or other departments), 19 hospital centres, and 9 centres in industry (companies, associations or individuals). The majority are in Ontario (30) and Quebec (20). All other provinces are represented except Prince Edward Island. The complete list is given, by Province, in the pages following.

2.6 Libraries with Data Access Facilities (continued)

Alberta

- Calgary: University of Calgary, Medical Library
(403)-284-6857
(restricted to southern Alberta physicians,
U. of Calgary staff & students only)
- Edmonton: Alberta Research Council, Industrial Information
(403)-438-0666
- University of Alberta, Health Sciences Library
(403)-432-3791

British Columbia

- Burnaby: Simon Fraser University, Library, Sciences Division
(604)-291-3269 or 291-4173
- Port Coquitlam: Riverview Hospital
(604)-521-1911, Loc. 521
- Vancouver: Cancer Control Agency of B.C., Library
(604)-873-6212
- Children's Hospital
(604)-875-2154
- St. Paul's Hospital
(604)-682-2344
- U.B.C. Computerized Bibliographic Services
(604)-228-2473 or 228-4440
- U.B.C. Biomedical Branch Library
(604)-875-4505
- Victoria: Royal Jubilee Hospital, VMS/RJH Library
(604)-595-9723
- University of Victoria, Library, Reference Division
(604)-721-8276
(restricted to university users only)

Manitoba

- Winnipeg: University of Manitoba, Reference, E. Dafoe Library
(204)-474-9844 or 474-9871

2.6 Libraries with Data Access Facilities (continued)

University of Manitoba, Medical Library
(204)-786-4342

New Brunswick

Fredericton: University of New Brunswick, Science Library
(506)-453-3566 or 453-3567

Newfoundland

St. John's: Memorial University, Health Sciences Library
(709)-722-4343
(restricted to people in Newfoundland)

Nova Scotia

Halifax: Dalhousie University, Kellogg Health Sciences Library
(902)-424-2483
(restricted to registered health professionals in
the Maritimes only)

Wolfville: Acadia University, Library
(902)-542-2201, ext. 248

Ontario

Chatham: Ontario Centre for Farm Machinery and Food
Processing Technology, Information Services
(519)-354-6883

Guelph: University of Guelph, Information Services
(519)-824-4120, ext. 3794 or 3861

Hamilton: McMaster University, Health Sciences Library
(416)-525-9140
(restricted to health professionals)

Kingston: Queen's University, Bracken Library
(613)-547-5753
(restricted to health professionals, university
staff and students)

London: University of Western Ontario, Natural Sciences Ctr.
(519)-679-3008 or 679-6174

Victoria Hospital Corp.
(519)-432-5241

2.6 Libraries with Data Access Facilities (continued)

Ottawa:	Canadian Dental Association (613)-523-1770
	Canadian Pharmaceutical Association (613)-523-7877
	Children's Hospital of Eastern Ontario, Med. Library (613)-737-2206 (restricted to hospital libraries and health care institutions)
	CISTI, Health Science Resource Centre ICIST, Centre Bibliographique des sciences et de la santé (613)-993-1604
	Ontario Cancer Foundation, Beattie Library (613)-725-6363 (restricted to cancer-related subjects)
	Ottawa Civic Hospital, Health Sciences Library (613)-725-4450
	University of Ottawa, Health Sciences Library (613)-737-6432
	University of Ottawa, Vanier Library (613)-231-3942
Owen Sound:	General and Marine Hospital, Health Sci. Library (519)-376-2121, ext. 373
Thunder Bay:	Lakehead University, Paterson Library (807)-345-2121
Toronto:	Metropolitan Toronto Library, Metroline Search Service (416)-928-5349
	Mississauga Hospital (416)-279-7330 (Mississauga)
	Ontario Hospital Association, Library (416)-429-2661 (restricted to health personnel only)
	Ontario Research Foundation, Library (416)-822-4111, ext. 268 (Mississauga)

2.6 Libraries with Data Access Facilities (continued)

Sunnybrook Medical Centre, University of Toronto
(416)-486-3880
(restricted to health care professionals & associates)

University of Toronto, Dentistry Library
(416)-978-2796

University of Toronto, Occupational and Environmental Health
(416)-978-4522

University of Toronto, Science and Medicine Library
(416)-978-8617 or 978-8619

York University, Steacie Science Library
(416)-667-3927

Waterloo: University of Waterloo, E.M.S. Library
(519)-885-1211, ext. 2648

Windsor: Hotel Dieu Hospital of St. Joseph
(519)-973-4444, ext. 178

University of Windsor, Reference Dept., Leddy Library
(519)-253-4232, ext. 661

Quebec

Chicoutimi: University du Québec a Chicoutimi, Bibliothèque
(418)-545-5338

Dorval: Sandoz Canada Ltd.
(514)-631-6775

Kirkland: Burroughs Wellcome, Inc.
(514)-366-9211, ext 284
(restricted to physicians and pharmacists)

Laval: Université du Québec, Institut Armand-Frappier,
Bibliothèque
(514)-687-5010

Montreal: Centre hospitalier Maisonneuve-Rosemont
(514)-254-8341, poste 334

Commission de la santé et de la sécurité du travail
(514)-873-3160
(offert seulement aux intervenants en santé et
sécurité du travail)

2.6 Libraries with Data Access Facilities (continued)

Hôpital Ste-Justine, Centre d'information sur la
santé de l'enfant
(514)-731-4931, poste 333

Hotel-Dieu de Montréal, Service de Documentation
(514)-842-1481, poste 275

Institut de Recherches Cliniques de Montréal
(514)-842-1481, poste 275

McGill University, Medical Library
(514)-392-5375

Montreal Children's Hospital, Medical Library
(514)-937-8511, ext 374

Montreal General Hospital, Medical Library
(514)-937-6011, ext. 775

Sir Mortimer B. Davis Jewish General Hospital
Medical Library
(514)-342-3111, ext. 325

Université de Montréal, Bibliothèque de la santé
(514)-343-5964 or 343-6826

Université de Montreal, Bibliothèque Para-Medicale
(514)-343-7490

Pointe Claire: Merck Frosst Canada Inc.
(514)-695-7920, ext. 463 or 466
(restricted to research personnel, pharmaceutical,
chemical, medical)

Quebec: Université Laval, Bibliothèque scientifique
(418)-656-3969
(restricted to health professionals, CLSC, health
organizations)

Sherbrooke: Université de Sherbrooke, Bibliothèque medicale
Centre hospitalier universitaire
(819)-565-2098 or 565-2096

Trois Rivières: Université du Québec a Trois-Rivières, Bibliothèque
(819)-376-5706

2.6 Libraries with Data Access Facilities (continued)

Saskatchewan

Regina: Saskatchewan Provincial Library, Professional Services
(306)-565-2984, ext. 1516

Saskatoon: University of Saskatchewan, Health Sciences Library
(306)-343-3168

University of Saskatchewan Library, Online Services
(306)-343-4285

2.7 Direct Access to Computer Databases

2.7 Direct Access to Computer Databases

Choosing the means of access to computer search services involves striking a compromise between search skills (i.e. those of the librarian) and subject familiarity (i.e. that of you, the indoor air quality researcher). A period of training, or practice, is usually required to develop good search skills.

Researchers who wish to establish direct communication with the data services described above (CAN/OLE - CISTI and MEDLARS - NLM) may do so with most computer terminals or microcomputers, combined with a modem, which enables communication with the central computer by telephone, and a hard copy printer, to permanently record the transmitted search. Offline print requests can also be made, and the resulting searches received by mail, after being printed on high-speed printers at the data centre.

Direct telephone lines, provided through the Canadian DATAPAC system, allow easy connection from major urban centres, without long distance charges. Researchers in other centres will incur long distance charges, to the nearest urban centre where DATAPAC is available.

The following centres, listed by province, presently have DATAPAC access:

<u>Alberta</u>	Calgary Edmonton Fort McMurray Grande Prairie	Lethbridge Medicine Hat Red Deer
<u>British Columbia</u>	Kamloops Kelowna Nelson Prince George	Terrace Vancouver Victoria
<u>Manitoba</u>	Brandon Thompson	Winnipeg
<u>New Brunswick</u>	Bathurst Fredericton	Moncton Saint John
<u>Nova Scotia</u>	Amherst Bridgewater Halifax Kentville	New Glasgow Sydney Truro
<u>Newfoundland</u>	St. John's	

2.7 Direct Access to Computer Databases (continued)

<u>Ontario</u>	Barrie Belleville Brampton Brantford Brockville Chatham Clarkson Cornwall Galt/Cambridge Guelph Hamilton Kingston Kitchener-Waterloo London	Niagara Falls North Bay Oshawa Ottawa Peterborough St. Catharines Sarnia Sault-Ste-Marie Sudbury Thunder Bay Toronto Windsor Woodstock
<u>Prince Edward Island</u>	Charlottetown	
<u>Québec</u>	Granby Joliette Jonquiere/Chicoutimi Montréal Québec	St-Hyacinthe St. Jean Sherbrooke Trois-Rivieres Valleyfield
<u>Saskatchewan</u>	Moose Jaw Prince Albert	Regina Saskatoon

For further information about connecting directly to CAN/OLE or MEDLARS through the Canada Institute for Scientific and Technical Information (CISTI), contact:

For CAN/OLE: Bonnie M. Bullock, Head
Client Services CAN/OLE CAN/SDI
Canada Institute for Scientific and
Technical Information
National Research Council of Canada
Ottawa, Ontario K1A 0S2

Telepho (613)-993-1210
Tel 053-3115
ENVOY 1 CISTI.CLIENT.SERV
CAN/O OLE075

2.7 Direct Access to Computer Databases (continued)

For MEDLARS: Marilyn E. Schafer, Head
Health Sciences Resource Centre
Canada Institute for Scientific and
Technical Information
National Research Council of Canada
Ottawa, Ontario K1A 0S2

Telepho (613)-993-1604
Tel 053-3115
ENVOY 1 CISTI.HSRC
CAN/O OLE03XM

2.8 Getting Hard Copy of Desired Articles

2.8 Getting Hard Copy of Desired Articles

There are a number of ways to obtain hard copies of the references discovered in bibliographic listings, or on-line computer searches:

- a) order reprints or copies from the publisher (e.g. of texts);
- b) obtain texts or journals by interlibrary loan;
- c) obtain a photocopy, either directly from the original, through a library reference service, or by on-line ordering; and/or
- d) obtain copies of microfiche where available, either from the publisher/distributor, or by on-line ordering.

The key to obtaining hard-copy references, by any of the above methods, is having as complete a bibliographic reference as possible to identify the material you seek. Most of the referenced databases have on-line ordering commands, which allow you, or your librarian, to place an immediate order for hard copy, at the same time as a computer search is performed.

Many libraries in Canada have interlibrary loan policies, which allow readers to place an order for material that is not held in his or her local library, but which is resident somewhere in the system to which the local librarian has access. For example, material held in CISTI may be obtained at a local library, through an interlibrary loan.

The Document Delivery Service of CISTI responds to the information needs of libraries and information centres in government, universities, industry and private concerns, as well as to those of individuals across Canada, by supplying loans or photocopies of materials from its library. Duplicate copies of microfiche, and hardcopy reproduction from microfiche, are also supplied. CISTI also identifies local or national locations for a required item.

Copies of material, for which a full bibliographic record has not been obtained, may be obtained by giving as much information as possible, either to your local librarian or directly to the information service of CISTI. If original information proves to be inaccurate or incomplete, or if the item desired cannot be located readily, a bibliographic search is carried out, to try to ensure that the requester receives the needed information. This service is extended especially to those with limited or no library service.

If a translated version of a foreign language document is preferred, the files of the Translations Index are available, to determine if such exists. This Index provides international coverage of available translations.

If no location can be found, and if the publication requested falls within the area of science and technology, an effort may be made to secure it for the CISTI library.

2.8 Getting Hard Copy of Desired Articles (continued)

CISTI will process requests through on-line ordering (e.g. CAN/OLE), mail, telex or telephone requests.

Enquire:

Interlibrary Loans and Photocopies
Canada Institute for Scientific and
Technical Information
National Research Council of Canada
Ottawa, Ontario
K1A 0S2

Telepho (613)-993-1585

Tel 053-3115

ENVOY 100: ILL.CISTI (for enquiries)

COMPOSE.CISTI (for placing orders)

CAN/O OLS001

2.9 Accessing Other Computer Data Bases

2.9 Accessing Other Computer Data Bases

Some libraries and private search companies may have direct access to additional computer base listings, both in North America and elsewhere. The listing in section 2.5 above covers only those databases accessible through CAN/OLE (Canadian Institute for Scientific and Technical Information (CISTI) in Ottawa), or MEDLARS (National Library of Medicine (U.S.) in Bethesda, Maryland).

Other sources, which may be helpful for indoor air quality researchers, include the Canadian Centre for Occupational Health and Safety in Hamilton:

Bonnie Bird
Manager, Readers' Services
Canadian Centre for Occupational Health
and Safety
250 Main St. East
Hamilton, Ontario L8N 1H6
(416)-527-6590
Telex: 061-8532

Some researchers have also found the DIALOG data base system useful, particularly for regular automatic updates:

DIALOG Services
3460 Hillview Avenue
Palo Alto, CA 94304
(415)-858-3810

Canadian contact:

Ulla Destriker
Micromedia Limited
144 Front St. W.
Toronto, Ontario M5J 2L7
(416)-593-5211 ext. 233
1-800-387-2689

Readers wishing further information, on other Canadian databases, may consult the Directory of Canadian Scientific and Technical Databases, published by the Canada Institute for Scientific and Technical Information (NRC No. 23071, 1984; \$10.00; CISTI, Ottawa K1A 0R6).

Information on a number of European databases was provided, to this author, by Lois Warren of L. M. Warren, Inc., Programmed Library and Information Services, one such source for searches of computer data bases:

2.9 Accessing Other Computer Data Bases (continued)

HSELINE-47

Produced by the UK Health and Safety Executive (HSE), to provide access to references on different aspects of health and safety at work. The source material consists of documents acquired and produced by HSE, and includes report literature, relevant legislation, monographs and conference proceedings. Some 250 periodicals are scanned for relevant entries. Documents can be ordered online.

CIS

Produced by the International Occupational Safety and Health Information Centre of the International Labour Organization. The database, in general, covers worldwide literature on occupational safety and health. It is available through the QUESTEL computer system in France (and the Centre for Occupational Health and Safety in Canada - see above).

URBAMET

Available through the QUESTEL computer system in France. Contains scientific, technical, economical and legal information related to town planning, environment and transport, including housing and architecture.

CECILE

Produced by the Centre de Création Industrielle, Centre Georges Pompidou, available through the QUESTEL computer system in France. This database covers industrial design, visual planning, space planning and architectural practice.

ACOMPLINE

Produced by the Greater London Council Research Library, United Kingdom, as an extended version of the monthly printed abstract bulletin "Urban Abstracts". ACOMPLINE contains documentation needed by engineers, scientists and sociologists involved in urban matters. References are predominantly of British origin, but also include material from other European countries and from North America. Subject coverage includes housing design and construction, improvement and renewal, energy in housing, environmental health, and numerous other categories.

For further information, on accessing these and other such data bases, readers are invited to contact:

Lois Warren
L. M. Warren, Inc.
Programmed Library and Information Services
2000 West 12th Avenue, Vancouver, B.C. V6J 2G2
Tel: (604)-734-0755

PART 3: INDEX SECTION

Project Titles in Alphabetical order (Keyword in Context Index)	281 - 324
Index of Research and Funding Organizations in Alphabetical Order	325 - 332
Name Index	333 - 336
Subject Index	337 - 352

Keyword in Context Index - Project Titles in Alphabetical Order

AIRBASE, Air Infiltration Review and Additions to	252
About Asbestos, What You Should Know	62
Academic Research Buildings, Recirculation of Exhaust Gases in	21
Acceptable Indoor Air Quality, Ventilation Standards for	19
Access Facilities, Libraries with Data	265
Access to Computer Databases, Direct	272
Accessing Other Computer Data Bases	277
Accidents, Environmental Health Factors in Falling	32
Accreditation of Standards-Writing Organizations	33
Acquisition and Telemetry Systems Applicable to Air Quality Measurement, Data	71
Act - Designated Substances, Occupational Safety and Health	156
Active Dusts in Recirculated Air, Determination of Biologically	21
Activity of Adsorbed Polycyclic Aromatic Hydrocarbons, Chemical and Mutagenic	199
Additions to AIRBASE, Air Infiltration Review and	252
Adsorbed Polycyclic Aromatic Hydrocarbons, Chemical and Mutagenic Activity of	199
Adverse Health Effects from Urea-Formaldehyde Foam Insulation	217
Advice and Testing re Air Quality, Engineering Appraisal, Research,	10
Advice for UFFI Homeowners and Contractors, Remedial Measures	211
Advisory Committee on Dioxins, Expert	150
Advisory Panel, Health and Safety	223
Advisory Service, HEATLINE Telephone	144
Affordable Low Energy House Construction, A New Approach to	5
After Remedial Measures, Comparison of UFFI and Non-UFFI Residents Before and	218
Aftermath, Insulation	67
Aid Persons with Environmental Allergy, Self-help Group to	104
Air Changer Application Guide	80
Air Cleaning Devices With Respect to Formaldehyde, Evaluation of	119
Air Cleaning and Monitoring, Facilities Design for	191
Air Contaminants, Chemistry and Monitoring of Indoor	175
Air Contaminants, Standards for Methods of Measurement of Indoor	34
Air Contamination Committee, Formaldehyde and	29
Air Contamination, Report of the Subcommittee on Formaldehyde and	62
Air Control Systems	56
Air Exchange Guidelines: Ontario Building Code 1983, Changes in	210
Air Exchange Levels (Elliot Lake), Evaluation of	210
Air Exchange Products and Newsletter	74
Air Filter Efficiency Study, Optimum	133
Air Filters, Development of Alternative Electronic	94
Air Filtration, Assessment of Medium Efficiency	208
Air Filtration, Upgrading Residential Forced	78
Air Infiltration Characteristics of Houses	166
Air Infiltration Monitoring	97
Air Infiltration Review and Additions to AIRBASE	252
Air Intake Contamination from Nearby Exhaust Vents, A Design Procedure for Estimating	6
Air Intake for Fireplaces, Fresh	4

Keyword in Context Index - Project Titles in Alphabetical Order

Air Intakes from Roof Exhaust Vents, Contamination of	6
Air Leakage Flow Correlations for Varying House Construction	6
Air Leakage in Calgary Residences, A Study of	8
Air Monitoring for Asbestos, Indoor	95
Air Monitoring, Ambient	26
Air Movement and Infiltration Analysis	20
Air Pollutants, Education and Rehabilitation of Persons Sensitized to Indoor	107
Air Pollutants, Models for Indoor and Outdoor Exposure to	168
Air Pollution From Woodburning Stoves, Indoor	18
Air Pollution Monitoring, Indoor	192
Air Pollution Problems, Demands on Health Inspectors and Resources Needed to Handle Indoor	21
Air Pollution and Housing Technology, Indoor	85
Air Pollution and Housing Technology, Literature Review on Indoor	85
Air Pollution, Factors That Influence Assessments of Health Effects of	222
Air Pollution, Health Effects of Particulates and SO ₂ Level in	103
Air Pollution: Experience of the Public Health Branch, Indoor	101
Air Purifiers, Development of	58
Air Quality Analysis and Building Evaluation Techniques, Studies in	105
Air Quality Analysis for Microbial Factors and Trace Organics, Indoor	68
Air Quality Analysis: Polycyclic Aromatic Hydrocarbons, Indoor	146
Air Quality Control Techniques, Evaluation of Radon and	93
Air Quality Databank, Indoor	108
Air Quality Effects of Heat Recovery Ventilators, Indoor	207
Air Quality Evaluations, Indoor	65
Air Quality Field, Monitoring of Developments in the Indoor	65
Air Quality Investigation and Analysis, Indoor	38
Air Quality Investigation of an Office Building for Possible Presence of Airborne Asbestos	47
Air Quality Investigations, Indoor	109
Air Quality Measurement - Commercial and Industrial, Indoor	18
Air Quality Measurement, Data Acquisition and Telemetry Systems Applicable to	71
Air Quality Measurements for Offices and Residences, Indoor	178
Air Quality Measurements in a Group of Low Leakage Houses	167
Air Quality Measurements, Indoor	131
Air Quality Monitoring	42
Air Quality Monitoring	235
Air Quality Monitoring, Literature Research and	73
Air Quality Monitoring, R-2000 Low-Energy Home Demonstration Program:	143
Air Quality Monitoring: Commercial/Industrial, Indoor	82
Air Quality Relationships for Homes and Elementary Schools, Indoor/Outdoor	237
Air Quality Research Notes, Indoor	252
Air Quality Research: Measurement and Literature Surveys	83
Air Quality Sampling and Analysis, Indoor	11
Air Quality Sampling and Analysis, Indoor	91
Air Quality Sampling, Indoor	28
Air Quality Sampling, Laboratory Services for Indoor	75

Keyword in Context Index - Project Titles in Alphabetical Order

Air Quality Sampling, Monitoring and Modelling, Indoor	117
Air Quality Studies and Measurement, Indoor	12
Air Quality Studies, Indoor	21
Air Quality Studies, Particularly Radon Emissions, Indoor	130
Air Quality Testing, Odour Measurement and Control, Indoor	128
Air Quality and Health Investigation of Three Schools, Indoor	51
Air Quality and Risk Assessment, Indoor	60
Air Quality and Weathersealing, Relationship Between Indoor	187
Air Quality in Animal Housing	112
Air Quality in Canadian Homes, Studies on Indoor	86
Air Quality in Cold Climates, International Specialty Conference on Indoor	202
Air Quality in Energy Efficient Homes, Investigation of	228
Air Quality in Homes, Program for Monitoring Indoor	98
Air Quality in Houses	159
Air Quality in Low Energy Houses	167
Air Quality in Sick Buildings, Investigation of	227
Air Quality in Weatherized Homes, Testing	209
Air Quality in an Energy Efficient Office Building.	49
Air Quality, Canadian Issues and Opportunities in Indoor	200
Air Quality, Committee on Residential	184
Air Quality, Criteria Reviews of Indoor	83
Air Quality, Energy Conservation and Indoor	192
Air Quality, Engineering Appraisal, Research, Advice and Testing Re	10
Air Quality, Facts and Policy Issues Regarding Indoor	198
Air Quality, Federal-Provincial Working Group on Indoor	148
Air Quality, Field Research on Indoor	236
Air Quality, Homeowner Information on Energy Conservation and	67
Air Quality, Impact of Energy Conservation on Indoor	182
Air Quality, Industrial	6
Air Quality, Interaction Between Energy Conservation and Indoor	30
Air Quality, Library Holdings in Indoor	246
Air Quality, Literature Review Capability: Indoor	197
Air Quality, Periodicals Containing Articles Relating to Indoor	243
Air Quality, Project Management and Research in Indoor	190
Air Quality, Seminar Courses Pertaining to Indoor	66
Air Quality, Seminar on Indoor	19
Air Quality, Trace Organic Laboratory for Analyzing Indoor	156
Air Quality, Ventilation Standards for Acceptable Indoor	19
Air Quality: Industrial, Indoor	134
Air Requirements Regulations, Fuel-fired Appliances: Combustion	181
Air Requirements and Air Supplies, A Study of Residential Combustion	83
Air Sampling Filters, Preparation and Analysis of	27
Air Scrubber, Development of a Water Spray	216
Air Sealing Study, Richmond Hill Demonstration Project: An	211
Air Supplies, A Study of Residential Combustion Air Requirements and	83
Air Supply, Carbon Dioxide Controlled Outside	160
Air Ventilation Standards for Office Buildings, Energy Implications of Various Outdoor	232
Air and Certain Classes of Pesticides, Interaction of Nitrogen Oxides in	2

Keyword in Context Index - Project Titles in Alphabetical Order

Air quality Monitoring, Environmental and Socio-economic Impact	44
Air, Determination of Biologically Active Dusts in Recirculated	21
Airborne Asbestos Contamination in Saskatoon Arena, Assessment of	50
Airborne Asbestos Investigation in University Classrooms."	46
Airborne Asbestos Particles in a Curling Rink	53
Airborne Asbestos Particles in a Large Office Building	54
Airborne Asbestos Particles in a Printing Press	49
Airborne Asbestos, Air Quality Investigation of an Office Building for Possible Presence of	47
Airborne Formaldehyde Concentration in Carcass Storage Rooms of the College of Veterinary Medicine	48
Airflow in Rooms, Structure of	234
Airtightening, The Effects of Residential	137
Alberta Home Heating Research Facility	7
All Indoor Problems, Physiological Reactions to the Sum of	196
Allergens in Thermally Insulated or Fire-gutted Homes, Investigations of Potential Respiratory Irritants or	52
Allergies, Information and Support for Persons with	81
Allergy, Self-help Group to Aid Persons with Environmental	104
Alternative Electronic Air Filters, Development of	94
Ambient Air Monitoring	26
Analyse des eventuelles reactions d'hypersensibilite a la mousse isolante d'uree-formaldehyde et a ses sous-produits	154
Analysis Using Gas Chromatography and Mass Spectrometry, Environmental	189
Analysis and Building Evaluation Techniques, Studies in Air Quality	105
Analysis for Microbial Factors and Trace Organics, Indoor Air Quality	68
Analysis of Air Sampling Filters, Preparation and	27
Analysis of Asbestos Samples	132
Analysis of Field Survey Results and Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing:	23
Analysis of Formaldehyde Dosimeters	213
Analysis of Formaldehyde in UFFI Homes, Sampling and	119
Analysis of Formaldehyde in UFFI Homes, Sampling and	124
Analysis of Formaldehyde in UFFI Homes, Testing and	177
Analysis of Possible Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts	154
Analysis re Ventilation Standards, Literature Review and	35
Analysis, Air Movement and Infiltration	20
Analysis, Indoor Air Quality Investigation and	38
Analysis, Indoor Air Quality Sampling and	11
Analysis, Indoor Air Quality Sampling and	91
Analysis: Polycyclic Aromatic Hydrocarbons, Indoor Air Quality	146
Analyzing Indoor Air Quality, Trace Organic Laboratory for	156
Angle on Dilution from Roof Vents, Influence of Exhaust Velocity and Wind Incidence	6
Animal Housing, Air Quality in	112

Keyword in Context Index - Project Titles in Alphabetical Order

Answer Book to Home Insulation Conflict and Confusion, Canadian	67
Appliances in the Indoor Environment, Contaminants from Residential Combustion	70
Appliances, Improved Safety of Vented Gas	137
Applicable Moisture Reduction Techniques for Newfoundland: Pt. 3, Moisture Induced Problems in NHA Housing:	25
Applicable to Air Quality Measurement, Data Acquisition and Telemetry Systems	71
Appliances: Combustion Air Requirements Regulations, Fuel-fired	181
Application Guide, Air Changer	80
Appraisal, Research, Advice and Testing re Air Quality, Engineering	10
Approach to Affordable Low Energy House Construction, A New	5
Areas North of the Tree Line, Ventilation Standards for	204
Arena, Assessment of Airborne Asbestos Contamination in Saskatoon	50
Aromatic Hydrocarbons, Chemical and Mutagenic Activity of Adsorbed Polycyclic	199
Aromatic Hydrocarbons, Indoor Air Quality Analysis: Polycyclic	146
Articles Relating to Indoor Air Quality, Periodicals Containing	243
Articles, Getting Hard Copy of Desired	275
Asbestos Contamination in Saskatoon Arena, Assessment of Airborne	50
Asbestos Fibers, Controlling Workplace Exposure to	116
Asbestos Investigation in University Classrooms, Airborne	46
Asbestos Particles in a Curling Rink, Airborne	53
Asbestos Particles in a Large Office Building, Airborne	54
Asbestos Particles in a Printing Press, Airborne	49
Asbestos Samples, Analysis of	132
Asbestos, Indoor Air Monitoring for	95
Asbestos, What You Should Know About	62
Asbestos, Air Quality Investigation of an Office Building for Possible Presence of Airborne	47
Assay Kit, Formaldehyde	127
Assessment of Airborne Asbestos Contamination in Saskatoon Arena	50
Assessment of Medium Efficiency Air Filtration	208
Assessment of the Energy Saving Measures Used in the ER-1 Conservation/ Solar Research House	5
Assessment, Indoor Air Quality and Risk	60
Assessment, Office Environment	106
Assessments of Health Effects of Air Pollution, Factors That Influence	222
Assistance Program for UFFI Homeowners, Federal	120
Associated with Urea-Formaldehyde Foam Insulation, Dust	1
Associated with Urea-formaldehyde Foam Insulation, Technical Support for the Investigation of Problems	174
Asthma Patients to UFFI Gases and Formaldehyde, Controlled Exposure of	185
Automotive Emissions, Effects of	73
Backdraft Checklist: Design and Evaluation, Residential Chimney	30
Bad Odour Problems at a Retail Store	49
Base Systems, Using Major Canadian and U.S. Computer Data	255
Base, Information	241
Base, Research and Information	86
Bases, Accessing Other Computer Data	277
Baygon in NO ₂ Gas: I. Identification of NitrosoBaygon, Production of NitrosoBaygon from	2

Keyword in Context Index - Project Titles in Alphabetical Order

Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from	2
Before and After Remedial Measures, Comparison of UFFI and Non-UFFI Residents	218
Between Energy Conservation and Indoor Air Quality, Interaction	30
Between Indoor Air Quality and Weathersealing, Relationship	187
Bi-Monthly Environmental Newsletter	129
Bibliographies, Update Services and Newsletters	251
Biological Indicators for the Effects of Urea-Formaldehyde Foam Insulation, Workshop on Development of	151
Biologically Active Dusts in Recirculated Air, Determination of	21
Biomedical Research and Toxicology	127
Book to Home Insulation Conflict and Confusion, Canadian Answer	67
Branch, Indoor Air Pollution: Experience of the Public Health	101
Building Code 1983, Changes in Air Exchange Guidelines: Ontario	210
Building Energy Conservation R&D Plan, Federal	92
Building Evaluation Techniques, Studies in Air Quality Analysis and	105
Building Investigations and Literature Reviews	61
Building Performance Database	109
Building Science and Engineering	20
Building Science and Technology, Second Conference on	20
Building Site, Future Radon Levels at a Proposed	139
Building Surface Concentrations from Nearby Point Sources, Estimates of	6
Building for Possible Presence of Airborne Asbestos, Air Quality Investigation of an Office	47
Building, Airborne Asbestos Particles in a Large Office	54
Building, Interaction of a Roof Level Plume with a Downwind	6
Building, Air Quality in an Energy Efficient Office	49
Buildings Program, Energy Efficient	72
Buildings, Chemical Hazards and Energy Conservation in	76
Buildings, Energy Conservation in	20
Buildings, Energy Implications of Various Outdoor Air Ventilation Standards for Office	232
Buildings, Environmental Performance of Office	135
Buildings, Indoor Organic Contaminants in Energy Efficient	128
Buildings, Investigation of Air Quality in Sick	227
Buildings, Quality of the Working Environment in Office	153
Buildings, Recirculation of Exhaust Gases in Academic Research	21
Buildings, The Measurement of Formaldehyde Levels in Wall Cavities of UFFI-Insulated	14
Buildings, Ventilation and Space Conditioning in Commercial, Industrial and Residential	20
Built Environments, Programming, Design and Evaluation of	136
Bureaux, Projet De Recherche Sur La Qualité Du Milieu De Travail Dans Les Édifices à	153
Byproducts, Analysis of Possible Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its	154
Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in Port Hope, Ontario	39
Calgary Residences, A Study of Air Leakage in	8

Keyword in Context Index - Project Titles in Alphabetical Order

Canada Health Survey	16
Canada, National Research Council of	169
Canadian Answer Book to Home Insulation Conflict and Confusion	67
Canadian Centre for Toxicology	43
Canadian Homes, Measurement of Radon and Radon Daughters in	149
Canadian Homes, Studies on Indoor Air Quality in	86
Canadian Issues and Opportunities in Indoor Air Quality	200
Canadian Scientific and Technical Databases, Directory of	277
Canadian and U.S. Computer Data Base Systems, Using Major	255
Cancers in Port Hope, Ontario, Calculation of Radiation Exposure in a Case Control Study of Lung	39
Capability: Indoor Air Quality, Literature Review	197
Carbon Dioxide Controlled Outside Air Supply	160
Carbon Dioxide Monitoring, Indoor	84
Carcass Storage Rooms of the College of Veterinary Medicine, Airborne Formaldehyde Concentration in	48
Case Control Study of Lung Cancers in Port Hope, Ontario, Calculation of Radiation Exposure in a	39
Cavities of UFFI-Insulated Buildings, The Measurement of Formaldehyde Levels in Wall	14
Centre / Centre sur la MIUF, UFFI	120
Centre for Toxicology, Canadian	43
Centre sur la MIUF, UFFI Centre /	120
Centre, Urea-Formaldehyde Foam Insulation	120
Century Disease, Documentary: The Twentieth	87
Certain Classes of Pesticides, Interaction of Nitrogen Oxides in Air and Chamber, Dynamic Emission	165
Changer Application Guide, Air	80
Changes in Air Exchange Guidelines: Ontario Building Code 1983	210
Characteristics of Houses, Air Infiltration	166
Checklist, Residential Combustion Safety	190
Checklist: Design and Evaluation, Residential Chimney Backdraft	30
Chemical Hazards and Energy Conservation in Buildings	76
Chemical Scrubbers for Formaldehyde, Field Experience with	13
Chemical Susceptibility and Urea-Formaldehyde Foam Insulation	172
Chemical and Mutagenic Activity of Adsorbed Polycyclic Aromatic Hydrocarbons	199
Chemicals on the Farm, Toxic	127
Chemistry and Monitoring of Indoor Air Contaminants	175
Children in UFFI Homes, Historic Health Records of School	219
Chimney Backdraft Checklist: Design and Evaluation, Residential	30
Chimney Flues, Thermal and Flow Performance of	211
Chromatography and Mass Spectrometry, Environmental Analysis Using Gas	189
Chronic Lung Disease, Environmental Factors in	102
Classes of Pesticides, Interaction of Nitrogen Oxides in Air and Certain	2
Classrooms, Airborne Asbestos Investigation in University	46
Cleaning Devices With Respect to Formaldehyde, Evaluation of Air	119
Cleaning and Monitoring, Facilities Design for Air	191
Climates, International Specialty Conference on Indoor Air Quality in Cold	202

Keyword in Context Index - Project Titles in Alphabetical Order

Clinic, Occupational Health	9
Code 1983, Changes in Air Exchange Guidelines: Ontario Building	210
Cold Climates, International Specialty Conference on Indoor Air Quality in	202
Collection Impingers, Efficiency of Formaldehyde Gas	179
Collection, Environmental Literature	118
College of Veterinary Medicine, Airborne Formaldehyde Concentration in Carcass Storage Rooms of the	48
Combustion Air Requirements Regulations, Fuel-fired Appliances:	181
Combustion Air Requirements and Air Supplies, A Study of Residential	83
Combustion Appliances in the Indoor Environment, Contaminants from Residential	70
Combustion Safety Checklist, Residential	190
Combustion and Ventilation, Response to Inquiries on Fuel	181
Comfort Complaints in the Workplace, Investigation of Health and	55
Comité sur la qualité de l'air dans les habitations	184
Commercial and Industrial, Indoor Air Quality Measurement -	18
Commercial, Industrial and Residential Buildings, Ventilation and Space Conditioning in	20
Commercial/Industrial, Indoor Air Quality Monitoring:	82
Committee on Dioxins, Expert Advisory	150
Committee on Residential Air Quality	184
Committee, Formaldehyde and Air Contamination	29
Comparison of UFFI and Non-UFFI Residents Before and After Remedial Measures	218
Complaint Service, Consumer Information and	45
Complaints in the Workplace, Investigation of Health and Comfort	55
Comprehensive Environmental Laboratory and Field Services	75
Comprehensive Planning, Programming and Evaluation of Interior Environments	118
Computer Data Base Systems, Using Major Canadian and U.S.	255
Computer Data Bases, Accessing Other	277
Computer Databases, Direct Access to	272
Concentration Fluctuations from a Ground Level Source, Predicting the Spatial Distribution of	6
Concentration at Roof Level, The Effect of Varying Exhaust Stack Height on Contaminant	6
Concentration in Carcass Storage Rooms of the College of Veterinary Medicine, Airborne Formaldehyde	48
Concentrations from Nearby Point Sources, Estimates of Building Surface	6
Condensation and Ventilation in Houses, Humidity,	169
Conditioning in Commercial, Industrial and Residential Buildings, Ventilation and Space	20
Conditions in Housing, Hazardous Heating and Ventilating	203
Conference on Building Science and Technology, Second	20
Conference on Health Problems Potentially Related to Urea Formaldehyde Foam Insulation, Consensus	155
Conference on Indoor Air Quality in Cold Climates, International Specialty	202
Conflict and Confusion, Canadian Answer Book to Home Insulation	67

Keyword in Context Index - Project Titles in Alphabetical Order

Confusion, Canadian Answer Book to Home Insulation Conflict and	67
Consensus Conference on Health Problems Potentially Related to Urea Formaldehyde Foam Insulation	155
Conservation R&D Plan, Federal Building Energy	92
Conservation Studies, Energy	215
Conservation and Air Quality, Homeowner Information on Energy	67
Conservation and Indoor Air Quality, Energy	192
Conservation and Indoor Air Quality, Interaction Between Energy	30
Conservation in Buildings, Chemical Hazards and Energy	76
Conservation in Buildings, Energy	20
Conservation on Indoor Air Quality, Impact of Energy	182
Conservation/ Solar Research House, Assessment of the Energy Saving Measures Used in the ER-1	5
Construction of Low-Energy and Low-Pollution Homes, Design and	80
Construction, A New Approach to Affordable Low Energy House	5
Construction, Air Leakage Flow Correlations for Varying House	6
Construction, Updating Health Standards for Residential	79
Consumer Information and Complaint Service	45
Containing Articles Relating to Indoor Air Quality, Periodicals	243
Contaminant Concentration at Roof Level, The Effect of Varying Exhaust Stack Height on	6
Contaminant Emissions From Gas Stoves	161
Contaminant Emissions From Kerosene Heaters	162
Contaminants from Residential Combustion Appliances in the Indoor Environment	70
Contaminants in Energy Efficient Buildings, Indoor Organic	128
Contaminants in Indoor Environments, Measurement of Inorganic	145
Contaminants in Indoor Environments, Measurement of Organic	147
Contaminants, Chemistry and Monitoring of Indoor Air	175
Contaminants, Standards for Methods of Measurement of Indoor Air	34
Contamination Committee, Formaldehyde and Air	29
Contamination from Nearby Exhaust Vents, A Design Procedure for Estimating Air Intake	6
Contamination in Saskatoon Arena, Assessment of Airborne Asbestos	50
Contamination of Air Intakes from Roof Exhaust Vents	6
Contamination of Elliot Lake, Ontario, Remedial Measures for the Radiation Reduction and Radioactive	140
Contamination, Report of the Subcommittee on Formaldehyde and Air	62
Contractors, Remedial Measures Advice for UFFI Homeowners and	211
Control Study of Lung Cancers in Port Hope, Ontario, Calculation of Radiation Exposure in a Case	39
Control Systems, Air	56
Control Techniques, Evaluation of Radon and Air Quality	93
Control, Indoor Air Quality Testing, Odour Measurement and	128
Control, Ventilation Systems Design, Optimization and	116
Control, Ventilation for Humidity	206
Controlled Exposure of Asthma Patients to UFFI Gases and Formaldehyde	185
Controlled Outside Air Supply, Carbon Dioxide	160
Controlling Workplace Exposure to Asbestos Fibers	116
Copy of Desired Articles, Getting Hard	275

Keyword in Context Index - Project Titles in Alphabetical Order

Correlations for Varying House Construction, Air Leakage Flow	6
Corriger les Défauts de l'Isolation , J'isole Mieux, Repérer Et	67
Cost Effective UFFI Removal Techniques, Investigations Into	230
Council of Canada, National Research	169
Courses Pertaining to Indoor Air Quality, Seminar	66
Criteria Reviews of Indoor Air Quality	83
Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes	6
Curling Rink, Airborne Asbestos Particles in a	53
Custom Electronic Instrumentation	188
D'hypersensibilité à la mousse isolante d'urée-formaldehyde et à ses sous-produits, Analyse Des Éventuelles Réactions	154
D'urée-formaldehyde et à ses sous-produits, Analyse Des Éventuelles Réactions D'hypersensibilité à La Mousse Isolante	154
Damper, Retrofit Fireplace	3
Dans les édifices à bureaux, Projet De Recherche Sur La Qualité Du Milieu De Travail	153
Dans les habitations, Comite Sur La Qualite De L'air	184
Data Access Facilities, Libraries with	265
Data Acquisition and Telemetry Systems Applicable to Air Quality Measurement	71
Data Base Systems, Using Major Canadian and U.S. Computer	255
Data Bases, Accessing Other Computer	277
Databank, Indoor Air Quality	108
Database, Building Performance	109
Databases, Direct Access to Computer	272
Databases, Directory of Canadian Scientific and Technical	277
Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f")", The Seasonal Fluctuation of the Radon	39
Daughters in Canadian Homes, Measurement of Radon and Radon	149
De l'Isolation", J'isole Mieux, Repérer Et Corriger Les Défauts	67
De l'air dans les habitations, Comité Sur La Qualite	184
De recherche sur la qualité du milieu de travail dans les édifices à bureaux, Projet	153
De travail dans les édifices à bureaux, Projet De Recherche Sur La Qualité Du Milieu	153
Défauts de l'Isolation , J'isole Mieux, Repérer Et Corriger Les	67
Demands on Health Inspectors and Resources Needed to Handle Indoor Air Pollution Problems	21
Demonstration Program: Air Quality Monitoring, R-2000 Low-Energy Home	143
Demonstration Project, Energy Efficient Housing	5
Demonstration Project: An Air Sealing Study, Richmond Hill	211
Departmental Houses, Field Performance Evaluation of	36
Des éventuelles réactions d'hypersensibilité à la mousse isolante	

Keyword in Context Index - Project Titles in Alphabetical Order

d'urée-formaldehyde et à ses sous-produits, Analyse	154
Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents, A	6
Design and Construction of Low-Energy and Low-Pollution Homes	80
Design and Evaluation of Built Environments, Programming,	136
Design and Evaluation, Residential Chimney Backdraft Checklist:	30
Design for Air Cleaning and Monitoring, Facilities	191
Design, HVAC	59
Design, Optimization and Control, Ventilation Systems	116
Designated Substances, Occupational Safety and Health Act -	156
Desired Articles, Getting Hard Copy of	275
Detached Houses, Mechanical Fresh-Air Ventilation Systems in	171
Determination of Biologically Active Dusts in Recirculated Air	21
Development of Air Purifiers	58
Development of Alternative Electronic Air Filters	94
Development of Biological Indicators for the Effects of Urea-Formaldehyde Foam Insulation, Workshop on	151
Development of Passive Sampler Systems	60
Development of a Water Spray Air Scrubber	216
Developments in the Indoor Air Quality Field, Monitoring of	65
Devices With Respect to Formaldehyde, Evaluation of Air Cleaning	119
Devices, Investigations into Various Formaldehyde Monitoring	175
Dilution from Roof Vents, Influence of Exhaust Velocity and Wind Incidence Angle on	6
Dioxide Controlled Outside Air Supply, Carbon	160
Dioxide Gas, NitrosoBaygon Formation in Nitrogen	2
Dioxide Monitoring, Indoor Carbon	84
Dioxins, Expert Advisory Committee on	150
Direct Access to Computer Databases	272
Directory of Canadian Scientific and Technical Databases	277
Directory of Federally Supported Research in Universities	260
Disease, Documentary: The Twentieth Century	87
Disease, Environmental Factors in Chronic Lung	102
Display Terminals, Radiation Emissions from Video	89
Distribution of Concentration Fluctuations from a Ground Level Source, Predicting the Spatial	6
Documentary: The Twentieth Century Disease	87
Domestic Formaldehyde Exposure, Interim Guidelines for	29
Domestic Storage Tank Water Heaters, Emissions from Polyurethane Foam Insulation on	157
Dosimeters, Analysis of Formaldehyde	213
Downwind Building, Interaction of a Roof Level Plume with a	6
Du milieu de travail dans les édifices à bureaux, Projet De Recherche Sur La Qualité	153
Dust Associated with Urea-Formaldehyde Foam Insulation	1
Dusts in Recirculated Air, Determination of Biologically Active	21
Dynamic Emission Chamber	165
ER-1 Conservation/ Solar Research House, Assessment of the Energy Saving Measures Used in the	5
Édifices à bureaux, Projet De Recherche Sur La Qualité Du Milieu De	

Keyword in Context Index - Project Titles in Alphabetical Order

Travail Dans Les	153
Education and Rehabilitation of Persons Sensitized to Indoor Air	
Pollutants	107
Education in Toronto, Pollution and	239
Education, Household Pollutants and Householder	183
Effect of Indoor Environmental Factors on Human Platelets, as Seen by	
Transmission Electron Microscopy	99
Effect of Varying Exhaust Stack Height on Contaminant Concentration at	
Roof Level, The	6
Effective UFFI Removal Techniques, Investigations Into Cost	230
Effects from Urea-Formaldehyde Foam Insulation, Adverse Health	217
Effects of Air Pollution, Factors That Influence Assessments of Health	222
Effects of Automotive Emissions	73
Effects of Heat Recovery Ventilators, Indoor Air Quality	207
Effects of Particulates and SO ₂ Level in Air Pollution, Health	103
Effects of Residential Airtightening, The	137
Effects of Urea-Formaldehyde Foam Insulation, Workshop on Development	
of Biological Indicators for the	151
Efficiency Air Filtration, Assessment of Medium	208
Efficiency Study, Optimum Air Filter	133
Efficiency of Formaldehyde Gas Collection Impingers	179
Efficient Buildings Program, Energy	72
Efficient Buildings, Indoor Organic Contaminants in Energy	128
Efficient Homes, Investigation of Air Quality in Energy	228
Efficient Houses, Seminars on Ventilation of Energy	69
Efficient Housing Demonstration Project, Energy	5
Efficient Northern Housing, Energy	37
Efficient Office Building, Air Quality in an Energy	49
Electron Microscopy, Effect of Indoor Environmental Factors on Human	
Platelets, as Seen by Transmission	99
Electronic Air Filters, Development of Alternative	94
Electronic Instrumentation, Custom	188
Elementary Schools, Indoor/Outdoor Air Quality Relationships for Homes	
and	237
Elliot Lake, Ontario, Remedial Measures for the Radiation Reduction and	
Radioactive Contamination of	140
Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The Reduction	
of Indoor Formaldehyde Gas and That	41
Emission Chamber, Dynamic	165
Emission Rates, Identification of Formaldehyde Sources and	221
Emissions From Gas Stoves, Contaminant	161
Emissions From Kerosene Heaters, Contaminant	162
Emissions from ParticleBoard, Field Study of Formaldehyde	163
Emissions from Polyurethane Foam Insulation on Domestic Storage Tank	
Water Heaters	157
Emissions from Polyurethane Foam, Indoor	158
Emissions from Video Display Terminals, Radiation	89
Emissions from Woodstoves	31
Emissions, Effects of Automotive	73
Emissions, Indoor Air Quality Studies, Particularly Radon	130

Keyword in Context Index - Project Titles in Alphabetical Order

Energy Conservation R&D Plan, Federal Building	92
Energy Conservation Studies	215
Energy Conservation and Air Quality, Homeowner Information on	67
Energy Conservation and Indoor Air Quality	192
Energy Conservation and Indoor Air Quality, Interaction Between	30
Energy Conservation in Buildings	20
Energy Conservation in Buildings, Chemical Hazards and	76
Energy Conservation on Indoor Air Quality, Impact of	182
Energy Efficient Buildings Program	72
Energy Efficient Buildings, Indoor Organic Contaminants in	128
Energy Efficient Homes, Investigation of Air Quality in	228
Energy Efficient Houses, Seminars on Ventilation of	69
Energy Efficient Housing Demonstration Project	5
Energy Efficient Northern Housing	37
Energy Efficient Office Building, Air Quality in an	49
Energy House Construction, A New Approach to Affordable Low	5
Energy Houses, Air Quality in Low	167
Energy Houses, Low	80
Energy Implications of Various Outdoor Air Ventilation Standards for Office Buildings	232
Energy Leakage Project (H.E.L.P.), Home	180
Energy Saving Measures Used in the ER-1 Conservation/ Solar Research House, Assessment of the	5
Energy-related Impacts of Regulations, Socio-economic and	57
Engineering Appraisal, Research, Advice and Testing re Air Quality	10
Engineering, Building Science and	20
Enhanced Radiation Levels in Port Hope, Potential Health Impact of	39
Entry from Flush Vents at Roof Level Intakes, Critical Wind Speeds for Maximum Exhaust Gas	6
Envelope Heat Losses, A Study of Residential Housing	7
Envelope Upgrading, Thermal	233
Environment Assessment, Office	106
Environment in Office Buildings, Quality of the Working	153
Environment, Contaminants from Residential Combustion Appliances in the Indoor	70
Environment, Formaldehyde in the Indoor	90
Environmental Allergy, Self-help Group to Aid Persons with	104
Environmental Analysis Using Gas Chromatography and Mass Spectrometry	189
Environmental Factors in Chronic Lung Disease	102
Environmental Factors on Human Platelets, as Seen by Transmission Electron Microscopy, Effect of Indoor	99
Environmental Health Factors in Falling Accidents	32
Environmental Health Unit, Occupational and	193
Environmental Laboratory and Field Services, Comprehensive	75
Environmental Literature Collection	118
Environmental Monitoring (1982), Working Group on	194
Environmental Newsletter, Bi-Monthly	129
Environmental Performance of Office Buildings	135
Environmental and Socio-economic Impact, Air Quality Monitoring,	44
Environments, Comprehensive Planning, Programming and Evaluation of	

Keyword in Context Index - Project Titles in Alphabetical Order

Interior	118
Environments, Measurement of Inorganic Contaminants in Indoor	145
Environments, Measurement of Organic Contaminants in Indoor	147
Environments, Programming, Design and Evaluation of Built	136
Environments, Sampling and Evaluation of Interior	226
Environments, Strategies for Healthful Residential	79
Equilibrium Factor "f)", The Seasonal Fluctuation of the Radon	
Daughter to Parent Radon Ratio (commonly Known as the	39
Equipment for Fine Particulates and Gaseous Pollutants, Filtering	90
Equipment, Household Facilities and	15
Equipment: Gaseous Pollutants, Filtering	90
Estimates of Building Surface Concentrations from Nearby Point Sources	6
Estimating Air Intake Contamination from Nearby Exhaust Vents, A Design	
Procedure for	6
Estimation of Total Human Exposure to Pollutants, The	168
Et Corriger les Défauts de l'Isolation , J'isole Mieux, Repérer	67
Et à ses sous-produits, Analyse Des Éventuelles Réactions	
D'hypersensibilité à La Mousse Isolante D'urée-formaldehyde	154
Evaluation Techniques, Studies in Air Quality Analysis and Building	105
Evaluation of Air Cleaning Devices With Respect to Formaldehyde	119
Evaluation of Air Exchange Levels (Elliot Lake)	210
Evaluation of Built Environments, Programming, Design and	136
Evaluation of Departmental Houses, Field Performance	36
Evaluation of Interior Environments, Comprehensive Planning,	
Programming and	118
Evaluation of Interior Environments, Sampling and	226
Evaluation of Radon and Air Quality Control Techniques	93
Evaluation of Remedial Measures in UFFI Homes	205
Evaluation of Unvented Kerosene Heaters, Safety	224
Evaluation, Residential Chimney Backdraft Checklist: Design and	30
Evaluations, Indoor Air Quality	65
Éventuelles réactions d'hypersensibilité à la mousse isolante	
d'urée-formaldehyde et à ses sous-produits, Analyse Des	154
Examination of Hypersensitive Individuals, Exploratory	115
Exchange Guidelines: Ontario Building Code 1983, Changes in Air	210
Exchange Levels (Elliot Lake), Evaluation of Air	210
Exchange Products and Newsletter, Air	74
Exhaust Gas Entry from Flush Vents at Roof Level Intakes, Critical Wind	
Speeds for Maximum	6
Exhaust Gases in Academic Research Buildings, Recirculation of	21
Exhaust Stack Height on Contaminant Concentration at Roof Level, The	
Effect of Varying	6
Exhaust Velocity and Wind Incidence Angle on Dilution from Roof Vents,	
Influence of	6
Exhaust Vents, A Design Procedure for Estimating Air Intake	
Contamination from Nearby	6
Exhaust Vents, Contamination of Air Intakes from Roof	6
Experience of the Public Health Branch, Indoor Air Pollution:	101
Experience with Chemical Scrubbers for Formaldehyde, Field	13
Expert Advisory Committee on Dioxins	150

Keyword in Context Index - Project Titles in Alphabetical Order

Exploratory Examination of Hypersensitive Individuals	115
Exposing the Fungicide, Triforine, to NO ₂ Gas, Production of Nitrosopiperazines on	2
Exposure in a Case Control Study of Lung Cancers in Port Hope, Ontario, Calculation of Radiation	39
Exposure of Asthma Patients to UFFI Gases and Formaldehyde, Controlled	185
Exposure to Air Pollutants, Models for Indoor and Outdoor	168
Exposure to Asbestos Fibers, Controlling Workplace	116
Exposure to Pollutants, The Estimation of Total Human	168
Exposure, Interim Guidelines for Domestic Formaldehyde	29
Facilities Design for Air Cleaning and Monitoring	191
Facilities and Equipment, Household	15
Facilities, Libraries with Data Access	265
Facility, Alberta Home Heating Research	7
Factor "f")", The Seasonal Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly Known as the Equilibrium	39
Factors and Trace Organics, Indoor Air Quality Analysis for Microbial	68
Factors in Chronic Lung Disease, Environmental	102
Factors in Falling Accidents, Environmental Health	32
Factors on Human Platelets, as Seen by Transmission Electron Microscopy, Effect of Indoor Environmental	99
Factors that Influence Assessments of Health Effects of Air Pollution	222
Facts and Policy Issues Regarding Indoor Air Quality	198
Falling Accidents, Environmental Health Factors in	32
Farm, Toxic Chemicals on the	127
Federal Assistance Program for UFFI Homeowners	120
Federal Building Energy Conservation R&D Plan	92
Federal-Provincial Working Group on Indoor Air Quality	148
Federally Supported Research in Universities, Directory of	260
Fibers, Controlling Workplace Exposure to Asbestos	116
Field Experience with Chemical Scrubbers for Formaldehyde	13
Field Measurement of Material Off-Gassing, Methods for	164
Field Performance Evaluation of Departmental Houses	36
Field Research on Indoor Air Quality	236
Field Services, Comprehensive Environmental Laboratory and	75
Field Study of Formaldehyde Emissions from ParticleBoard	163
Field Survey Results and Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of	23
Field, Monitoring of Developments in the Indoor Air Quality	65
Fields Near VDTs, Very Low Frequency	89
Filter Efficiency Study, Optimum Air	133
Filtering Equipment for Fine Particulates and Gaseous Pollutants	90
Filtering Equipment: Gaseous Pollutants	90
Filters, Development of Alternative Electronic Air	94
Filters, Preparation and Analysis of Air Sampling	27
Filtration, Assessment of Medium Efficiency Air	208

Keyword in Context Index - Project Titles in Alphabetical Order

Filtration, Upgrading Residential Forced Air	78
Fine Particulates and Gaseous Pollutants, Filtering Equipment for	90
Fire-gutted Homes, Investigations of Potential Respiratory Irritants or Allergens in Thermally Insulated or	52
Fireplace Damper, Retrofit	3
Fireplaces, Fresh Air Intake for	4
Flow Correlations for Varying House Construction, Air Leakage	6
Flow Performance of Chimney Flues, Thermal and	211
Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f")", The Seasonal	39
Fluctuations from a Ground Level Source, Predicting the Spatial Distribution of Concentration	6
Flues, Thermal and Flow Performance of Chimney	211
Flush Vents at Roof Level Intakes, Critical Wind Speeds for Maximum Exhaust Gas Entry from	6
Foam Insulation (UFFI) Home Testing, Urea-Formaldehyde	100
Foam Insulation (UFFI), The Reduction of Indoor Formaldehyde Gas and That Emanating From Urea-Formaldehyde	41
Foam Insulation Centre, Urea-Formaldehyde	120
Foam Insulation and its Byproducts, Analysis of Possible Hypersensitivity Reactions to Urea-Formaldehyde	154
Foam Insulation from Masonry Structures, Removal of Urea-Formaldehyde	220
Foam Insulation in Homes, Urea-Formaldehyde	21
Foam Insulation on Domestic Storage Tank Water Heaters, Emissions from Polyurethane	157
Foam Insulation, Adverse Health Effects from Urea-Formaldehyde	217
Foam Insulation, Chemical Susceptibility and Urea-Formaldehyde	172
Foam Insulation, Consensus Conference on Health Problems Potentially Related to Urea Formaldehyde	155
Foam Insulation, Dust Associated with Urea-Formaldehyde	1
Foam Insulation, Investigation of Homes with Urea-Formaldehyde	64
Foam Insulation, Technical Support for the Investigation of Problems Associated with Urea-formaldehyde	174
Foam Insulation, Workshop on Development of Biological Indicators for the Effects of Urea-Formaldehyde	151
Foam Insulation; May 17/18, 1983, Proceedings of the Workshop on Urea-Formaldehyde	173
Foam Insulation; October 1982, Transcription of the Proceedings of the Workshop on Urea-Formaldehyde	152
Foam, Indoor Emissions from Polyurethane	158
Forced Air Filtration, Upgrading Residential	78
Formaldehyde Assay Kit	127
Formaldehyde Concentration in Carcass Storage Rooms of the College of Veterinary Medicine, Airborne	48
Formaldehyde Dosimeters, Analysis of	213
Formaldehyde Emissions from ParticleBoard, Field Study of	163
Formaldehyde Exposure, Interim Guidelines for Domestic	29
Formaldehyde Foam Insulation, Consensus Conference on Health Problems Potentially Related to Urea	155
Formaldehyde Gas Collection Impingers, Efficiency of	179

Keyword in Context Index - Project Titles in Alphabetical Order

Formaldehyde Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The Reduction of Indoor	41
Formaldehyde Levels in Wall Cavities of UFFI-Insulated Buildings, The Measurement of	14
Formaldehyde Levels, Relationships to Indoor Living Space	14
Formaldehyde Levels, Techniques to Reduce	230
Formaldehyde Measurements in Schools and Homes	13
Formaldehyde Monitoring Devices, Investigations into Various	175
Formaldehyde Sources and Emission Rates, Identification of	221
Formaldehyde and Air Contamination Committee	29
Formaldehyde and Air Contamination, Report of the Subcommittee on	62
Formaldehyde in UFFI Homes, Sampling and Analysis of	119
Formaldehyde in UFFI Homes, Sampling and Analysis of	124
Formaldehyde in UFFI Homes, Testing and Analysis of	177
Formaldehyde in the Indoor Environment	90
Formaldehyde, Controlled Exposure of Asthma Patients to UFFI Gases and	185
Formaldehyde, Evaluation of Air Cleaning Devices With Respect to	119
Formaldehyde, Field Experience with Chemical Scrubbers for	13
Formation in Nitrogen Dioxide Gas, NitrosoBaygon	2
Formation of NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas: II.	2
Frequency Fields Near VDTs, Very Low	89
Fresh Air Intake for Fireplaces	4
Fresh-Air Ventilation Systems in Detached Houses, Mechanical	171
Fuel Combustion and Ventilation, Response to Inquiries on	181
Fuel-fired Appliances: Combustion Air Requirements Regulations	181
Fungicide, Triforine, to NO ₂ Gas, Production of Nitrosopiperazines on Exposing the	2
Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of	23
Future Problems: Pt. 2, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of	24
Future Problems: Pt. 3, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of	25
Future Radon Levels at a Proposed Building Site	139
Gas Appliances, Improved Safety of Vented	137
Gas Chromatography and Mass Spectrometry, Environmental Analysis Using	189
Gas Collection Impingers, Efficiency of Formaldehyde	179
Gas Entry from Flush Vents at Roof Level Intakes, Critical Wind Speeds for Maximum Exhaust	6
Gas Stoves, Contaminant Emissions From	161
Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The Reduction of Indoor Formaldehyde	41
Gas, NitrosoBaygon Formation in Nitrogen Dioxide	2
Gas, Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO ₂	2
Gas: I. Identification of NitrosoBaygon, Production of NitrosoBaygon from Baygon in NO ₂	2
Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂	2

Keyword in Context Index - Project Titles in Alphabetical Order

Gaseous Pollutants, Filtering Equipment for Fine Particulates and	90
Gaseous Pollutants, Filtering Equipment:	90
Gases and Formaldehyde, Controlled Exposure of Asthma Patients to UFFI	185
Gases in Academic Research Buildings, Recirculation of Exhaust	21
Getting Hard Copy of Desired Articles	275
Ground Level Source, Predicting the Spatial Distribution of Concentration Fluctuations from a	6
Group of Low Leakage Houses, Air Quality Measurements in a	167
Group on Environmental Monitoring (1982), Working	194
Group on Indoor Air Quality, Federal-Provincial Working	148
Group to Aid Persons with Environmental Allergy, Self-help	104
Guide, Air Changer Application	80
Guidelines for Domestic Formaldehyde Exposure, Interim	29
Guidelines: Ontario Building Code 1983, Changes in Air Exchange	210
HEATLINE Telephone Advisory Service	144
HVAC Design	59
Habitations, Comite Sur La Qualite De L'air Dans Les	184
Habits, Survey of Smoking	17
Handle Indoor Air Pollution Problems, Demands on Health Inspectors and Resources Needed to	21
Hard Copy of Desired Articles, Getting	275
Hazard, Home as a	77
Hazardous Heating and Ventilating Conditions in Housing	203
Hazards and Energy Conservation in Buildings, Chemical	76
Hazards in the Home	22
Health Act - Designated Substances, Occupational Safety and	156
Health Branch, Indoor Air Pollution: Experience of the Public	101
Health Clinic, Occupational	9
Health Effects from Urea-Formaldehyde Foam Insulation, Adverse	217
Health Effects of Air Pollution, Factors That Influence Assessments of	222
Health Effects of Particulates and SO ₂ Level in Air Pollution	103
Health Factors in Falling Accidents, Environmental	32
Health Impact of Enhanced Radiation Levels in Port Hope, Potential	39
Health Inspectors and Resources Needed to Handle Indoor Air Pollution Problems, Demands on	21
Health Investigation of Three Schools, Indoor Air Quality and	51
Health Problems Potentially Related to Urea Formaldehyde Foam Insulation, Consensus Conference on	155
Health Records of School Children in UFFI Homes, Historic	219
Health Standards for Residential Construction, Updating	79
Health Survey, Canada	16
Health Unit, Occupational and Environmental	193
Health and Comfort Complaints in the Workplace, Investigation of	55
Health and Safety Advisory Panel	223
Health and Safety, Inquiries Services for Occupational	89
Healthful Residential Environments, Strategies for	79
Heat Losses, A Study of Residential Housing Envelope	7
Heat Recovery Ventilators, Indoor Air Quality Effects of	207
Heaters, Contaminant Emissions From Kerosene	162
Heaters, Emissions from Polyurethane Foam Insulation on Domestic	

Keyword in Context Index - Project Titles in Alphabetical Order

Storage Tank Water	157
Heaters, Safety Evaluation of Unvented Kerosene	224
Heaters, Testing of Unvented Kerosene	225
Heating Research Facility, Alberta Home	7
Heating and Ventilating Conditions in Housing, Hazardous	203
Heating and Ventilation of Residences	231
Height on Contaminant Concentration at Roof Level, The Effect of Varying Exhaust Stack	6
Hill Demonstration Project: An Air Sealing Study, Richmond	211
Historic Health Records of School Children in UFFI Homes	219
Holdings in Indoor Air Quality, Library	246
Home Demonstration Program: Air Quality Monitoring, R-2000 Low-Energy	143
Home Energy Leakage Project (H.E.L.P.)	180
Home Heating Research Facility, Alberta	7
Home Insulation Conflict and Confusion, Canadian Answer Book to	67
Home Testing, Urea-Formaldehyde Foam Insulation (UFFI)	100
Home as a Hazard	77
Home, Hazards in the	22
Homeowner Information on Energy Conservation and Air Quality	67
Homeowners and Contractors, Remedial Measures Advice for UFFI	211
Homeowners, Federal Assistance Program for UFFI	120
Homes and Elementary Schools, Indoor/Outdoor Air Quality Relationships for	237
Homes with Urea-Formaldehyde Foam Insulation, Investigation of	64
Homes, Design and Construction of Low-Energy and Low-Pollution	80
Homes, Evaluation of Remedial Measures in UFFI	205
Homes, Formaldehyde Measurements in Schools and	13
Homes, Historic Health Records of School Children in UFFI	219
Homes, Investigation of Air Quality in Energy Efficient	228
Homes, Investigations of Potential Respiratory Irritants or Allergens in Thermally Insulated or Fire-gutted	52
Homes, Measurement of Radon and Radon Daughters in Canadian	149
Homes, Program for Monitoring Indoor Air Quality in	98
Homes, Remedial Measures for UFFI	40
Homes, Sampling and Analysis of Formaldehyde in UFFI	119
Homes, Sampling and Analysis of Formaldehyde in UFFI	124
Homes, Studies on Indoor Air Quality in Canadian	86
Homes, Testing Air Quality in Weatherized	209
Homes, Testing and Analysis of Formaldehyde in UFFI	177
Homes, Testing of UFFI	58
Homes, Urea-Formaldehyde Foam Insulation in	21
Hope, Ontario, Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in Port	39
Hope, Potential Health Impact of Enhanced Radiation Levels in Port	39
House Construction, A New Approach to Affordable Low Energy	5
House Construction, Air Leakage Flow Correlations for Varying	6
House, Assessment of the Energy Saving Measures Used in the ER-1 Conservation/ Solar Research	5
Household Facilities and Equipment	15
Household Pollutants and Householder Education	183

Keyword in Context Index - Project Titles in Alphabetical Order

Householder Education, Household Pollutants and	183
Houses, Air Infiltration Characteristics of	166
Houses, Air Quality Measurements in a Group of Low Leakage	167
Houses, Air Quality in	159
Houses, Air Quality in Low Energy	167
Houses, Field Performance Evaluation of Departmental	36
Houses, Humidity, Condensation and Ventilation in	169
Houses, Identifying Ventilation-Troubled	238
Houses, Low Energy	80
Houses, Mechanical Fresh-Air Ventilation Systems in Detached	171
Houses, Modelling the Movement of Radon Through Soil into	138
Houses, Seminars on Ventilation of Energy Efficient	69
Housing Demonstration Project, Energy Efficient	5
Housing Envelope Heat Losses, A Study of Residential	7
Housing Technology, Indoor Air Pollution and	85
Housing Technology, Literature Review on Indoor Air Pollution and	85
Housing, Air Quality in Animal	112
Housing, Energy Efficient Northern	37
Housing, Hazardous Heating and Ventilating Conditions in	203
Housing: Analysis of Field Survey Results and Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA	23
Housing: Literature Review and Research: Pt. 2, Moisture Induced Problems in NHA	24
Housing: Applicable Moisture Reduction Techniques for Newfoundland: Pt. 3, Moisture Induced Problems in NHA	25
Human Exposure to Pollutants, The Estimation of Total	168
Human Platelets, as Seen by Transmission Electron Microscopy, Effect of Indoor Environmental Factors on	99
Humidity Control, Ventilation for	206
Humidity, Condensation and Ventilation in Houses	169
Hydrocarbons, Chemical and Mutagenic Activity of Adsorbed Polycyclic Aromatic	199
Hydrocarbons, Indoor Air Quality Analysis: Polycyclic Aromatic	146
Hypersensitive Individuals, Exploratory Examination of	115
Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts, Analysis of Possible	154
I. Identification of NitrosoBaygon, Production of NitrosoBaygon from Baygon in NO ₂ Gas:	2
II. Formation ² of NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas:	2
Identification of Formaldehyde Sources and Emission Rates	221
Identification of NitrosoBaygon, Production of NitrosoBaygon from Baygon in NO ₂ Gas: I.	2
Identifying Ventilation-Troubled Houses	238
Immunopharmacology, International Journal of	127
Impact of Energy Conservation on Indoor Air Quality	182
Impact of Enhanced Radiation Levels in Port Hope, Potential Health	39
Impact, Air Quality Monitoring, Environmental and Socio-economic	44
Impacts of Regulations, Socio-economic and Energy-related	57
Impingers, Efficiency of Formaldehyde Gas Collection	179

Keyword in Context Index - Project Titles in Alphabetical Order

Implications of Various Outdoor Air Ventilation Standards for Office Buildings, Energy	232
Improved Safety of Vented Gas Appliances	137
Incidence Angle on Dilution from Roof Vents, Influence of Exhaust Velocity and Wind	6
Indicators for the Effects of Urea-Formaldehyde Foam Insulation, Workshop on Development of Biological	151
Individuals, Exploratory Examination of Hypersensitive	115
Indoor Air Contaminants, Chemistry and Monitoring of	175
Indoor Air Contaminants, Standards for Methods of Measurement of	34
Indoor Air Monitoring for Asbestos	95
Indoor Air Pollutants, Education and Rehabilitation of Persons Sensitized to	107
Indoor Air Pollution From Woodburning Stoves	18
Indoor Air Pollution Monitoring	192
Indoor Air Pollution Problems, Demands on Health Inspectors and Resources Needed to Handle	21
Indoor Air Pollution and Housing Technology	85
Indoor Air Pollution and Housing Technology, Literature Review on	85
Indoor Air Pollution: Experience of the Public Health Branch	101
Indoor Air Quality Analysis for Microbial Factors and Trace Organics	68
Indoor Air Quality Analysis: Polycyclic Aromatic Hydrocarbons	146
Indoor Air Quality Databank	108
Indoor Air Quality Effects of Heat Recovery Ventilators	207
Indoor Air Quality Evaluations	65
Indoor Air Quality Field, Monitoring of Developments in the	65
Indoor Air Quality Investigation and Analysis	38
Indoor Air Quality Investigations	109
Indoor Air Quality Measurement - Commercial and Industrial	18
Indoor Air Quality Measurements	131
Indoor Air Quality Measurements for Offices and Residences	178
Indoor Air Quality Monitoring: Commercial/Industrial	82
Indoor Air Quality Research Notes	252
Indoor Air Quality Sampling	28
Indoor Air Quality Sampling and Analysis	11
Indoor Air Quality Sampling and Analysis	91
Indoor Air Quality Sampling, Laboratory Services for	75
Indoor Air Quality Sampling, Monitoring and Modelling	117
Indoor Air Quality Studies	21
Indoor Air Quality Studies and Measurement	12
Indoor Air Quality Studies, Particularly Radon Emissions	130
Indoor Air Quality Testing, Odour Measurement and Control	128
Indoor Air Quality and Health Investigation of Three Schools	51
Indoor Air Quality and Risk Assessment	60
Indoor Air Quality and Weathersealing, Relationship Between	187
Indoor Air Quality in Canadian Homes, Studies on	86
Indoor Air Quality in Cold Climates, International Specialty Conference on	202
Indoor Air Quality in Homes, Program for Monitoring	98
Indoor Air Quality, Canadian Issues and Opportunities in	200

Keyword in Context Index - Project Titles in Alphabetical Order

Indoor Air Quality, Criteria Reviews of	83
Indoor Air Quality, Energy Conservation and	192
Indoor Air Quality, Facts and Policy Issues Regarding	198
Indoor Air Quality, Federal-Provincial Working Group on	148
Indoor Air Quality, Field Research on	236
Indoor Air Quality, Impact of Energy Conservation on	182
Indoor Air Quality, Interaction Between Energy Conservation and	30
Indoor Air Quality, Library Holdings in	246
Indoor Air Quality, Literature Review Capability:	197
Indoor Air Quality, Periodicals Containing Articles Relating to	243
Indoor Air Quality, Project Management and Research in	190
Indoor Air Quality, Seminar Courses Pertaining to	66
Indoor Air Quality, Seminar on	19
Indoor Air Quality, Trace Organic Laboratory for Analyzing	156
Indoor Air Quality, Ventilation Standards for Acceptable	19
Indoor Air Quality: Industrial	134
Indoor Carbon Dioxide Monitoring	84
Indoor Emissions from Polyurethane Foam	158
Indoor Environment, Contaminants from Residential Combustion Appliances in the	70
Indoor Environment, Formaldehyde in the	90
Indoor Environmental Factors on Human Platelets, as Seen by Transmission Electron Microscopy, Effect of	99
Indoor Environments, Measurement of Inorganic Contaminants in	145
Indoor Environments, Measurement of Organic Contaminants in	147
Indoor Formaldehyde Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The Reduction of	41
Indoor Inhalant Sensitivities	81
Indoor Living Space Formaldehyde Levels, Relationships to	14
Indoor Organic Contaminants in Energy Efficient Buildings	128
Indoor Pollutants, Information and Support for Persons Susceptible to	96
Indoor Pollution Research, State-of-the-Art Review of	88
Indoor Problems, Physiological Reactions to the Sum of All	196
Indoor and Outdoor Exposure to Air Pollutants, Models for	168
Indoor/Outdoor Air Quality Relationships for Homes and Elementary Schools	237
Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems: Pt. 1, Moisture	23
Induced Problems in NHA Housing: Literature Review and Research: Pt. 2, Moisture	24
Induced Problems in NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland: Pt. 3, Moisture	25
Industrial Air Quality	6
Industrial and Residential Buildings, Ventilation and Space Conditioning in Commercial,	20
Industrial, Indoor Air Quality Measurement - Commercial and	18
Industrial, Indoor Air Quality:	134
Infiltration Analysis, Air Movement and	20
Infiltration Characteristics of Houses, Air	166
Infiltration Monitoring, Air	97
Infiltration Review and Additions to AIRBASE, Air	252

Keyword in Context Index - Project Titles in Alphabetical Order

Influence Assessments of Health Effects of Air Pollution, Factors That	222
Influence of Exhaust Velocity and Wind Incidence Angle on Dilution from	
Roof Vents	6
Information Base	241
Information Base, Research and	86
Information and Complaint Service, Consumer	45
Information and Support for Persons Susceptible to Indoor Pollutants	96
Information and Support for Persons with Allergies	81
Information on Energy Conservation and Air Quality, Homeowner	67
Inhalant Sensitivities, Indoor	81
Inorganic Contaminants in Indoor Environments, Measurement of	145
Inquiries Services for Occupational Health and Safety	89
Inquiries on Fuel Combustion and Ventilation, Response to	181
Inspectors and Resources Needed to Handle Indoor Air Pollution	
Problems, Demands on Health	21
Instrumentation, Custom Electronic	188
Insulated or Fire-gutted Homes, Investigations of Potential Respiratory	
Irritants or Allergens in Thermally	52
Insulation (UFFI) Home Testing, Urea-Formaldehyde Foam	100
Insulation (UFFI), The Reduction of Indoor Formaldehyde Gas and That	
Emanating From Urea-Formaldehyde Foam	41
Insulation Aftermath	67
Insulation Centre, Urea-Formaldehyde Foam	120
Insulation Conflict and Confusion, Canadian Answer Book to Home	67
Insulation and its Byproducts, Analysis of Possible Hypersensitivity	
Reactions to Urea-Formaldehyde Foam	154
Insulation from Masonry Structures, Removal of Urea-Formaldehyde Foam	220
Insulation in Homes, Urea-Formaldehyde Foam	21
Insulation on Domestic Storage Tank Water Heaters, Emissions from	
Polyurethane Foam	157
Insulation, Adverse Health Effects from Urea-Formaldehyde Foam	217
Insulation, Chemical Susceptibility and Urea-Formaldehyde Foam	172
Insulation, Consensus Conference on Health Problems Potentially Related	
to Urea Formaldehyde Foam	155
Insulation, Dust Associated with Urea-Formaldehyde Foam	1
Insulation, Investigation of Homes with Urea-Formaldehyde Foam	64
Insulation, Technical Support for the Investigation of Problems	
Associated with Urea-formaldehyde Foam	174
Insulation, Workshop on Development of Biological Indicators for the	
Effects of Urea-Formaldehyde Foam	151
Insulation; May 17/18, 1983, Proceedings of the Workshop on	
Urea-Formaldehyde Foam	173
Insulation; October 1982, Transcription of the Proceedings of the	
Workshop on Urea-Formaldehyde Foam	152
Intake Contamination from Nearby Exhaust Vents, A Design Procedure for	
Estimating Air	6
Intake for Fireplaces, Fresh Air	4
Intakes from Roof Exhaust Vents, Contamination of Air	6
Intakes, Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush	
Vents at Roof Level	6

Keyword in Context Index - Project Titles in Alphabetical Order

Interaction Between Energy Conservation and Indoor Air Quality	30
Interaction of Nitrogen Oxides in Air and Certain Classes of Pesticides	2
Interaction of a Roof Level Plume with a Downwind Building	6
Interim Guidelines for Domestic Formaldehyde Exposure	29
Interior Environments, Comprehensive Planning, Programming and Evaluation of	118
Interior Environments, Sampling and Evaluation of	226
International Journal of Immunopharmacology	127
International Specialty Conference on Indoor Air Quality in Cold Climates	202
Investigation Techniques, Site	39
Investigation and Analysis, Indoor Air Quality	38
Investigation in University Classrooms, Airborne Asbestos	46
Investigation of Air Quality in Energy Efficient Homes	228
Investigation of Air Quality in Sick Buildings	227
Investigation of Health and Comfort Complaints in the Workplace	55
Investigation of Homes with Urea-Formaldehyde Foam Insulation	64
Investigation of Problems Associated with Urea-formaldehyde Foam Insulation, Technical Support for the	174
Investigation of Three Schools, Indoor Air Quality and Health	51
Investigation of an Office Building for Possible Presence of Airborne Asbestos, Air Quality	47
Investigations Into Cost Effective UFFI Removal Techniques	230
Investigations and Literature Reviews, Building	61
Investigations into Various Formaldehyde Monitoring Devices	175
Investigations of Potential Respiratory Irritants or Allergens in Thermally Insulated or Fire-gutted Homes	52
Investigations, Indoor Air Quality	109
Irritants or Allergens in Thermally Insulated or Fire-gutted Homes, Investigations of Potential Respiratory	52
Isolante d'urée-formaldehyde et à ses sous-produits, Analyse Des Éventuelles Réactions D'hypersensibilité à La Mousse	154
Issues Regarding Indoor Air Quality, Facts and Policy	198
Issues and Opportunities in Indoor Air Quality, Canadian	200
J'isole Mieux, Repérer et Corriger les Défauts de l'Isolation	67
Journal of Immunopharmacology, International	127
Kerosene Heaters, Contaminant Emissions From	162
Kerosene Heaters, Safety Evaluation of Unvented	224
Kerosene Heaters, Testing of Unvented	225
Kit, Formaldehyde Assay	127
Know About Asbestos, What You Should	62
Known as the Equilibrium Factor "F") , The Seasonal Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly	39
L'Isolation , J'isole Mieux, Repérer Et Corriger Les Défauts De	67
L'air dans les habitations, Comité Sur La Qualité De	184
La MIUF, UFFI Centre / Centre Sur	120
La mousse isolante d'urée-formaldehyde et à ses sous-produits, Analyse Des Éventuelles Réactions D'hypersensibilité à	154
La qualité de l'air dans les habitations, Comité Sur	184

Keyword in Context Index - Project Titles in Alphabetical Order

La qualite du milieu de travail dans les edifices a bureaux, Projet De Recherche Sur	153
Laboratory Registration Program	213
Laboratory Services for Indoor Air Quality Sampling	75
Laboratory and Field Services, Comprehensive Environmental	75
Laboratory for Analyzing Indoor Air Quality, Trace Organic	156
Lake), Evaluation of Air Exchange Levels (Elliot	210
Lake, Ontario, Remedial Measures for the Radiation Reduction and Radioactive Contamination of Elliot	140
Large Office Building, Airborne Asbestos Particles in a	54
Leakage Flow Correlations for Varying House Construction, Air	6
Leakage Houses, Air Quality Measurements in a Group of Low	167
Leakage Project (H.E.L.P.), Home Energy	180
Leakage in Calgary Residences, A Study of Air	8
Les Defauts de l'Isolation", J'isole Mieux, Reperer Et Corriger	67
Les edifices a bureaux, Projet De Recherche Sur La Qualite Du Milieu De Travail Dans	153
Les habitations, Comite Sur La Qualite De L'air Dans	184
Level Intakes, Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof	6
Level Plume with a Downwind Building, Interaction of a Roof	6
Level Profile, The Radon/Working	39
Level Source, Predicting the Spatial Distribution of Concentration Fluctuations from a Ground	6
Level in Air Pollution, Health Effects of Particulates and SO ₂	103
Level, The Effect of Varying Exhaust Stack Height on Contaminant Concentration at Roof	6
Levels (Elliot Lake), Evaluation of Air Exchange	210
Levels at a Proposed Building Site, Future Radon	139
Levels in Port Hope, Potential Health Impact of Enhanced Radiation	39
Levels in Wall Cavities of UFFI-Insulated Buildings, The Measurement of Formaldehyde	14
Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂	2
Levels, Relationships to Indoor Living Space Formaldehyde	14
Levels, Techniques to Reduce Formaldehyde	230
Libraries with Data Access Facilities	265
Library Holdings in Indoor Air Quality	246
Line, Ventilation Standards for Areas North of the Tree	204
Literature Collection, Environmental	118
Literature Research and Air Quality Monitoring	73
Literature Review Capability: Indoor Air Quality	197
Literature Review and Analysis re Ventilation Standards	35
Literature Review and Research: Pt. 2, Moisture Induced Problems in NHA Housing:	25
Literature Review on Indoor Air Pollution and Housing Technology	85
Literature Reviews, Building Investigations and	61
Literature Surveys, Air Quality Research: Measurement and	83
Living Space Formaldehyde Levels, Relationships to Indoor	14
Losses, A Study of Residential Housing Envelope Heat	7

Keyword in Context Index - Project Titles in Alphabetical Order

Low Energy House Construction, A New Approach to Affordable	5
Low Energy Houses	80
Low Energy Houses, Air Quality in	167
Low Frequency Fields Near VDTs, Very	89
Low Leakage Houses, Air Quality Measurements in a Group of	167
Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at	2
Low-Energy Home Demonstration Program: Air Quality Monitoring, R-2000	143
Low-Energy and Low-Pollution Homes, Design and Construction of	80
Low-Pollution Homes, Design and Construction of Low-Energy and	80
Lung Cancers in Port Hope, Ontario, Calculation of Radiation Exposure in a Case Control Study of	39
Lung Disease, Environmental Factors in Chronic	102
MIUF, UFFI Centre / Centre Sur La	120
Major Canadian and U.S. Computer Data Base Systems, Using	255
Management and Research in Indoor Air Quality, Project	190
Masonry Structures, Removal of Urea-Formaldehyde Foam Insulation from	220
Mass Spectrometry, Environmental Analysis Using Gas Chromatography and	189
Material Off-Gassing, Methods for Field Measurement of	164
Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes, Critical Wind Speeds for	6
May 17/18, 1983, Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation;	173
Measurement - Commercial and Industrial, Indoor Air Quality	18
Measurement and Control, Indoor Air Quality Testing, Odour	128
Measurement and Literature Surveys, Air Quality Research:	83
Measurement of Formaldehyde Levels in Wall Cavities of UFFI-Insulated Buildings, The	14
Measurement of Indoor Air Contaminants, Standards for Methods of	34
Measurement of Inorganic Contaminants in Indoor Environments	145
Measurement of Material Off-Gassing, Methods for Field	164
Measurement of Organic Contaminants in Indoor Environments	147
Measurement of Radon and Radon Daughters in Canadian Homes	149
Measurement of UFFI Off-gassing	40
Measurement, Data Acquisition and Telemetry Systems Applicable to Air Quality	71
Measurement, Indoor Air Quality Studies and	12
Measurements for Offices and Residences, Indoor Air Quality	178
Measurements in Schools and Homes, Formaldehyde	13
Measurements in a Group of Low Leakage Houses, Air Quality	167
Measurements, Indoor Air Quality	131
Measures Advice for UFFI Homeowners and Contractors, Remedial	211
Measures Used in the ER-1 Conservation/ Solar Research House, Assessment of the Energy Saving	5
Measures for UFFI Homes, Remedial	40
Measures for the Radiation Reduction and Radioactive Contamination of Elliot Lake, Ontario, Remedial	140
Measures in UFFI Homes, Evaluation of Remedial	205
Measures, Comparison of UFFI and Non-UFFI Residents Before and After Remedial	218

Keyword in Context Index - Project Titles in Alphabetical Order

Mechanical Fresh-Air Ventilation Systems in Detached Houses	171
Medicine, Airborne Formaldehyde Concentration in Carcass Storage Rooms of the College of Veterinary	48
Medium Efficiency Air Filtration, Assessment of	208
Methods for Field Measurement of Material Off-Gassing	164
Methods of Measurement of Indoor Air Contaminants, Standards for	34
Microbial Factors and Trace Organics, Indoor Air Quality Analysis for	68
Microscopy, Effect of Indoor Environmental Factors on Human Platelets, as Seen by Transmission Electron	99
Mieux, Reperer et Corriger les Defauts de l'Isolation", J'isole	67
Milieu de travail dans les edifices a bureaux, Projet De Recherche Sur La Qualite Du	153
Modelling the Movement of Radon Through Soil into Houses	138
Modelling, Indoor Air Quality Sampling, Monitoring and	117
Models for Indoor and Outdoor Exposure to Air Pollutants	168
Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems: Pt. 1	23
Moisture Induced Problems in NHA Housing: Literature Review and Research: Pt. 2	24
Moisture Induced Problems in NHA Housing: Applicable Moisture Reduction Techniques or Newfoundland: Pt. 3	25
Monitoring (1982), Working Group on Environmental	194
Monitoring Devices, Investigations into Various Formaldehyde	175
Monitoring Indoor Air Quality in Homes, Program for	98
Monitoring and Modelling, Indoor Air Quality Sampling,	117
Monitoring for Asbestos, Indoor Air	95
Monitoring of Developments in the Indoor Air Quality Field	65
Monitoring of Indoor Air Contaminants, Chemistry and	175
Monitoring, Air Infiltration	97
Monitoring, Air Quality	42
Monitoring, Air Quality	235
Monitoring, Ambient Air	26
Monitoring, Environmental and Socio-economic Impact, Air Quality	44
Monitoring, Facilities Design for Air Cleaning and	191
Monitoring, Indoor Air Pollution	192
Monitoring, Indoor Carbon Dioxide	84
Monitoring, Literature Research and Air Quality	73
Monitoring, R-2000 Low-Energy Home Demonstration Program: Air Quality	143
Monitoring, Radiation	97
Monitoring: Commercial/Industrial, Indoor Air Quality	82
Mousse isolante d'uree-formaldehyde et a ses sous-produits, Analyse Des Eventuelles Reactions D'hypersensibilite a La	154
Movement Studies, Smoke	97
Movement and Infiltration Analysis, Air	20
Movement of Radon Through Soil into Houses, Modelling the	138
Mutagenic Activity of Adsorbed Polycyclic Aromatic Hydrocarbons, Chemical and	199
NHA Housing: Analysis of Field Survey Results and Projections of Future	

Keyword in Context Index - Project Titles in Alphabetical Order

Problems: Pt. 1, Moisture Induced Problems in	23
NHA Housing: Literature Review and Research: Pt. 2, Moisture Induced Problems in	24
NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland: Pt. 3, Moisture Induced Problems in	25
NO ₂ Gas, Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to	2
NO ₂ Gas: I. Identification of NitrosoBaygon, Production of NitrosoBaygon from Baygon in	2
NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in	2
NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low	2
National Research Council of Canada	169
Near VDTs, Very Low Frequency Fields	89
Nearby Exhaust Vents, A Design Procedure for Estimating Air Intake Contamination from	6
Nearby Point Sources, Estimates of Building Surface Concentrations from Needed to Handle Indoor Air Pollution Problems, Demands on Health Inspectors and Resources	6
New Approach to Affordable Low Energy House Construction, A	21
Newsletter, Air Exchange Products and	5
Newsletter, Bi-Monthly Environmental	74
Newsletters, Bibliographies, Update Services and	129
Nitrogen Dioxide Gas, NitrosoBaygon Formation in	251
Nitrogen Oxides in Air and Certain Classes of Pesticides, Interaction of NitrosoBaygon Formation in Nitrogen Dioxide Gas	2
NitrosoBaygon at Low NO ₂ Levels, Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of	2
NitrosoBaygon from Baygon in NO ₂ Gas: I. Identification of NitrosoBaygon, Production of	2
NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels, Production of	2
NitrosoBaygon, Production of NitrosoBaygon from Baygon in NO ₂ Gas: I. Identification of	2
Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO ₂ Gas, Production of	2
Non-Standard Work Schedules, TLV's for	38
Non-UFFI Residents Before and After Remedial Measures, Comparison of UFFI and	218
North of the Tree Line, Ventilation Standards for Areas	204
Northern Housing, Energy Efficient	37
Notes, Indoor Air Quality Research	252
Occupational Health Clinic	9
Occupational Health and Safety, Inquiries Services for	89
Occupational Safety and Health Act - Designated Substances	156
Occupational and Environmental Health Unit	193
October 1982, Transcription of the Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation;	152
Odour Measurement and Control, Indoor Air Quality Testing,	128

Keyword in Context Index - Project Titles in Alphabetical Order

Odour Problems at a Retail Store, Bad	49
Off-Gassing, Methods for Field Measurement of Material	164
Off-gassing, Measurement of UFFI	40
Office Building for Possible Presence of Airborne Asbestos, Air Quality Investigation of an	47
Office Building, Airborne Asbestos Particles in a Large	54
Office Building, Air Quality in an Energy Efficient	49
Office Buildings, Energy Implications of Various Outdoor Air Ventilation Standards for	232
Office Buildings, Environmental Performance of	135
Office Buildings, Quality of the Working Environment in	153
Office Environment Assessment	106
Offices and Residences, Indoor Air Quality Measurements for	178
Ontario Building Code 1983, Changes in Air Exchange Guidelines:	210
Ontario, Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in Port Hope,	39
Ontario, Remedial Measures for the Radiation Reduction and Radioactive Contamination of Elliot Lake,	140
Opportunities in Indoor Air Quality, Canadian Issues and	200
Optimization and Control, Ventilation Systems Design,	116
Optimum Air Filter Efficiency Study	133
Organic Contaminants in Energy Efficient Buildings, Indoor	128
Organic Contaminants in Indoor Environments, Measurement of	147
Organic Laboratory for Analyzing Indoor Air Quality, Trace	156
Organics, Indoor Air Quality Analysis for Microbial Factors and Trace	68
Organizations, Accreditation of Standards-Writing	33
Other Computer Data Bases, Accessing	277
Outdoor Air Ventilation Standards for Office Buildings, Energy Implications of Various	232
Outdoor Exposure to Air Pollutants, Models for Indoor and	168
Outside Air Supply, Carbon Dioxide Controlled	160
Oxides in Air and Certain Classes of Pesticides, Interaction of Nitrogen	2
Panel, Health and Safety Advisory	223
Parent Radon Ratio (commonly known as the Equilibrium Factor "f")", The Seasonal Fluctuation of the Radon Daughter to	39
ParticleBoard, Field Study of Formaldehyde Emissions from	163
Particles in a Curling Rink, Airborne Asbestos	53
Particles in a Large Office Building, Airborne Asbestos	54
Particles in a Printing Press, Airborne Asbestos	49
Particularly Radon Emissions, Indoor Air Quality Studies,	130
Particulates and Gaseous Pollutants, Filtering Equipment for Fine	90
Particulates and SO ₂ Level in Air Pollution, Health Effects of	103
Passive Sampler Systems, Development of	60
Passive Ventilation Systems, Performance of	170
Patients to UFFI Gases and Formaldehyde, Controlled Exposure of Asthma	185
Performance Database, Building	109
Performance Evaluation of Departmental Houses, Field	36
Performance of Chimney Flues, Thermal and Flow	211

Keyword in Context Index - Project Titles in Alphabetical Order

Performance of Office Buildings, Environmental	135
Performance of Passive Ventilation Systems	170
Periodicals Containing Articles Relating to Indoor Air Quality	243
Persons Sensitized to Indoor Air Pollutants, Education and Rehabilitation of	107
Persons Susceptible to Indoor Pollutants, Information and Support for	96
Persons with Allergies, Information and Support for	81
Persons with Environmental Allergy, Self-help Group to Aid	104
Pertaining to Indoor Air Quality, Seminar Courses	66
Pesticides, Interaction of Nitrogen Oxides in Air and Certain Classes of	2
Physiological Reactions to the Sum of all Indoor Problems	196
Plan, Federal Building Energy Conservation R&D	92
Planning, Programming and Evaluation of Interior Environments, Comprehensive	118
Platelets, as Seen by Transmission Electron Microscopy, Effect of Indoor Environmental Factors on Human	99
Plume with a Downwind Building, Interaction of a Roof Level	6
Point Sources, Estimates of Building Surface Concentrations from Nearby	6
Policy Issues Regarding Indoor Air Quality, Facts and	198
Pollutants and Householder Education, Household	183
Pollutants, Education and Rehabilitation of Persons Sensitized to Indoor Air	107
Pollutants, Filtering Equipment for Fine Particulates and Gaseous	90
Pollutants, Filtering Equipment: Gaseous	90
Pollutants, Information and Support for Persons Susceptible to Indoor	96
Pollutants, Models for Indoor and Outdoor Exposure to Air	168
Pollutants, The Estimation of Total Human Exposure to	168
Pollution From Woodburning Stoves, Indoor Air	18
Pollution Monitoring, Indoor Air	192
Pollution Problems, Demands on Health Inspectors and Resources Needed to Handle Indoor Air	21
Pollution Research, State-of-the-Art Review of Indoor	88
Pollution and Education in Toronto	239
Pollution and Housing Technology, Indoor Air	85
Pollution and Housing Technology, Literature Review on Indoor Air	85
Pollution, Factors That Influence Assessments of Health Effects of Air	222
Pollution, Health Effects of Particulates and SO ₂ Level in Air	103
Pollution: Experience of the Public Health Branch, Indoor Air	101
Polycyclic Aromatic Hydrocarbons, Chemical and Mutagenic Activity of Adsorbed	199
Polycyclic Aromatic Hydrocarbons, Indoor Air Quality Analysis:	146
Polyurethane Foam Insulation on Domestic Storage Tank Water Heaters, Emissions from	157
Polyurethane Foam, Indoor Emissions from	158
Port Hope, Ontario, Calculation of Radiation Exposure in a Case Control Study of Lung Cancers in	39
Port Hope, Potential Health Impact of Enhanced Radiation Levels in	39
Possible Hypersensitivity Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts, Analysis of	154
Possible Presence of Airborne Asbestos, Air Quality Investigation of an	

Keyword in Context Index - Project Titles in Alphabetical Order

Office Building for	47
Potential Health Impact of Enhanced Radiation Levels in Port Hope	39
Potential Respiratory Irritants or Allergens in Thermally Insulated or Fire-gutted Homes, Investigations of	52
Potentially Related to Urea Formaldehyde Foam Insulation, Consensus Conference on Health Problems	155
Predicting the Spatial Distribution of Concentration Fluctuations from a Ground Level Source	6
Preparation and Analysis of Air Sampling Filters	27
Presence of Airborne Asbestos, Air Quality Investigation of an Office Building for Possible	47
Press, Airborne Asbestos Particles in a Printing	49
Printing Press, Airborne Asbestos Particles in a	49
Problems Associated with Urea-formaldehyde Foam Insulation, Technical Support for the Investigation of	174
Problems Potentially Related to Urea Formaldehyde Foam Insulation, Consensus Conference on Health	155
Problems at a Retail Store, Bad Odour	49
Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems: Pt. 1, Moisture Induced	23
Problems in NHA Housing: Literature Review and Research: Pt. 2, Moisture Induced	24
Problems in NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland: Pt. 3, Moisture Induced	25
Problems, Demands on Health Inspectors and Resources Needed to Handle Indoor Air Pollution	21
Problems, Physiological Reactions to the Sum of All Indoor	196
Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future	23
Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents, A Design	6
Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; May 17/18, 1983	173
Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; October 1982, Transcription of the	152
Production of NitrosoBaygon from Baygon in NO ₂ Gas: I. Identification of NitrosoBaygon	2
Production of NitrosoBaygon from Baygon in NO ₂ Gas: II. Formation of NitrosoBaygon at Low NO ₂ Levels	2
Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO ₂ Gas	2
Products and Newsletter, Air Exchange	74
Profile, The Radon/Working Level	39
Program for Monitoring Indoor Air Quality in Homes	98

Keyword in Context Index - Project Titles in Alphabetical Order

Program for UFFI Homeowners, Federal Assistance	120
Program, Energy Efficient Buildings	72
Program, Laboratory Registration	213
Program, UFFI Research	120
Program: Air Quality Monitoring, R-2000 Low-Energy Home Demonstration	143
Programming and Evaluation of Interior Environments, Comprehensive Planning,	118
Programming, Design and Evaluation of Built Environments	136
Project (H.E.L.P.), Home Energy Leakage	180
Project Management and Research in Indoor Air Quality	190
Project, Energy Efficient Housing Demonstration	5
Project: An Air Sealing Study, Richmond Hill Demonstration	211
Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and	23
Projet de recherche sur la qualite du milieu de travail dans les edifices a bureaux	153
Proposed Building Site, Future Radon Levels at a	139
Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field Survey Results and Projections of Future Problems:	23
Pt. 2, Moisture Induced Problems in NHA Housing: Literature Review and Research:	24
Pt. 3, Moisture Induced Problems in NHA Housing: Applicable Moisture Reduction Techniques for Newfoundland:	25
Public Health Branch, Indoor Air Pollution: Experience of the	101
Published Texts and Reports	251
Purifiers, Development of Air	58
Qualite de l'air dans les habitations, Comite Sur La	184
Qualite du milieu de travail dans les edifices a bureaux, Projet De Recherche Sur La	153
Quality Analysis and Building Evaluation Techniques, Studies in Air	105
Quality Analysis for Microbial Factors and Trace Organics, Indoor Air	68
Quality Analysis: Polycyclic Aromatic Hydrocarbons, Indoor Air	146
Quality Control Techniques, Evaluation of Radon and Air	93
Quality Databank, Indoor Air	108
Quality Effects of Heat Recovery Ventilators, Indoor Air	207
Quality Evaluations, Indoor Air	65
Quality Field, Monitoring of Developments in the Indoor Air	65
Quality Investigation and Analysis, Indoor Air	38
Quality Investigation of an Office Building for Possible Presence of Airborne Asbestos, Air	47
Quality Investigations, Indoor Air	109
Quality Measurement - Commercial and Industrial, Indoor Air	18
Quality Measurement, Data Acquisition and Telemetry Systems Applicable to Air	71
Quality Measurements for Offices and Residences, Indoor Air	178
Quality Measurements in a Group of Low Leakage Houses, Air	167

Keyword in Context Index - Project Titles in Alphabetical Order

Quality Measurements, Indoor Air	131
Quality Monitoring, Air	42
Quality Monitoring, Air	235
Quality Monitoring, Environmental and Socio-economic Impact, Air	44
Quality Monitoring, Literature Research and Air	73
Quality Monitoring, R-2000 Low-Energy Home Demonstration Program: Air	143
Quality Monitoring: Commercial/Industrial, Indoor Air	82
Quality Relationships for Homes and Elementary Schools, Indoor/Outdoor Air	237
Quality Research Notes, Indoor Air	252
Quality Research: Measurement and Literature Surveys, Air	83
Quality Sampling and Analysis, Indoor Air	11
Quality Sampling and Analysis, Indoor Air	91
Quality Sampling, Indoor Air	28
Quality Sampling, Laboratory Services for Indoor Air	75
Quality Sampling, Monitoring and Modelling, Indoor Air	117
Quality Studies and Measurement, Indoor Air	12
Quality Studies, Indoor Air	21
Quality Studies, Particularly Radon Emissions, Indoor Air	130
Quality Testing, Odour Measurement and Control, Indoor Air	128
Quality and Health Investigation of Three Schools, Indoor Air	51
Quality and Risk Assessment, Indoor Air	60
Quality and Weathersealing, Relationship Between Indoor Air	187
Quality in Animal Housing, Air	112
Quality in Canadian Homes, Studies on Indoor Air	86
Quality in Cold Climates, International Specialty Conference on Indoor Air	202
Quality in Energy Efficient Homes, Investigation of Air	228
Quality in Homes, Program for Monitoring Indoor Air	98
Quality in Houses, Air	159
Quality in Low Energy Houses, Air	167
Quality in Sick Buildings, Investigation of Air	227
Quality in Weatherized Homes, Testing Air	209
Quality in an Energy Efficient Office Building, Air	49
Quality of the Working Environment in Office Buildings	153
Quality, Canadian Issues and Opportunities in Indoor Air	200
Quality, Committee on Residential Air	184
Quality, Criteria Reviews of Indoor Air	83
Quality, Energy Conservation and Indoor Air	192
Quality, Engineering Appraisal, Research, Advice and Testing Re Air	10
Quality, Facts and Policy Issues Regarding Indoor Air	198
Quality, Federal-Provincial Working Group on Indoor Air	148
Quality, Field Research on Indoor Air	236
Quality, Homeowner Information on Energy Conservation and Air	67
Quality, Impact of Energy Conservation on Indoor Air	182
Quality, Industrial Air	6
Quality, Interaction Between Energy Conservation and Indoor Air	30
Quality, Library Holdings in Indoor Air	246
Quality, Literature Review Capability: Indoor Air	197
Quality, Periodicals Containing Articles Relating to Indoor Air	243

Keyword in Context Index - Project Titles in Alphabetical Order

Quality, Project Management and Research in Indoor Air	190
Quality, Seminar Courses Pertaining to Indoor Air	66
Quality, Seminar on Indoor Air	19
Quality, Trace Organic Laboratory for Analyzing Indoor Air	156
Quality, Ventilation Standards for Acceptable Indoor Air	19
Quality: Industrial, Indoor Air	134
R&D Plan, Federal Building Energy Conservation	92
R-2000 Low-Energy Home Demonstration Program: Air Quality Monitoring	143
Radiation Emissions from Video Display Terminals	89
Radiation Exposure in a Case Control Study of Lung Cancers in Port Hope, Ontario, Calculation of	39
Radiation Levels in Port Hope, Potential Health Impact of Enhanced Radiation Monitoring	39
Radiation Monitoring	97
Radiation Reduction and Radioactive Contamination of Elliot Lake, Ontario, Remedial Measures for the	140
Radioactive Contamination of Elliot Lake, Ontario, Remedial Measures for the Radiation Reduction and	140
Radon Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f")", The Seasonal Fluctuation of the	39
Radon Daughters in Canadian Homes, Measurement of Radon and	149
Radon Emissions, Indoor Air Quality Studies, Particularly	130
Radon Levels at a Proposed Building Site, Future	139
Radon Ratio (commonly known as the Equilibrium Factor "f") , The Seasonal Fluctuation of the Radon Daughter to Parent	39
Radon Through Soil into Houses, Modelling the Movement of	138
Radon and Air Quality Control Techniques, Evaluation of	93
Radon and Radon Daughters in Canadian Homes, Measurement of	149
Radon/Working Level Profile, The	39
Rates, Identification of Formaldehyde Sources and Emission	221
Ratio (commonly known as the Equilibrium Factor "f") , The Seasonal Fluctuation of the Radon Daughter to Parent Radon	39
Re Air Quality, Engineering Appraisal, Research, Advice and Testing	10
Re Ventilation Standards, Literature Review and Analysis	35
Réactions d'hypersensibilité à la mousse isolante d'urée-formaldehyde et à ses sous-produits, Analyse Des Éventuelles	154
Reactions to Urea-Formaldehyde Foam Insulation and its Byproducts, Analysis of Possible Hypersensitivity	154
Reactions to the Sum of all Indoor Problems, Physiological	196
Recherche sur la qualité du milieu de travail dans les édifices à bureaux, Projet De	153
Recirculated Air, Determination of Biologically Active Dusts in	21
Recirculation of Exhaust Gases in Academic Research Buildings	21
Records of School Children in UFFI Homes, Historic Health	219
Recovery Ventilators, Indoor Air Quality Effects of Heat	207
Reduce Formaldehyde Levels, Techniques to	230
Reduction and Radioactive Contamination of Elliot Lake, Ontario, Remedial Measures for the Radiation	140
Reduction of Indoor Formaldehyde Gas and that Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The	41
Regarding Indoor Air Quality, Facts and Policy Issues	198

Keyword in Context Index - Project Titles in Alphabetical Order

Registration Program, Laboratory	213
Regulations, Fuel-fired Appliances: Combustion Air Requirements	181
Regulations, Socio-economic and Energy-related Impacts of	57
Rehabilitation of Persons Sensitized to Indoor Air Pollutants, Education and	107
Related to Urea Formaldehyde Foam Insulation, Consensus Conference on Health Problems Potentially	155
Relating to Indoor Air Quality, Periodicals Containing Articles	243
Relationship Between Indoor Air Quality and Weathersealing	187
Relationships for Homes and Elementary Schools, Indoor/Outdoor Air Quality	237
Relationships to Indoor Living Space Formaldehyde Levels	14
Remedial Measures Advice for UFFI Homeowners and Contractors	211
Remedial Measures for UFFI Homes	40
Remedial Measures for the Radiation Reduction and Radioactive Contamination of Elliot Lake, Ontario	140
Remedial Measures in UFFI Homes, Evaluation of	205
Remedial Measures, Comparison of UFFI and Non-UFFI Residents Before and After	218
Removal Techniques, Investigations Into Cost Effective UFFI	230
Removal of Urea-Formaldehyde Foam Insulation from Masonry Structures	220
Repérer et Corriger les Défauts de l'Isolation, J'isole Mieux,	67
Report of the Subcommittee on Formaldehyde and Air Contamination	62
Reports, Published Texts and	251
Requirements Regulations, Fuel-fired Appliances: Combustion Air	181
Requirements and Air Supplies, A Study of Residential Combustion Air	83
Research Buildings, Recirculation of Exhaust Gases in Academic	21
Research Council of Canada, National	169
Research Facility, Alberta Home Heating	7
Research House, Assessment of the Energy Saving Measures Used in the ER-1 Conservation/ Solar	5
Research Notes, Indoor Air Quality	252
Research Program, UFFI	120
Research and Air Quality Monitoring, Literature	73
Research and Information Base	86
Research and Toxicology, Biomedical	127
Research in Indoor Air Quality, Project Management and	190
Research in Universities, Directory of Federally Supported	260
Research on Indoor Air Quality, Field	236
Research, Advice and Testing re Air Quality, Engineering Appraisal,	10
Research, State-of-the-Art Review of Indoor Pollution	88
Research: Measurement and Literature Surveys, Air Quality	83
Residences, A Study of Air Leakage in Calgary	8
Residences, Heating and Ventilation of	231
Residences, Indoor Air Quality Measurements for Offices and	178
Residential Air Quality, Committee on	184
Residential Airtightening, The Effects of	137
Residential Buildings, Ventilation and Space Conditioning in	

Keyword in Context Index - Project Titles in Alphabetical Order

Commercial, Industrial and	20
Residential Chimney Backdraft Checklist: Design and Evaluation	30
Residential Combustion Air Requirements and Air Supplies, A Study of	83
Residential Combustion Appliances in the Indoor Environment, Contaminants from	70
Residential Combustion Safety Checklist	190
Residential Construction, Updating Health Standards for	79
Residential Environments, Strategies for Healthful	79
Residential Forced Air Filtration, Upgrading	78
Residential Housing Envelope Heat Losses, A Study of	7
Residents Before and After Remedial Measures, Comparison of UFFI and Non-UFFI	218
Resources Needed to Handle Indoor Air Pollution Problems, Demands on Health Inspectors and	21
Respect to Formaldehyde, Evaluation of Air Cleaning Devices With	119
Respiratory Irritants or Allergens in Thermally Insulated or Fire-gutted Homes, Investigations of Potential	52
Response to Inquiries on Fuel Combustion and Ventilation	181
Results and Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field Survey	23
Retail Store, Bad Odour Problems at a	49
Retrofit Fireplace Damper	3
Review Capability: Indoor Air Quality, Literature	197
Review and Additions to AIRBASE, Air Infiltration	252
Review and Analysis re Ventilation Standards, Literature	35
Review and Research: Pt. 2, Moisture Induced Problems in NHA Housing: Literature	24
Review of Indoor Pollution Research, State-of-the-Art	88
Review on Indoor Air Pollution and Housing Technology, Literature	85
Reviews of Indoor Air Quality, Criteria	83
Reviews, Building Investigations and Literature	61
Richmond Hill Demonstration Project: An Air Sealing Study	211
Rink, Airborne Asbestos Particles in a Curling	53
Risk Assessment, Indoor Air Quality and	60
Roof Exhaust Vents, Contamination of Air Intakes from	6
Roof Level Intakes, Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at	6
Roof Level Plume with a Downwind Building, Interaction of a	6
Roof Level, The Effect of Varying Exhaust Stack Height on Contaminant Concentration at	6
Roof Vents, Influence of Exhaust Velocity and Wind Incidence Angle on Dilution from	6
Rooms of the College of Veterinary Medicine, Airborne Formaldehyde Concentration in Carcass Storage	48
Rooms, Structure of Airflow in	234
SO ₂ Level in Air Pollution, Health Effects of Particulates and	103
Safety Advisory Panel, Health and	223
Safety Checklist, Residential Combustion	190

Keyword in Context Index - Project Titles in Alphabetical Order

Safety Evaluation of Unvented Kerosene Heaters	224
Safety and Health Act - Designated Substances, Occupational	156
Safety of Vented Gas Appliances, Improved	137
Safety, Inquiries Services for Occupational Health and	89
Sampler Systems, Development of Passive	60
Samples, Analysis of Asbestos	132
Sampling Filters, Preparation and Analysis of Air	27
Sampling and Analysis of Formaldehyde in UFFI Homes	119
Sampling and Analysis of Formaldehyde in UFFI Homes	124
Sampling and Analysis, Indoor Air Quality	11
Sampling and Analysis, Indoor Air Quality	91
Sampling and Evaluation of Interior Environments	226
Sampling, Indoor Air Quality	28
Sampling, Laboratory Services for Indoor Air Quality	75
Sampling, Monitoring and Modelling, Indoor Air Quality	117
Saskatoon Arena, Assessment of Airborne Asbestos Contamination in	50
Saving Measures Used in the ER-1 Conservation/ Solar Research House, Assessment of the Energy	5
Schedules, TLV's for Non-Standard Work	38
School Children in UFFI Homes, Historic Health Records of	219
Schools and Homes, Formaldehyde Measurements in	13
Schools, Indoor Air Quality and Health Investigation of Three	51
Schools, Indoor/Outdoor Air Quality Relationships for Homes and Elementary	237
Science and Engineering, Building	20
Science and Technology, Second Conference on Building	20
Scientific and Technical Databases, Directory of Canadian	277
Scrubber, Development of a Water Spray Air	216
Scrubbers for Formaldehyde, Field Experience with Chemical	13
Sealing Study, Richmond Hill Demonstration Project: An Air	211
Seasonal Fluctuation of the Radon Daughter to Parent Radon Ratio (commonly known as the Equilibrium Factor "f") , The	39
Second Conference on Building Science and Technology	20
Seen by Transmission Electron Microscopy, Effect of Indoor Environmental Factors on Human Platelets, as	99
Self-help Group to Aid Persons with Environmental Allergy	104
Seminar Courses Pertaining to Indoor Air Quality	66
Seminar on Indoor Air Quality	19
Seminars on Ventilation of Energy Efficient Houses	69
Sensitivities, Indoor Inhalant	81
Sensitized to Indoor Air Pollutants, Education and Rehabilitation of Persons	107
Service, Consumer Information and Complaint	45
Service, HEATLINE Telephone Advisory	144
Services and Newsletters, Bibliographies, Update	251
Services for Indoor Air Quality Sampling, Laboratory	75
Services for Occupational Health and Safety, Inquiries	89
Services, Comprehensive Environmental Laboratory and Field	75

Keyword in Context Index - Project Titles in Alphabetical Order

Ses sous-produits, Analyse Des Éventuelles Réactions D'hypersensibilité à La Mousse Isolante D'urée-formaldehyde Et à	154
Should Know About Asbestos, What You	62
Sick Buildings, Investigation of Air Quality in	227
Site Investigation Techniques	39
Site, Future Radon Levels at a Proposed Building	139
Smoke Movement Studies	97
Smoking Habits, Survey of	17
Socio-economic Impact, Air Quality Monitoring, Environmental and	44
Socio-economic and Energy-related Impacts of Regulations	57
Soil into Houses, Modelling the Movement of Radon Through	138
Solar Research House, Assessment of the Energy Saving Measures Used in the ER-1 Conservation/	5
Source, Predicting the Spatial Distribution of Concentration Fluctuations from a Ground Level	6
Sources and Emission Rates, Identification of Formaldehyde	221
Sources, Estimates of Building Surface Concentrations from Nearby Point	6
Sous-produits, Analyse Des Éventuelles Réactions D'hypersensibilité à La Mousse Isolante D'urée-formaldehyde Et à Ses	154
Space Conditioning in Commercial, Industrial and Residential Buildings, Ventilation and	20
Space Formaldehyde Levels, Relationships to Indoor Living	14
Spatial Distribution of Concentration Fluctuations from a Ground Level Source, Predicting the	6
Specialty Conference on Indoor Air Quality in Cold Climates, International	202
Spectrometry, Environmental Analysis Using Gas Chromatography and Mass	189
Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes, Critical Wind	6
Spray Air Scrubber, Development of a Water	216
Stack Height on Contaminant Concentration at Roof Level, The Effect of Varying Exhaust	6
Standards for Acceptable Indoor Air Quality, Ventilation	19
Standards for Areas North of the Tree Line, Ventilation	204
Standards for Methods of Measurement of Indoor Air Contaminants	34
Standards for Office Buildings, Energy Implications of Various Outdoor Air Ventilation	232
Standards for Residential Construction, Updating Health	79
Standards, Literature Review and Analysis Re Ventilation	35
Standards-Writing Organizations, Accreditation of	33
State-of-the-Art Review of Indoor Pollution Research	88
Storage Rooms of the College of Veterinary Medicine, Airborne Formaldehyde Concentration in Carcass	48
Storage Tank Water Heaters, Emissions from Polyurethane Foam Insulation on Domestic	157
Store, Bad Odour Problems at a Retail	49
Stoves, Contaminant Emissions From Gas	161
Stoves, Indoor Air Pollution From Woodburning	18
Strategies for Healthful Residential Environments	79
Structure of Airflow in Rooms	234

Keyword in Context Index - Project Titles in Alphabetical Order

Structures, Removal of Urea-Formaldehyde Foam Insulation from Masonry	220
Studies and Measurement, Indoor Air Quality	12
Studies in Air Quality Analysis and Building Evaluation Techniques	105
Studies on Indoor Air Quality in Canadian Homes	86
Studies, Energy Conservation	215
Studies, Indoor Air Quality	21
Studies, Particularly Radon Emissions, Indoor Air Quality	130
Studies, Smoke Movement	97
Studies, Ventilation	233
Study of Air Leakage in Calgary Residences, A	8
Study of Formaldehyde Emissions from ParticleBoard, Field	163
Study of Lung Cancers in Port Hope, Ontario, Calculation of Radiation Exposure in a Case Control	39
Study of Residential Combustion Air Requirements and Air Supplies, A	83
Study of Residential Housing Envelope Heat Losses, A	7
Study, Optimum Air Filter Efficiency	133
Study, Richmond Hill Demonstration Project: An Air Sealing	211
Subcommittee on Formaldehyde and Air Contamination, Report of the	62
Substances, Occupational Safety and Health Act - Designated	156
Sum of all Indoor Problems, Physiological Reactions to the	196
Supplies, A Study of Residential Combustion Air Requirements and Air	83
Supply, Carbon Dioxide Controlled Outside Air	160
Support for Persons Susceptible to Indoor Pollutants, Information and	96
Support for Persons with Allergies, Information and	81
Support for the Investigation of Problems Associated with Urea-formaldehyde Foam Insulation, Technical	174
Supported Research in Universities, Directory of Federally	260
Sur Les	155
Sur la MIUF, UFFI Centre / Centre	120
Sur la qualite de l'air dans les habitations, Comite	184
Sur la qualite du milieu de travail dans les edifices a bureaux, Projet De Recherche	153
Surface Concentrations from Nearby Point Sources, Estimates of Building	6
Survey Results and Projections of Future Problems: Pt. 1, Moisture Induced Problems in NHA Housing: Analysis of Field	23
Survey of Smoking Habits	17
Survey, Canada Health	16
Surveys, Air Quality Research: Measurement and Literature	83
Susceptibility and Urea-Formaldehyde Foam Insulation, Chemical	172
Susceptible to Indoor Pollutants, Information and Support for Persons	96
Systems Applicable to Air Quality Measurement, Data Acquisition and Telemetry	71
Systems Design, Optimization and Control, Ventilation	116
Systems in Detached Houses, Mechanical Fresh-Air Ventilation	171

Keyword in Context Index - Project Titles in Alphabetical Order

Systems, Air Control	56
Systems, Development of Passive Sampler	60
Systems, Performance of Passive Ventilation	170
Systems, Using Major Canadian and U.S. Computer Data Base	255
TLV's for Non-Standard Work Schedules	38
Tank Water Heaters, Emissions from Polyurethane Foam Insulation on Domestic Storage	157
Technical Databases, Directory of Canadian Scientific and	277
Technical Support for the Investigation of Problems Associated with Urea-formaldehyde Foam Insulation	174
Techniques to Reduce Formaldehyde Levels	230
Techniques, Evaluation of Radon and Air Quality Control	93
Techniques, Investigations Into Cost Effective UFFI Removal	230
Techniques, Site Investigation	39
Techniques, Studies in Air Quality Analysis and Building Evaluation	105
Technology, Indoor Air Pollution and Housing	85
Technology, Literature Review on Indoor Air Pollution and Housing	85
Technology, Second Conference on Building Science and	20
Telemetry Systems Applicable to Air Quality Measurement, Data Acquisition and	71
Telephone Advisory Service, HEATLINE	144
Terminals, Radiation Emissions from Video Display	89
Testing Air Quality in Weatherized Homes	209
Testing and Analysis of Formaldehyde in UFFI Homes	177
Testing of UFFI Homes	58
Testing of Unvented Kerosene Heaters	225
Testing re Air Quality, Engineering Appraisal, Research, Advice and	10
Testing, Odour Measurement and Control, Indoor Air Quality	128
Testing, Urea-Formaldehyde Foam Insulation (UFFI) Home	100
Texts and Reports, Published	251
That Emanating From Urea-Formaldehyde Foam Insulation (UFFI), The Reduction of Indoor Formaldehyde Gas and	41
That Influence Assessments of Health Effects of Air Pollution, Factors	222
Thermal Envelope Upgrading	233
Thermal and Flow Performance of Chimney Flues	211
Thermally Insulated or Fire-gutted Homes, Investigations of Potential Respiratory Irritants or Allergens in	52
Three Schools, Indoor Air Quality and Health Investigation of	51
Through Soil into Houses, Modelling the Movement of Radon	138
Toronto, Pollution and Education in	239
Total Human Exposure to Pollutants, The Estimation of	168
Toxic Chemicals on the Farm	127
Toxicology of UFFI, Workshop on the	151
Toxicology, Biomedical Research and	127
Toxicology, Canadian Centre for	43
Trace Organic Laboratory for Analyzing Indoor Air Quality	156
Trace Organics, Indoor Air Quality Analysis for Microbial Factors and	68
Transcription of the Proceedings of the Workshop on Urea-Formaldehyde Foam Insulation; October 1982	152
Transmission Electron Microscopy, Effect of Indoor Environmental	

Keyword in Context Index - Project Titles in Alphabetical Order

Factors on Human Platelets, as Seen by	99
Travail dans les édifices à bureaux, Projet De Recherche Sur La Qualité	
Du Milieu De	153
Tree Line, Ventilation Standards for Areas North of the	204
Triforine, to NO ₂ Gas, Production of Nitrosopiperazines on Exposing	
the Fungicide,	2
Twentieth Century Disease, Documentary: The	87
U.S. Computer Data Base Systems, Using Major Canadian and	255
UFFI Centre / Centre sur la MIUF	120
UFFI Gases and Formaldehyde, Controlled Exposure of Asthma Patients to	185
UFFI Homeowners and Contractors, Remedial Measures Advice for	211
UFFI Homeowners, Federal Assistance Program for	120
UFFI Homes, Evaluation of Remedial Measures in	205
UFFI Homes, Historic Health Records of School Children in	219
UFFI Homes, Remedial Measures for	40
UFFI Homes, Sampling and Analysis of Formaldehyde in	119
UFFI Homes, Sampling and Analysis of Formaldehyde in	124
UFFI Homes, Testing and Analysis of Formaldehyde in	177
UFFI Homes, Testing of	58
UFFI Off-gassing, Measurement of	40
UFFI Removal Techniques, Investigations Into Cost Effective	230
UFFI Research Program	120
UFFI and Non-UFFI Residents Before and After Remedial Measures,	
Comparison of	218
UFFI, Workshop on the Toxicology of	151
UFFI-Insulated Buildings, The Measurement of Formaldehyde Levels in	
Wall Cavities of	14
Unit, Occupational and Environmental Health	193
Universities, Directory of Federally Supported Research in	260
University Classrooms, Airborne Asbestos Investigation in	46
Unvented Kerosene Heaters, Safety Evaluation of	224
Unvented Kerosene Heaters, Testing of	225
Update Services and Newsletters, Bibliographies,	251
Updating Health Standards for Residential Construction	79
Upgrading Residential Forced Air Filtration	78
Upgrading, Thermal Envelope	233
Urea Formaldehyde Foam Insulation, Consensus Conference on Health	
Problems Potentially Related to	155
Urea-Formaldehyde Foam Insulation (UFFI) Home Testing	100
Urea-Formaldehyde Foam Insulation (UFFI), The Reduction of Indoor	
Formaldehyde Gas and That Emanating From	41
Urea-Formaldehyde Foam Insulation Centre	120
Urea-Formaldehyde Foam Insulation and its Byproducts, Analysis of	
Possible Hypersensitivity Reactions to	154
Urea-Formaldehyde Foam Insulation from Masonry Structures, Removal of	220
Urea-Formaldehyde Foam Insulation in Homes	21
Urea-Formaldehyde Foam Insulation, Adverse Health Effects from	217
Urea-Formaldehyde Foam Insulation, Chemical Susceptibility and	172
Urea-Formaldehyde Foam Insulation, Dust Associated with	1
Urea-Formaldehyde Foam Insulation, Investigation of Homes with	64

Keyword in Context Index - Project Titles in Alphabetical Order

Urea-Formaldehyde Foam Insulation, Workshop on Development of Biological Indicators for the Effects of	151
Urea-Formaldehyde Foam Insulation; May 17/18, 1983, Proceedings of the Workshop on	173
Urea-Formaldehyde Foam Insulation; October 1982, Transcription of the Proceedings of the Workshop on	152
Urea-formaldehyde Foam Insulation, Technical Support for the Investigation of Problems Associated with	174
Used in the ER-1 Conservation/ Solar Research House, Assessment of the Energy Saving Measures	5
Using Gas Chromatography and Mass Spectrometry, Environmental Analysis	189
Using Major Canadian and U.S. Computer Data Base Systems	255
VDTs, Very Low Frequency Fields Near	89
Various Formaldehyde Monitoring Devices, Investigations into	175
Various Outdoor Air Ventilation Standards for Office Buildings, Energy Implications of	232
Varying Exhaust Stack Height on Contaminant Concentration at Roof Level, The Effect of	6
Varying House Construction, Air Leakage Flow Correlations for Velocity and Wind Incidence Angle on Dilution from Roof Vents, Influence of Exhaust	6
Vented Gas Appliances, Improved Safety of	137
Ventilating Conditions in Housing, Hazardous Heating and Ventilation Standards for Acceptable Indoor Air Quality	203
Ventilation Standards for Areas North of the Tree Line	19
Ventilation Standards for Office Buildings, Energy Implications of Various Outdoor Air	204
Ventilation Standards, Literature Review and Analysis Re	232
Ventilation Studies	35
Ventilation Systems Design, Optimization and Control	233
Ventilation Systems in Detached Houses, Mechanical Fresh-Air	116
Ventilation Systems, Performance of Passive	171
Ventilation and Space Conditioning in Commercial, Industrial and Residential Buildings	170
Ventilation for Humidity Control	20
Ventilation in Houses, Humidity, Condensation and	206
Ventilation of Energy Efficient Houses, Seminars on	169
Ventilation of Residences, Heating and	69
Ventilation, Response to Inquiries on Fuel Combustion and	231
Ventilation-Troubled Houses, Identifying	181
Ventilators, Indoor Air Quality Effects of Heat Recovery	238
Vents at Roof Level Intakes, Critical Wind Speeds for Maximum Exhaust Gas Entry from Flush	207
Vents, A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust	6
Vents, Contamination of Air Intakes from Roof Exhaust	6
Vents, Influence of Exhaust Velocity and Wind Incidence Angle on Dilution from Roof	6
Very Low Frequency Fields Near VDTs	89
Veterinary Medicine, Airborne Formaldehyde Concentration in Carcass	

Keyword in Context Index - Project Titles in Alphabetical Order

Storage Rooms of the College of	48
Video Display Terminals, Radiation Emissions from	89
Wall Cavities of UFFI-Insulated Buildings, The Measurement of Formaldehyde Levels in	14
Water Heaters, Emissions from Polyurethane Foam Insulation on Domestic Storage Tank	157
Water Spray Air Scrubber, Development of a	216
Weatherized Homes, Testing Air Quality in	209
Weathersealing, Relationship Between Indoor Air Quality and	187
What You Should Know About Asbestos	62
Wind Incidence Angle on Dilution from Roof Vents, Influence of Exhaust Velocity and	6
Wind Speeds for Maximum Exhaust Gas Entry from Flush Vents at Roof Level Intakes, Critical	6
Woodburning Stoves, Indoor Air Pollution From	18
Woodstoves, Emissions from	31
Work Schedules, TLV's for Non-Standard	38
Working Environment in Office Buildings, Quality of the	153
Working Group on Environmental Monitoring (1982)	194
Working Group on Indoor Air Quality, Federal-Provincial	148
Workplace Exposure to Asbestos Fibers, Controlling	116
Workplace, Investigation of Health and Comfort Complaints in the	55
Workshop on Development of Biological Indicators for the Effects of Urea-Formaldehyde Foam Insulation	151
Workshop on Urea-Formaldehyde Foam Insulation; May 17/18, 1983, Proceedings of the	173
Workshop on Urea-Formaldehyde Foam Insulation; October 1982, Transcription of the Proceedings of the	152
Workshop on the Toxicology of UFFI	151

Index of Research and Funding Organizations in Alphabetical Order

ALX Technical 123
 AQR 213
 ASHRAE 19,62,252
 ASHRAE Research and Technical Committee 90
 ASHRAE Toronto Chapter 19
 ASTM 118
 Acadia University 127
 Acres Consulting Services Limited 93,124,130,139,140
 Agriculture Canada 75,112
 Air Changer Company Ltd. 80
 Air Infiltration and Ventilation Centre (AIVC) 252
 Air Pollution Control Association 70,202
 Air Seal Technologies, N.S. 123
 Alberta Agriculture 69
 Alberta Department of Housing 3,4,5
 Alberta Energy and Natural Resources 7,8
 Alberta Environment 129
 Alberta Masonry Institute 7
 Alberta Ministry of Environment 129
 Alberta Public Works, Supply and Services 88
 Alberta/Canada Energy Resources Research Fund 7,8
 Allen-Drerup-White Ltd. 80
 Allergy Information Association 81
 American Industrial Hygiene Association 91
 American Institute of Architects 111
 American Society of Agricultural Engineering 114
 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 19
 Andre Marsan & Associates Limited 131
 Architectural Diagnostics 135
 Arthur Scott and Associates 93
 Asbestos Information Association of North America 116
 Ashton and Associates Limited 190
 Associated Kellogg Limited 121,123,220
 Atlantic Airseal Limited 123
 Atlantic Analytical Services Limited 124
 Atlantic Industrial Research Institute 132
 Atomic Energy Control Board 97,139,140
 Atomic Energy of Canada Limited 97
 B.C. Research 83
 B.C. Government Ministries 83
 B.C. Inter-Ministry Committee of Safety and Occupational Health 29
 B.C. Ministry of Labour 29
 B.H. Levelton & Associates Limited 124
 Barringer Research Limited 82
 Beak Analytical Services 121,123,214
 Bell Canada 110
 Bill Johnston Architect Ltd. 8
 Bioquest International Inc. 60
 Board of Education for the City of Toronto 239

Index of Research and Funding Organizations in Alphabetical Order

Bondar-Clegg & Company Limited 27
Bow Valley Resource Services Ltd. 44
Brian E. Felske & Associates Ltd. 134
British Columbia Buildings Corporation 109,133
British Columbia Ministry of Environment 84
British Columbia Ministry of Health 29
British Columbia Ministry of Labour 61
Bruce M. Small and Associates Limited 32,85,86,107,122,172,190,239
Building Diagnostics Inc. 136
Building Energy Conservation Sector Committee (BECS) 215
Building Engineering Group 20,116
CANPRO Laboratories 68
CES 74
CSA 162,224
Can Test Limited 124
Canada Institute for Scientific and Technical Information (CISTI) 112,
246,255,262,265,273
Canada Mortgage and Housing Corporation 22,23,24,25,30,58,78,79,85,86,
116,123,139,169,190,196,203,204,206,207,208,211,238,253
Canadian Applied Technology 71
Canadian Broadcasting Corporation 87
Canadian Centre for Occupational Health and Safety 89,277,278
Canadian Centre for Toxicology 43
Canadian Electrical Association 67,72,233
Canadian Gas Research Institute 231
Canadian General Standards Board 33,223
Canadian Microanalytical Service Limited 124
Canadian Radiation Protection Association 39
Canadian Service for the Selective Dissemination of Information 255
Canadian Society for Civil Engineering 20
Canadian Society of Agricultural Engineering 113
Canadian Society of Agronomy 114
Canadian Society of Animal Science 114
Canadian Standards Association 33,34,35,162
Canadian Union of Public Employees 109
Cell Biology Research Institute 99
Center for Energy Studies, N.S. 123
Centre de Création Industrielle 278
Centre de Toxicologie du Québec 217
Centre for Occupational Health and Safety, Waterloo 226
Centre sur la MIUF 176
Circul-Aire Inc. 90
City of Saskatoon 50
Clayton Environmental Consultants Limited 91,124
Clerk Window & Wall Technical Services Ltd. 64,123
Committee on Asbestos Hazards in Public Buildings 62
Con-Serve Group Ltd. 215
Concord Scientific Corporation 121,122,176
Conference of Deputy Ministers of Health 148

Index of Research and Funding Organizations in Alphabetical Order

Conservation Energy Systems Inc. 74
 Consumer and Corporate Affairs Canada 12,13,45,58,60,119,120,124,176,
 177,185,214,216,219,224,225
 Consumer's Association of Canada 224
 Consumer's Gas 137
 CORPUS 21,219
 Crown Corporations 83
 DIALOG Services 277
 DIDAK Corporation 173
 DSMA ATCON LTD. 93,130,138,139,140
 Deco-Plan 172
 Department of Preventive Medicine and Biostatistics (U. of Toronto) 194
 Dept. of Nutritional Sciences 115
 Dept. of Plant Sciences 2
 Diagnostics Immobiliers Inc. 136
 Diamond Products Company 123
 Didak Management Services Inc. 124
 Division of Architecture and Building Sciences 105
 Division of Building Research 12,13,41,92,97,151,152,157,158,159,160,161,162,
 163,164,165,169,170,171,172,176,201
 Eco-Research Inc. 146
 Ecology House 182,183
 Enchem Development Limited 122
 Eneraction Inc. 123
 Energy Mines and Resources Canada 7,37,92,137,143,144,203,212,215,228,238
 Engineering Dynamics Ltd. 94
 Enviroclean Division of MacLaren Plansearch 75
 Envirocon Ltd. 122,179
 Environment Canada 31,57,73,75,260
 Environment Views 129
 Environmental Applications Group Ltd. 73
 Environnement Canada, Région du Québec 31
 Extech Systems Ltd. 11
 F.D.C. Consultants Incorporated 122,150,151,152
 FTS Contractors 123
 Faculty of Agriculture and Forestry 113
 Faculty of Medicine, University of Toronto 115
 Federal Building Energy Conservation Sector (BECS) Committee 92
 Federal-Provincial Advisory Committee on Environmental and Occupational
 Health 148
 Federal-Provincial Working Group on Indoor Air Quality 29,65,148
 Federal/Provincial Task Force on Radioactivity 140,142
 Formtek Technologies Inc. 230
 Foundation for Independent Research on Technology and Health 107,108,253
 Fuels Safety Branch 181
 G. M. Rekken and Associates Ltd. 5
 Gage Research Institute 194,218,222
 Geortec Limited 13,121,122,123,125
 Gouvernement du Québec 184

Index of Research and Funding Organizations in Alphabetical Order

Government of Canada 43
Government of Ontario 43
Government of Saskatchewan 45
Greater London Council Research Library 278
Guelph Management Laboratories Limited 125
Hardy Associates (1978) Ltd. 95
Hatch Associates Limited 203
Hazardous Material Consultants Limited 125
Health Department, City of Regina 51
Health Sciences Urban Air Environment Group (McMaster University) 194
Health and Welfare Canada 16,76,83,102,103,109,120,136,138,140,145,146,147,
148,149,185,194,203,217,218,219,223
Health and Welfare Canada, Radiation Protection Bureau 138
Hôpital Général de Montréal 154,155
Hôpital Royal Victoria 154
Hôpital du Saint Sacrement 153
Housing Renovation & Energy Conservation Unit 182
Human Ecology Foundation (Toronto) 96
Human Ecology Foundation of Canada 96
IEC Beak Consultants Limited 121,122,125,209,214
IES Working Group on Environmental Monitoring 194
IUS - Institute for User Studies 118
Independent Measurement and Technology Inc. (IMET) 178
Indian and Northern Affairs Canada 36,37
Industrial Research Institute - University of Windsor 117
Industrial Technology Centre 122
Institute for Environmental Studies (U. of Toronto) 194
Institute of Occupational Health and Safety 200
International Energy Agency 252
International Labour Organization 278
International Occupational Safety and Health Information Centre 278
J.M. Berry Company Limited 125
James F. Hickling Management Consultants Ltd. 57
James F. MacLaren Ltd. 142
Jon Eakes Enterprises, Inc. 67
Keith Consulting 142
Kemic Bioresearch Laboratories Ltd. 122,127,213
Kent Engineering Limited 18
Kleen Air Limited 123
L'Université Laval 217
L. M. Warren, Inc. 277,278
LMBDS-SIDAM Inc. 56
Labour Canada 83
Lakehead University 121
Lawrence Berkeley Laboratory 252
Les Éditions de l'Homme 67
Levelton 123
Lincolnberg Development Corporation 5
MacLaren Engineers, Planners and Scientists 75,97

Index of Research and Funding Organizations in Alphabetical Order

MacLaren Plansearch 70,75
 Man-Environment Studies 1
 Manitoba Institute of Cell Biology 99
 Mann Testing Laboratories Ltd. 156
 Marshall Macklin Monaghan Limited 23,24,25
 McGill University 201
 McMaster University 102,103,219,237
 Michael Holliday & Associates 76
 Micromedia Limited 277
 Minister's Expert Advisory Committee on Dioxins 150
 Ministère de l'énergie et des ressources 184
 Ministère de l'habitation et de la protection du consommateur 184
 Ministère des Affaires Sociales 153,154,155
 Ministry of Municipal Affairs and Housing 209,210
 NIOSH 75,177,263
 NSERC 116
 NTL 123
 National Institute for Occupational Safety and Health 75,177,263
 National Library of Medicine 255,263,264
 National Research Council of Canada 12,13,20,32,41,45,64,92,97,118,120,127,
 139,151,152,157,158,159,160,161,162,163,164,165,166,167,168,170,171,172,
 173,174,176,177,190,201,202,211,214,215,220,238
 National Testing Laboratories 125
 Natural Sciences and Engineering Research Council (Canada) 2,7,21,116,199
 New Brunswick Energy Secretariat 180
 Northern Scientific, Inc. 236
 Nova Chem Limited 58,125
 Nova Scotia Agricultural College 113
 Nova Scotia Department of Health 65
 Novalab Limited 28
 Oakridge National Laboratory 122
 Oboe Engineering Ltd. 235
 Occupational Health and Safety Resource Centre 12
 Occupational Hygiene Association of Ontario 70
 Occupational and Environmental Health Unit 9,193
 Ontario Hydro Research Division 233
 Ontario Marketing Productions Limited 67
 Ontario Ministry of Consumer and Commercial Relations 181
 Ontario Ministry of Energy 93,137,209,210,233
 Ontario Ministry of Health 21,100,101,102,103
 Ontario Ministry of Labour 9,70,75,100,116,148,193
 Ontario Ministry of Municipal Affairs and Housing 93,182,183
 Ontario Ministry of the Environment 103,194
 Ontario Research Foundation 121,122,123,205,227,229
 Pacific Bell 110
 Pan Canadian Consultants Limited 42
 Panel for Energy Research and Development (PERD) 190
 Pergamon Press 127
 Plainair Environmental Allergy Society 104

Index of Research and Funding Organizations in Alphabetical Order

Pollution Probe Foundation 182,183
 Proctor & Redfern Limited 177
 Promet Environmental Group Ltd. 26
 Public Works Canada 105,136,232
 Queen's University 122,185
 Radiation Environmental Management Systems Inc. (REMS) 125
 Research & Productivity Council (RPC) 125
 Research Foods (1976) Ltd. 68
 Resource Integration Systems Ltd. 187
 Riverdale Co-op 80
 Roche Associ  s Lt  e 31,126
 Rose Technology Group Ltd. 232
 Royal Commission on Matters of Health and Safety Arising from the Use of
 Asbestos in Ontario 116
 SENES Consultants Limited 38
 SNC Inc. 191,196
 Saskatchewan Consumer and Commercial Affairs 45
 Saskatchewan Department of Health 53
 Saskatchewan Dept. of Agriculture 113
 Saskatchewan Health and Labour 45
 Saskatchewan Power Corporation 54
 Saskatchewan Research Council 45,46,47,48,49,121,123,216
 Scanada Consultants Limited 36,122,123,126,190,211
 Schultz International Ltd. 10
 Scientific Instrumentation Ltd. 188
 Sealox Ltd., N.B. 123
 Seatech Investigation Services Limited 126
 Sheltair Scientific Ltd. 30,190,238
 Shrader Analytical & Consulting Laboratories (Canada) Ltd. 189
 Simon Fraser University 111
 Small and Associates (see also Bruce M. Small & Assoc. Ltd.) 32,85,172
 Sodexen Inc. 121,123
 Solar Energy Society of Canada, Inc. 7
 St. Joseph's Hospital 219
 St. Michael's Hospital, Toronto 9
 Standards Council of Canada 33,223
 Statistics Canada 15,16,17
 Subcommittee on Air of the Associate Committee on Scientific Criteria for
 Environmental Quality 190
 Sunnyhill Research Centre 107
 Super Energy Efficient Home Program 143
 Supply and Services Canada 31,260
 Swedish Council for Building Research 111
 Synectia Consultants Division 106
 Synectia Productions 106
 TEAG - Environmental Analysis Group, Ltd. 118
 TRC Advanced Analytics Canada 128
 TRC Environmental Consultants (U.S.) 128
 Technical Sub-Committee of the Canadian Formaldehyde Council 165

Index of Research and Funding Organizations in Alphabetical Order

Technitrol Canada Limited 119,121,123,126
Technology and Health Foundation 85,108,254
The Conservation Store 187
The New Brunswick Housing Corporation 180
The New Brunswick Occupation Health and Safety Commission 55
The Trow Group Limited 126
Theodor D. Sterling Limited 109,110
U. of Western Ontario 121
U.F. Labs Inc. 126
UFFI Centre/Centre de la MIUF 119,120,124,176,214,216,219
UK Health and Safety Executive 278
UNIES Limited 123,192
United Technology and Science Inc. 177
University of Alberta 6,7,112
University of Aston, Birmingham 110
University of Calgary 50,51,53,54,66
University of California at Berkeley 110
University of Guelph 43
University of Manitoba 40,60,122
University of Saskatchewan 46,48,50,51,52,53,54
University of South Florida College of Medicine 127
University of Texas School of Public Health 111
University of Toronto 9,21,24,43,77,101,115,137,193,218,222
University of Waterloo 1,20,116,122,226,234
University of Western Ontario 2,12,70,121
University of Windsor 117
Vit-Vitaille-Viron Inc. (Triple-V) 196
W. L. Wardop & Associates Ltd. 59
Warnock Hersey Professional Services Limited 126
Washburn & Gillis Assoc. Ltd. 197
Western Research 44,122
Woodbridge Reid 18
World Health Organization 194
York University 199

Names Index

-
- | | | |
|-----------------------|-------------|--|
| Ackerman, Mark | 7 | |
| Acosta, Ms. Hortencia | 60 | |
| Adley, Tom | 146 | |
| Alderson, Bill | 228 | |
| Alderton, William B. | 42 | |
| Aldworth, George A. | 97 | |
| Allen, Greg | 80 | |
| Amster, M. | 128 | |
| Anderson, Harvey | 115 | |
| Andreychuk, R. | 100 | |
| Angus, Doug | 16 | |
| Armstrong, Vic | 148 | |
| Astle, A. | 128 | |
| Atherley, G.R.C. | 89 | |
| Bagdan, Donna | 69 | |
| Baikowitz, Harry | 119 | |
| Ball, Don | 209 | |
| Barclay, Penny | 15 | |
| Barrett, P.V.L. | 230 | |
| Barton, Syd | 205,227,229 | |
| Bazowski, Peter | 29 | |
| Beck, Don | 181 | |
| Berglund, B. | 252 | |
| Berlin, Marc | 131 | |
| Besik, F.K. | 231 | |
| Beveridge, Don | 210 | |
| Biggs, R. C. | 169 | |
| Bird, Bonnie | 277 | |
| Bradstreet, J.W. | 128 | |
| Bragg, Gordon | 20,116 | |
| Brannigan, P.G. | 113 | |
| Branny, Tom | 177 | |
| Britter, R.E. | 6 | |
| Broder, I. | 121,218 | |
| Bullock, Bonnie M. | 273 | |
| Burgess, Wm. | 156 | |
| Burnett, Eric F.P. | 20 | |
| Carpio, J. Del | 154 | |
| Case, G.G. | 39 | |
| Castonguay, Gilles | 73 | |
| Catton, R. | 176 | |
| Caudwell, G. | 100 | |
| Chadder, Dave S. | 26 | |
| Chai, R. | 128 | |
| Chambers, D.B. | 38 | |
| Chandler, John | 176 | |
| Chart, E.J. | 39 | |
| Christian, Julie | 71 | |
| Christie, W. D. (Bud) | 59 | |
| Chui, E. | 6 | |
| Clark, R. H. | 185 | |
| Clarke, Robert | 180 | |
| Clerk, Marc | 64 | |
| Colley, Don | 44 | |
| Complin, P. | 70 | |
| Coon, David | 182,183 | |
| Cooper, Larry | 188 | |
| Corey, Paul | 194,222 | |
| Corke, Sue | 182 | |
| Corr, Denis | 103 | |
| Couët, Suzanne | 155 | |
| Cowan, J.D. | 232 | |
| Cummins, Joseph E. | 2 | |
| Curtis, Darwin | 180 | |
| Daglish, Susan | 81 | |
| Dale, Doug | 7 | |
| Davidge, Bob | 105 | |
| Davies, D. | 58 | |
| Davies, Gordon | 130 | |
| Davis, Gerald | 118 | |
| Day, James H. | 121,122,185 | |
| Destricker, Ulla | 277 | |
| Dickens, Brian | 35 | |
| Dimich-Ward, H. | 111 | |
| Douglas, H. | 233 | |
| Drake, Pleasantine | 135 | |
| Dranitsaris, Pascal | 205,227,229 | |
| Drerup, Oliver | 80 | |
| Duffee, R.A. | 128 | |
| Duffy, Ron | 129 | |
| Dumont, R. S. | 166,167 | |
| Eakes, Jon | 67 | |
| Eaton, R. S. | 140 | |
| Eisenberg, Howard | 106 | |
| Engelhardt, Jennifer | 76 | |
| Esplin, Gordon | 83 | |
| Ewing, W. D. | 10 | |
| Fackrell, J.E. | 6 | |
| Fanger, O. | 251 | |
| Farant, J. P. | 201 | |
| Farkas, Edward J. | 1 | |
| Feddes, J.J.R. | 112 | |
| Ficner, Charles | 143,229 | |
| Finley, Lorne | 204 | |
| Fletcher, David | 76,77 | |
| Forest, T. | 7 | |
| Fortin, Jean-Paul | 154,155 | |
| Fraser, T. Morris | 226 | |
| Garside, B. K. | 103 | |
| Gaudert, P. C. | 163,164,165 | |

Names Index

Geist, Valerius 66
Georghiou, Paris E. 13
Gerencser, George 88
Gerrard, Jon 99
Gesser, H. D. 40,60
Gilbert, Len 181
Gilmore, N. 154
Gnyp, A. W. 117
Goldman, N. 89
Goldsmith, C. H. 102,103,194
Gosnell, Lawrence M. 87
Greiner, Kathrine 22
Guertin, Charles 153
Hadden, J.W. 127
Halford, Ron 239
Hall, Stephen 214
Halton, D.M. 89
Handegord, G. O 169
Harris, Madeleine G. 21,101
Hatzinikolas, M. A. 3,4
Helena, Peter 27
Hijazi, Nasrat 128
Hoey, John 154,155
Holliday, Michael 76
Hollowell, C. 251
Honey, H.F. 112
Hook, Matthew B. Van 198
Hosein, H. Roland 194,222
Houston, Alvin J. 23,24,25
Howell, D.G. 5
Hung, I-Fu (Alex) 28
Huza, Stephen 90
Imbulgoda, Bandu 55
Jackson, Ron 82
Jarvis, I. 232
Joannou, C. J. 94
Johnston, Bill 8
Jones, Peter M. 223
Jones, W.R. 233
Katz, Morris 199
Kent, Clarence D. 18
Kerigan, A. T. 102,103
Kessler, Ron 45
Kiel, D.E. 6
Kim, A. 170
Kleta, Juergen 7,8
Koczkur, Eugene 38
Koski, Darlene 96
Labrie, Donald 31
Lanczi, Tom 215
Langmark, Otto 239
Lay, Richard 234
LeBlanc, Jim 65
Leach, John 83
Leclair, Ginette 153
Lee-Ruff, E. 199
Lees, R. E. M. 185
Leonard, J.J. 113
Lindvall, T. 252
Lipski, Alan J. 82
Lischkoff, J. K. 5
Lockhart, Dave 84
Long, Charles K. 123
Lorimer, Judy 190
Lowe, L.M. 38
Lstiburek, J. W. 5
Maarouf, A. 194
MacKay, Young 123
MacLean, Heather 115
Manley, Paul J. 97
Manna, Barid 84
Marha, Karel 89
Markham, J. W. 50,51,53,54
Marsh, Lois 134
Martin, K. R. 61
Mason, John 18
Mattar, Sam 88
McCuaig, Leo 235
McGregor, R. G. 138,149
McGugen, Colin 228
McIntyre, E.D. 111
McKee, John 44
McMullen, J. A. 57
McQuitty, Brian 112
Mehkeri, K. A. 225
Mejzner, T. A. 65
Melchers, J. 25
Méranger, J. C. 145
Mercer, Art 187
Meyer, C. Beat 251
Mintz, Sheldon 194,222
Moffatt, Sebastian 30
Mohamed, Hamid 92,215
Moriarity, W. 89
Moschandreas, D. 251
Mullen, Peter W. 127
Munn, R. E. 194
Munro, Ian C. 43
Nakatsui, Lewis 5
Nantel, Albert J. 121,217

Names Index

-
- Neaves, W. M. 75
 Nethercott, James 9
 Netten, C. Van 122,221
 Netterville, D.D.J. 6
 Newhouse, M. T. 219
 Nikiforuk, Gordon 115
 Nordstrom, G. A. 112
 Norman, G. R. 121,219
 O'Grodnik, T.M. 136
 Oh, Petro 214
 Olmstead, Richard W. 74
 Osterland, C.K. 154
 Otson, Rein 146,147
 Pant, B. C. 90
 Park, cJohn 76
 Pauls, Jake L. 32
 Pengelly, L.D. 102,103,194
 Peters, David 182
 Peters, Kerry 95
 Pick, Wm. 94
 Pickett, E. 194
 Pierce, Ronald 168
 Piersol, Peter 205,227,228,229
 Pilon, DeGuise 31
 Poirier-Defoy, Claude 196
 Portelance, Georges 67,72
 Priesnitz, Wendy 239
 Proskiw, Gary 192
 Pross, H. 121,185
 Raab, Karl H. 78,79
 Racine, Guy 191
 Regoza, Dennis 236
 Rekken, G.M. 5
 Richards, G. W. 36,37
 Riley, Mark 143
 Rinella, John 137
 Robins, A.G. 6
 Robinson, Ann 148
 Robinson, Terry 207,208
 Robinson, Tom J. 203
 Roche, Gilles La 196
 Rogers, Mike 177
 Roquet, J. L. 56
 Rosborough, Brian 35
 Roy, Jean-Pierre 184
 Russell, Peter 30,78,79,85,203
 Sadler, G.W. 7
 Samoiloff, Martin R. 40,60
 Sampson, David 130
 Sauvé, Pierre 184
 Schafer, Marilyn E. 274
 Scheff, P.A. 251
 Schreiber, John 136
 Scotcher, Patricia 102,103
 Scott, A. G. 93,138,139,140
 Seccombe, C. J. 224
 Semchuk, B. 37
 Shaw, C. Y. 170,171
 Shenfeld, L. 194
 Sheridan, Michael 17
 Sherman, M.H. 6
 Shirtliffe, Cliff 12,41,64,151,152,
 172,173,174,176,214,220
 Shrader, Stephen R. 189
 Silverman, Frances 194,222
 Slein, G. B. 189
 Sliwinski, John 214
 Sloat, Robert 3,4,5
 Small, Barbara J. 107
 Small, Bruce M. 32,85,86,107,108,
 172,239,251
 Smith, Cedric 19
 Smith, Douglas S. 91
 Smith, James W. 21,101
 Smith, L. 100
 Snow, D. 14
 Somers, M. 194
 Spengler, J. 251
 Stafford, B. F. 169
 Sterling, D.A. 111
 Sterling, Elia 110
 Sterling, T.D. 110
 Stuble, R. Dalton 19
 Stuckless, Pat 102,103
 Suarez, Joe 177
 Sullivan, John L. 12,70
 Sundell, J. 252
 Sutherland, R.B. 39
 Szczesiak, Geri 104
 Szigeti, Francoise 118
 Tait, David 173
 Tamura, George T. 97,159,160,161,
 162
 Taylor, Marilyn A. 199
 Terhune, Stuart 68
 Timusk, J. 24
 Toft, Peter 76
 Toplack, S.A. 237
 Trought, John 178
 Trueman, C.S. 133

Names Index

VanPoorten, J. H. 23
Veness, Cindy 15
Viau, R. 224,225
Vicars, Maryhelen 129
Wadden, R. A. 251
Walkinshaw, D. S. 92,157,158,159,
160,161,162,163,164,165,166,167,170,
171,201,202
Wallace, K. 46,47,48,49
Ward, Murray 11
Warren, Lois 278
Washburn, Owen 197
Watson, John 34
Wharton, Donald 69
White, Jim H. 86,169,190,206,212,
238
Whitehead, Roy 75
Willes, Robert F. 150,151,152
Wilson, A. Grant 201
Wilson, David J. 6,7
Wilson, G. Peter 132
Wilson, Jim 129
Winkel, G. 6
Yamasaki, R.S. 157,158
Yoshida, Ken 46,47,48,49,50,51,52,
53,54
Zdanowicz, Andrew 209
Zeisel, John 136

Subject Index

-
- abatement 40
 - abatement measures 202
 - absorption 90
 - academic 193
 - accidents 22,32
 - ACOMPLINE 278
 - acoustics 136
 - adaptability 107
 - addresses 251
 - adolescents 102
 - adsorption 90
 - adverse drug reactions 262
 - adverse health effects 121
 - Advisory Panel on Health and Safety 223
 - agricultural 68
 - air change 70,167
 - air change rate 159,170
 - air changes 72,171
 - air cleaning 191,200
 - air cleaning devices 119,121
 - air conditioning 19,33,56,59,62,110
 - air control standards 56
 - air cross leakage 228
 - air distribution 170,234
 - air exchange 113,210
 - air exchange products 74
 - air exchange rate 163
 - air flow 6,143
 - air infiltration 6,252
 - Air Infiltration Centre Library 252
 - air infiltration monitoring 97
 - air infiltration rates 161,162,166
 - air intake contamination 6
 - air leakage 6,7,72
 - air leakage rates 180
 - air monitoring 9
 - air movement 20,177,235
 - air purification 11
 - air purifiers 58
 - air quality 5,6,9,10
 - air quality analyses 42
 - air quality analyzers 71
 - air quality investigations 71
 - air quality measurement instrumentation 26
 - air quality monitoring 11
 - air quality technicians 26
 - air samples 33,,75,164
 - air scrubbers 121,205
 - air sealing 182,190,211
 - air temperature 170
 - air velocities 165
 - air-to-air heat exchange 123
 - air-to-air heat exchanger 141,216
 - air-to-air heat exchangers 40,80,121,205,233
 - AIRBASE 252
 - airborne microorganisms 227
 - airtight 209
 - airtight construction 80
 - airtight housing 203
 - airtight new housing 30
 - airtight stoves 150
 - airtightening 137,211
 - airtightness 36,146,170,238
 - aldehydes 83,148
 - allergic disease 81
 - allergic problems 81
 - allergic sensitivities 80
 - allergy 87
 - Allergy Shot 81
 - allergy-like reactions 62
 - ambersorb 156
 - ambient air quality monitoring 44
 - ambient loadings 73
 - amines 40
 - ammonia 26,112
 - ammonia gas 40,122
 - ammonia treatment 40
 - amosite asbestos 53
 - analysis 27,28,68,75,91,119,124,132,156,193
 - analytical 131,189
 - analytical capabilities 83
 - analytical laboratories 214
 - analytical methodology 75,128
 - analytical methods 146
 - analytical modelling 202
 - analytical procedures 213
 - analyzers 11
 - anatomy laboratory 48
 - animal dander 81
 - animal environment 112
 - animal health 112
 - animal housing 113
 - animal manures 112
 - animal tests 199
 - animals 196,202
 - apartment 163

Subject Index

- apartment tenants 110
appliance 137
applications 256
applied research 83
aquatic toxicity data 263
architechnology 111
architects 31,66,136
architecture 109,278
architectural practice 278
archive 109
aromatics 227
arsenic 34
asbestos 46,47,50,53,61,85,95,116,
132,178,202
asbestos removal 95
asbestos sampling 91
ASHRAE 62-1981 55,61
Assistance Program 120
asthmatic 185
asthmatics 121,122,222
atomic absorption 75,91
Atomic Absorption Spectrophotometer
193
attic insulation 67
attics 169
attitudes 202
automatic updates 255,277
automation 26
automobile emission 73
automobile exhaust 63,73
BA79 255
backdraft 30
backdraft test 238
backdrafting 143,190
background formaldehyde levels 221
backup of heating appliances 83
bacteria 85,207,228
bacteriocidal activity 40
Bancroft 97,142
banque d'informations 184
barrier coatings 165
basement wall 170
BECS 37,92,215
beef housing systems 113
behaviour 239
behavioural sciences 261
bentonite panels 141
bibliographic information 264
bibliographic reference 275
bibliographies 118,243,251
bimonthly newsletter 252
bioassays 60
biological abstracts 262
biological activity 40,122
biological agents 65,148
biological effects 40
biological indicators 122,127,151
biological monitors 40
biological organism tests 177
biological systems 40
biological testing 228
biological "yardsticks" 60
biologically active dusts 21
biomedical articles 262
biomedical research 127
BIOSIS Previews 255
biostatistics 102,103
birth defects 155
board-samples 164
box enclosures 164
BPD 109
brain function 239
broiler housing 114
browsing 241
building code 210
building contaminants 107
building design 66,109,202
building designers 168
building envelope 30,72,206,232
building illness 91,107,111
Building Insight '83 169
building maintenance 63
building materials 63,104,127,164,
165,202,221
building performance 136
Building Performance Database System
109
Building Practice Note 23 123
building products 108
building science 20,109,200
building sickness 88
building standards 204
building syndrome 88
building techniques 86
building trades 72
buildings 109
built environments 136
business machines 104
CAC 256
calves 113

Subject Index

-
- CAN/OLE 255,265
 CAN/SDI 255
 Canadian building practices 85
 Canadian homes 85,86
 cancer 155
 capital costs 78
 carbon monoxide 177
 carbon monoxide episodes 190
 carbon dioxide 36,62,71,84,98,109,
 113,148,160,161,162,177,178,211,224,
 225,227
 carbon monoxide 26,31,34,38,42,55,71,
 83,85,98,110,111,148,161,162,168,178,
 202,211,224,225
 carcinogens 85,199
 CAS registry numbers 256,263
 CAS82 256
 case-control study 51
 Catalog Online 263
 CATLINE 263
 cattle housing 112
 caulking 67
 CECILE 278
 cellular function 99
 central computer 272
 centres of excellence 200
 certification 33,223
 chamber studies 158
 charcoal 156
 charitable 96,108
 charitable organization 81,253
 Chemical Abstracts 262
 Chemical Abstracts condensates 256
 Chemical Abstracts search 256
 chemical compounds 263
 chemical contaminants 81
 Chemical Dictionary On-line 263
 Chemical Engineering 256,258
 chemical fractions 122
 chemical hazards 76,77
 chemical ionization 128
 chemical properties 263
 chemical sampling 9
 chemical scrubber 13
 chemical soup 129
 chemical substances 63,256
 chemical susceptibility 87,107,122,
 172
 chemical treatment 122,221
 chemically-clean indoor environments
 87
 chemically-pure foods 104
 chemisorbants 90,121,220
 chemistry 256,258
 chemists 31
 CHEMLINE 263
 chimney 30
 chimney downdrafting 203
 chimney flues 190,211
 chimney integrity 233
 chimneys 3
 CHIP evaluation study 215
 chlorinated hydrocarbons 148
 chromatography 44,68,122
 chronic health hazard 48
 chrysotile asbestos 50
 cigarette smoke 99,199
 cigarette smoking 146
 CIS 278
 CISTI Catalogue Online 246,262
 Civil Engineering 258
 clean indoor environment 80
 cleaning 79
 clerical workers 109
 Client Services CAN/OLE CAN/SDI 273
 climate 64
 clinic 9
 clinical articles 262
 clogged 208
 clothes 104
 Co-operative Documents Project 258
 coatings 142
 code 65
 CODOC 258
 cold 226
 cold climates 202
 collection 161
 collection impingers 179
 colorimeter 127
 combustion 4,199
 combustion air 137
 combustion air makeup 83
 combustion air requirements 137,181
 combustion appliances 30,143,238
 combustion equipment 2
 combustion flues 30
 combustion generated contaminants
 110
 combustion products 161,162,203

Subject Index

-
- combustion safety checklist 190
 - combustion systems 190
 - combustion temperature 150
 - comfort 55,106
 - comfort parameters 177
 - Comité sur la qualité de l'air 184
 - commercial 12,18,20,38,61,64,68,72,76,82,95,109,191
 - commercial livestock operations 112
 - Committee on Air Quality in Housing 184
 - COMPENDEX 258
 - complaints 45,55,61,62,98
 - complexation 90
 - compliance monitoring 38
 - composition 213
 - computer databases 242
 - computer facilities 265
 - computer modelling 83
 - computer search 242,275
 - computer systems 109
 - computer terminals 255
 - computer-based 108
 - computerized 109
 - computerized databank 253
 - computerized databases 265
 - Computerized Engineering Index 258
 - concentration-temperature relationships 113
 - concrete block basements 141
 - condensation 169,206,209,233
 - condensation nuclei 141
 - conference proceedings 241
 - confinement 113
 - consensus 223
 - consensus standards 35
 - conservation measures 76
 - construction 66,278
 - construction materials 110
 - construction specialists 31
 - consumer inquiries 181
 - consumer products 202
 - contact dermatitis 155
 - contaminant concentrations 159
 - contaminant production 196
 - continuous monitoring 121,188
 - continuous monitors 117
 - contract research 83
 - contractor 211
 - contractor manual 121
 - contractor training 220
 - contractors 120,123
 - control 90,116
 - control measure 48
 - control methods 93
 - control procedures 38
 - controlled combustion 4
 - controlled ventilation 35
 - controlled vocabulary 256
 - controversy 254
 - convective 162
 - cooling 200
 - copy printer 272
 - corrective measures 60,64,120,123,169
 - cosmetics 104
 - cost-effective 211
 - counselling 107
 - criteria documents 109
 - criteria reviews 83
 - crysotile asbestos 46
 - cultures 202
 - curling rink 53
 - DACO formaldehyde test kit 122
 - data acquisition 71
 - data acquisition system 113
 - data analysis 38
 - data collection 122,205,213
 - data interpretation 189
 - data logging 71
 - databank 108
 - database 22,109,180,242
 - datalogger 26,71
 - DATANET 109
 - DATAPAC telephone network 255,272
 - daughters 149
 - DDT 27
 - defence mechanisms 193
 - defrosting 228
 - dehumidifiers 206,216
 - Delta Meadowvale Inn 97
 - demonstration homes 5,182,209
 - design guidelines 88
 - design population 86
 - designers 66
 - desk drawers 241
 - detection limit 44
 - detector tubes 121,164
 - detectors 193
 - diagnosis 253

Subject Index

-
- DIALOG 277
 diffusion barrier 141
 dilution 6,63
 dilution control 79
 dioxins 150
 direct gain passive house 7
 discomfort 62
 disease 193,249
 disease surveillance 101
 dispersal 113
 dispersion 6
 disposal 220
 distribution 113,177
 DNPH solutions 213
 Document Delivery Service 275
 documentary 87
 domestic water heaters 157
 dosimeter survey 123,213
 dosimeters 213
 Double E 72
 downdrafts 30
 Draeger Formaldehyde Detector Tubes 123
 Draeger Multi-gas Detectors 98
 drowsiness 227
 dry scrubber 123
 DUPONT C-60 213
 DUPONT Reference Dosimeters 213
 dust 1,38,55,81,85,112,207
 dust samplers/detectors 193
 dusts 31
 dwelling improvements 15
 dynamic chamber facilities 165
 EBERLINE 142
 economics 261
 économie d'énergie 184
 EDA 142
 education 239,261
 educational performance 239
 educational programs 107
 efficiency 106
 effluent gases 40
 EI 258
 EIM 259
 electric heaters 33
 electric wiring 123,220
 electro-optical formaldehyde monitor 122
 electron microscope 226
 electronic engineering 258
 electronic 188
 electronic air filtration 94
 electronic office 88
 electrostatic air cleaners 33
 ELIAS 260
 elimination procedure 163
 Elliot Lake 93,140
 emergency 136
 emission rates 157,161,162,165,221
 emission sources 73,163
 emissions 158,164,213
 employee 106
 employee symptoms 62
 employer-employee relations 106
 energy 109,144,160,233
 energy conservation 20,37,67,70,76,80,121,182,184,187,192,220
 energy conservation incentives 202
 energy conservation materials 144
 energy conservation measures 30
 energy conservation research 92
 energy conservation technology 215
 energy-conservative construction 74
 energy conserving residences 109
 energy consumption 93,206
 energy cost 93
 energy-efficient 51,72
 energy-efficient homes 40,228
 energy-efficient house design 144
 energy-efficient office buildings 128
 energy improvements 15
 energy in housing 278
 energy-saving practices 62
 energy savings 211
 energy use 92
 engineering 20,109,200,258
 engineering analysis 178
 engineering meetings 259
 engineering reports 261
 engineers 31,278
 ENUF-24 123
 envelope 5,7
 environment 109
 Environment Libraries Automated System 260
 environment optimization 109
 environmental 198
 environmental allergies 104
 environmental chemicals 262

Subject Index

- environmental design research 118
- environmental exposures 107,108
- environmental factors 102,115
- environmental health 278
- environmental illness 104
- environmental issues 129
- environmental performance 135
- environmental science 33,82
- environmental standards 65
- environmental toxicology 221
- environmentally-related illness 96
- epidemiological 109
- epidemiological protocol 115,121
- epidemiology 102,103,111,193
- equilibrium concentrations 157
- equipment 236
- ergonomics 106,109,226
- European databases 277
- excess moisture 206
- exhaust 6,137,171
- exhaust backflow 137
- exhaust devices 190,238
- exhaust gases 21
- exhaust stack 170
- exhaust vents 6
- experimental research building 107
- experimental studies 107
- extraction techniques 164
- eye irritation 55,227
- fabric protectors 147
- factories 18,62
- fail-safe 200
- falling accident 32
- falls in buildings 32
- fan assembly efficiency 78
- fan depressurization 211
- fan depressurization tests 137
- fan operation 208
- fan-door depressurization 97
- fans 190,238
- FCAP Quality Assurance Program 75
- feasibility 44
- feasibility study 122
- federally registered 108
- fertilizers 63
- FEV1 185
- fiber concentration 50
- fibrous materials 148
- FICP Check Sample Program 75
- field investigation 23,174
- field measurement 105
- field performance 36
- field shooting 67
- field studies 167
- filing cabinets 241
- filtering equipment 90
- filters 40,78
- filtration media 90
- fine particulates 90
- fire 97
- fire safety 224
- fireplace damper 3
- fireplace operation 190,211
- fireplaces 4,238
- floor underlay 163
- flourides 34
- flow rate measurements 112
- flueless NHA housing 25
- fly ash 199
- foam removal 218
- foams 1,174
- foods 104,115
- forced air 93,170
- forced air heating 40,78
- forced ventilation 93
- foreign language reports 261
- foreign language document 275
- form release oil 142
- formaldehyde 12,29,31,36,40,44,48,55,58,61,62,65,68,83,85,90,93,95,98,100,119,121,124,131,143,147,148,163,164,167,168,172,174,177,178,179,182,185,192,202,205,211,213,219,227,228,230,236
- formaldehyde assay kit 121,122,127,213
- formaldehyde dosimeters 122,213
- formaldehyde levels 211
- formaldehyde measurement 13,91
- formaldehyde monitors 13
- formaldehyde removal 216
- formaldehyde sources 221
- fossil fuels 199
- fossil-fuel heating systems 137
- foundation wall insulation 67
- fractionate 40
- fresh air 62,121,220
- fresh air dampers 63
- fresh air intake 4,93
- fresh air ventilation 171

Subject Index

-
- friable asbestos 62
 - Frobisher Bay 36,37
 - fuel consumption rate 225
 - fuel-burning equipment 203
 - fuel-burning fireplaces 15
 - fuel-fired appliances 181
 - fuels 15
 - fumes 31,226
 - functional integrity 200
 - functional programming 118
 - fungal 228
 - fungi spores 202
 - furnace combustion 123
 - furnace fan 170
 - furnace filters 119
 - furnace industry 78
 - furnace problems 98
 - furnace return air flow 216
 - furnaces 208,238
 - furnishings 110,202
 - furniture 63,163
 - FVC 185
 - gardens 63
 - gas appliance venting 83
 - gas appliances 137
 - Gas Chromatograph 28,141,193
 - Gas Chromatograph/Mass Spectrometer 28,91,189
 - gas chromatography 75,91,189
 - gas chromatography/mass spectrometry 68,82,91
 - gas cookers 111
 - gas range 110
 - gas source/exposure chamber 121
 - gas stoves 2,161
 - gas/vapour samplers 193
 - gaseous pollutants 65,90
 - gases 226
 - gastrointestinal problems 115
 - GC/MS 28,91,189
 - general malaise 55
 - generation rates 79
 - geology 258
 - glues 207
 - government buildings 109
 - government grants 258
 - government publications 256,258
 - grab sampling technique 159
 - graduate 193
 - grant programs 65
 - graphics 71
 - groundwater 142
 - guide 67
 - guidelines 29,110,118,148,169,210
 - hard copy 275
 - hard copy output 71
 - Harry Hays Building 136
 - hazardous chemical list 60
 - hazardous gases 202
 - hazardous waste storage 59
 - hazards 22,224
 - headaches 55,62,227
 - headspace analysis 157,158
 - health 107,108,109,193,198
 - health and comfort 109,110
 - health and safety 106,200,278
 - health care facilities 111
 - health complaints 51
 - health effects 76,85,87,90,109,121,127,151,157,217,262
 - health examination 122
 - health hazards 89,111,183,202
 - health inspectors 21
 - health of Canadians 16
 - health problems 1,128
 - health records 121,219
 - health risk 172
 - health services 200
 - health standards 79
 - health status 218
 - health studies 200
 - health unit 101
 - healthful residential environments 79
 - heat 226
 - heat loss 4,7
 - heat pump 159
 - heat recovery 121,220,228
 - heat recovery ventilation 80,207
 - heater locations 162
 - heater surface temperatures 224,225
 - heater types 162
 - heating 19,56,59,62,144,231
 - heating and cooking 15
 - heating and ventilation equipment 181,121
 - heating equipment 70
 - heating system 78,79,170
 - heating, ventilating and air conditioning 184

Subject Index

- HEATLINE 144
heavy metal content 27
herbicides 189
high efficiency filtration systems 78
High Resolution AEI MS-30 Mass Spectrometer 189
high rise buildings 55
high volume samplers 82
high-speed printers 272
Hoetjer's Theory 165
home 177
home air conditioners 15
home building products 33
home care products 104
home energy planning 144
home show 67
homeowners 65,67,120
hookup 255
hospital environment 56
hospitals 111,136
house tightening 70
household activities 25
household pollutants 183
household strategy 79
housekeeping practices 79
housing design 278
housing epidemiology 111
housing technology 190
HPLC Method 156
HRV's 123
HSELINE-47 278
HUDAC 171
human comfort 200
human exposure 168
human health 66,202
humidification 232
humidity 55,63,93,143,169,177,181
humidity control 180,200
humidity levels 167
HVAC 59,61
HVAC systems 56,63,109
hydrocarbons 18,26,65,71
hydrogen sulphide 26,112
hydrogenation 44
hydrolysis 213
hygiene 109
hypersensitive individuals 115
hypersensitivity reactions 154
IEC 260
illness 62
immune reactions 155
immunological studies 121,185
immunological testing 127
immunotoxicology 127
impinger method 179
impingers 122
in-service problems 20
inadequate exhaustion 203
incomplete exhaustion 190
individual exposure 168
individual sensitivities 62
indoor air 22
indoor air quality 12,18,19
indoor air quality sampling 28
indoor/outdoor relationship 110
industrial 12,18,20,38,56,68,72,82,83,127,130,134,156,191
industrial air measurement 116
industrial arts laboratories 95
industrial design 278
industrial engineering 258
industrial hygiene 146,193,214
industrial ventilation 116
industrial workshops 95
industry 95,198,201,202
infiltration 2,3,20,64,161,211,232
infiltration rate 97,171
Infiltration Review 252
information 241
information access 190
information bank 184
information sheets 96
Infrared Gas Analyzer 166
Infrared Spectrophotometer 226
inhalant allergies 81
inhalants 104
inorganic 82
inorganic contaminants 145
inorganic particulates 207
inquiry service 89
insoluble gases 122
inspections 65,177
installation 174
institutional 64,109
instrumentation 11,26,131,139,188
insulating material 100
insulation 33,144,182
insulation hazards 67
insulation performance 36

Subject Index

-
- intake air 190
 - intake vent 170
 - integrated appliance 231
 - Integrated Gas Chromatograph 189
 - interactions 60
 - interdisciplinary 106,109
 - interlibrary loans 242,275,276
 - International Journal of Immunopharmacology 127
 - International Pharmaceutical Abstracts 262
 - International standards 33
 - interstitial moisture 23
 - investigation of complaints 45
 - investigations 109
 - ion concentration 99
 - ion detection 128
 - ion environments 99
 - ionizing 226
 - irritable airways 185
 - irritation syndromes 155
 - isocyanates 156
 - journals 243
 - KEMIC assay kits 123
 - kerosene heaters 2,162,224,225
 - keywords 249
 - kitchen hood 161
 - kitchens 111
 - Kusnetz Factors 141
 - laboratory 27,31,44,75,82,83,91,131,156,193,202,205,226
 - laboratory analysis 121
 - laboratory facilities 9
 - Laboratory Registration Program 121,213
 - landscape architects 136
 - lawns 63
 - LBL dosimeters 123
 - lead 34,38,148
 - lead in gasoline 57
 - lead time operation 63
 - leak sealing techniques 211
 - leakage measurements 209
 - learning ability 239
 - legal 196
 - librarian 275
 - libraries 108,241
 - library holdings 246
 - life sciences 255
 - lifestyle 16,107,109,202
 - lifestyle factors 79
 - lighting 106,110,136
 - lighting fixtures 228
 - Liquid Chromatograph 28
 - literature 118,190,197
 - literature review 73,85,182
 - literature searches 9,83,193
 - literature surveys 83,183
 - livestock buildings 112
 - livestock operators 112
 - living things 255
 - long distance charges 272
 - low-chemical environment 107
 - low-efficiency filtration 78
 - low-emission materials 200
 - low-energy building technologies 80
 - low-pollution housing co-operative 80
 - low-pollution indoor environments 86
 - low-pollution residences 80
 - low technology 79
 - lung disease 102
 - lung function values 185
 - mailing list 108
 - maintenance 78,79
 - makeup air 4,18
 - manufacturing 223
 - manufacturing data 263
 - manure gases 112
 - marketing 18
 - Markov-Rolle Method 141
 - masonry house 205
 - masonry structures 123,220
 - mass psychogenic illness 51
 - Mass Spectrometer 128,156
 - mass spectrometry 128,189
 - materials 132,256
 - materials testing 128
 - measurement 33,34,38,42,65,70,82,93,95,110,128,131,134,143
 - measurement instruments 31
 - measurement techniques 164
 - mechanical engineering 258
 - mechanical ventilation 69,72
 - medical authorities 87
 - Medical Literature Analysis and Retrieval System 262
 - medicine 193,262
 - medium-efficiency filtration 78,208

Subject Index

-
- MEDLARS 255,262,265
 - MEDLARS Online 262
 - MEDLINE 262
 - meetings 256
 - mercury 34
 - meso-climate 24
 - meteorological equipment 26
 - meteorologists 26
 - methane 130
 - methodology 136
 - micro-organisms 202
 - microbiological 68
 - microbiological contaminants 109
 - microclimatic measurements 26
 - microcomputer 71,272
 - microcomputer data acquisition system 189
 - microfiche 275
 - MICROLOG 260
 - midget impinger samples 156
 - mildew 23,25,206
 - mineral resource industry 134
 - mining 258
 - mists 226
 - modelling 117
 - models 168
 - modem 272
 - modern buildings 109
 - moisture 20,23,169,206
 - moisture damage 23
 - moisture flow 206
 - moisture generation 25
 - moisture loads 112
 - moisture problems 24
 - molecular formulas 263
 - molecular names 256
 - monitoring 7,11,38,40,44,73,75,82,95, 97,98,109,114,117,143,174,191,200, 236
 - monitoring equipment 226
 - motor ability 32
 - mould 23,25,68,81,85,104,206,207
 - mould toxins 68
 - Multi-mix (R) 90
 - multidisciplinary 260,261
 - multidosimeter studies 121,213
 - multiple media 168
 - mutagenicity 121
 - mutagens 199
 - N-nitroso pesticides 2
 - National Building Code 79
 - National Energy Program 37
 - National Standards of Canada 223
 - National Standards System 223
 - National Technical Information Service U.S. 261
 - natural language terms 256
 - natural radioactivity 141,149
 - nematode indicator tests 122
 - nematodes 40,122
 - network approach 71
 - neutral pressure level 170
 - neutralization 90,205
 - neutralizing agents 220
 - neutralizing UFFI residues 121
 - new building syndrome 128
 - Newfoundland 25
 - news items 258
 - newsletter 74,96,104,252
 - newsmagazine 129
 - NHA financed housing 23,24
 - NIOSH tests 91
 - nitric oxide 34,161,162,211
 - nitrogen dioxide 34,103,143,161,162, 167,211,222,228,237
 - nitrogen oxides 2,26,38,85,137,145, 168,202,224
 - nitrous oxide 166
 - noise 38,226
 - noise problems 98
 - nomenclature 263
 - non-ionizing radiation 226
 - non-NHRDP contracts 121
 - nonprofit 81,83,108
 - Northern Residential Standards 37
 - nosebleeds 227
 - notes 252
 - NOx 2
 - NTIS 261
 - nuclear 38,59
 - nuisance dusts 95
 - occupancy 136
 - occupancy needs 135
 - occupant behaviour 207
 - occupation factors 109
 - occupation health and safety 55
 - occupational environment 11
 - occupational health 9,101,112
 - occupational health and safety 56,89, 101,278

Subject Index

-
- occupational health standards 55
 - occupational hygiene 38,91
 - occupational illness 9
 - occupational settings 60
 - odour complaint 91
 - odour control 128
 - odours 38,93,115
 - off-gas 110,185
 - off-gasses 185
 - off-gassing 40,63,228
 - office buildings 49,55,73,109,135, 153,156
 - office conditions 61
 - office environments 55
 - office personnel 110
 - office workers 9,110
 - offices 31,62,65,109,147,177,178, 202
 - olefins 227
 - on-line ordering commands 275
 - Ontario Building Code 1983 210
 - OON 246,255,262
 - operating cost 5
 - operating costs 78
 - optimization 116
 - organic chemical 85
 - organic contaminants 42,147
 - organic vapours 75,93
 - organics 82,156,214
 - Orleans 225
 - out-gassing 174
 - outdoor 44
 - outdoor air requirements 61,110
 - outdoor air supply 170
 - outlets 123,220
 - overall building performance 118
 - overlaid panels 164
 - overlays 165
 - owner's manual 72
 - oxidants 83
 - oxidation 90
 - oxides of nitrogen 148,225
 - oxygen 178
 - oxygen percentage 31
 - ozone 26,34,38,55,85,94,98,148,177, 188
 - PAH 146,148,199
 - paints 141
 - paraffins 227
 - parking garages 63
 - particle filters 121,220
 - particleboard 163
 - particulate contaminants 65
 - particulate emission 121
 - particulate inhalants 115
 - particulate matter 148,199,222,237
 - particulate sampling 178
 - particulates 73,82,103,110,117,121, 208,226,227
 - particulates from UFFI 12
 - parts per trillion range 128
 - passive devices 213
 - passive sampler systems 60
 - passive solar 80
 - passive systems 40
 - passive ventilation systems 25,170
 - patents 256,258,261
 - pathogen production 196
 - pathological effects 196
 - patient support 96
 - PCBs 27,189
 - peer contact 251
 - peers 241
 - people affected 190
 - PERD 92,215
 - performance 109
 - performance criteria 109
 - performance of buildings 118
 - performance studies 109
 - periodicals 243
 - personal air pollution monitors 194
 - personal samplers 117
 - personal sampling pumps 226
 - pest control products 148
 - Pesticides Abstracts 262
 - pesticides 2,63,104,189
 - pharmacodynamics 263
 - phone call 251
 - photocopiers 89
 - photocopies 63,275,276
 - photocopy requests 252
 - physical agents 226
 - physicians 65
 - physics 258
 - physiological 196
 - physiological reactions 104
 - pig facility 113
 - Plainair Waves 104
 - planning 92
 - plant engineering 56

Subject Index

- plants 202
- platelets 99
- plotting 71
- plumbing systems 202
- plume 6
- point sources 6
- polarizing microscope 226
- policy issues 198
- poll 246
- pollutant absorbant systems 58
- pollutant levels 76
- pollutant sources 79,202
- Pollution and Education Review Group 239
- pollution control 79
- pollution hazards 70
- pollution migration 105
- pollution monitoring 188
- Polycyclic Aromatic Hydrocarbons 146, 148,199
- polycyclic organic matter 31
- polyurethane 228,230
- polyurethane foam insulation 157, 158
- polyurethane foams 158
- polyvinylidene chloride latex 123
- population exposures 148
- porous composite panels 164
- Port Hope 97,142
- portable humidifiers 15
- poultry laying houses 112
- PPB's 189
- practical assistance 96
- practical measures 86
- Prairie houses 167
- prefabricated buildings 37
- pressure conditions 137
- pressure distribution 138
- pressure drops 208
- pressure test 166
- pressures 12
- pressurization 192,220
- pressurizing 121,205
- primary emission sources 163
- printing press 49
- priority pollutants 189
- private search companies 277
- problem identification 38
- procedures 118,256
- proceedings 151,256
- product aerosols 148
- productivity 106
- products of combustion 224
- professional associations 260
- professional journals 241
- programmers 136
- project management 190
- property value changes 200
- proprietary compounds 43
- prototyping 80
- public awareness 88
- public buildings 226
- public concerns 200
- public education 187
- public health impacts 78
- public health inspectors 101
- public information 108
- published information 241
- PUDWH 157
- PUFI 157
- pulmonary function 222
- pulmonary response 121,122,185
- purification systems 11
- PVDC 123
- pyrolysis 213
- quality assurance program 75
- quarterly newsletter 252
- Quebec standards 56
- QUESTEL Computer System 278
- question and answer 67
- questionnaires 109,143
- R&D 201
- R-2000 low-energy homes 143
- R-2000 Monitoring Program 228
- radiant space heaters 162
- radiation emissions 89
- radiation monitoring 97
- radiation reduction 140
- radiative 162
- radioactive contamination 140
- radioactive decontamination 140
- radon 38,85,93,130,138,143,148,149, 167,168,182,202,211,214,228,236
- radon daughter levels 38
- radon daughters 38,149,228
- radon diffusion through concrete 141
- radon entry rate 139
- Radon Index Number 139
- radon release rate 139

Subject Index

-
- range of vulnerability 86
 - rashes 55
 - reactions 256
 - reactions in humans 196
 - real-time mobile analyzer 128
 - receptor modelling 73
 - recirculated air 21
 - recirculation 21
 - recirculation mode 63
 - reconstruction 172
 - refereed journals 253
 - refrigerating 19
 - Registry of Toxic Effects of Chemical Substances 263
 - regulations 57,149,181,184,198
 - regulatory framework 86
 - regulatory measures 200
 - regulatory powers 86
 - rehabilitation 108,163
 - rehabilitation programs 107
 - reimbursement 120
 - related illness 253
 - relative efficiencies 119
 - relative humidity 25,31,164,167
 - release characteristics 122,221
 - remedial 174
 - remedial action 167
 - remedial advice guides 123,211
 - remedial measures 64,121,140,172,205,218,220,227
 - removal 120,174,211,220
 - removal techniques 205,220,230
 - removed UFFI 121
 - reprints 275
 - reproduction 155
 - requests 272
 - research 43
 - research and development 92
 - research buildings 21
 - research findings 88
 - research interests 86
 - research organization 108
 - research reports 261
 - research strategies 202
 - residential 12,20,178
 - residential evaluations 65
 - residential filtration 78
 - Residential Ventilation Guidelines 233
 - respirable particles 177
 - respirable suspended particles 202
 - respiratory disorders 200
 - respiratory function 186
 - respiratory health 103
 - respiratory irritation 62
 - respiratory system 112
 - response of occupants 105
 - retail store 49
 - retrofit housing 24
 - retrofits 109,137,233
 - reverse flows 137
 - rewinterizing 67
 - Richmond Hill 211
 - risk assessment 60,77
 - Rolle Method 141
 - room temperatures 225
 - rot 206
 - RS232 computer port 71
 - RTECS 263
 - rubber base sealants 142
 - runny noses 55
 - safety 32,62,137,198
 - safety check 30
 - safety limit 46
 - safety measures 121,220
 - safety standards 53
 - sample bag 141
 - samplers 68,122,194
 - samples 40
 - sampling 12,82,83,91,117,119,124,146,156,177,226
 - sampling devices 28
 - sampling filters 27
 - school building 51
 - school children 9,121,219
 - school environments 239
 - schools 31,95,194,202,237
 - science 261,262,275
 - scientific debate 254
 - scientific literature 241
 - scientists 278
 - scintillation cell count rate 142
 - scintillometer 142
 - scrubber 11,216
 - sealants 207
 - sealed buildings 111
 - sealing measures 211
 - sealing 30,182,192
 - sealing techniques 121,205,209
 - search services 265

Subject Index

-
- seasonal changes 12
 - seasonal effects 121
 - self-help group 104
 - seminars 19,66,69,70,107,183
 - sensitivity 107
 - sensitized individuals 87
 - sensitizing effects 122
 - sensors 200
 - Serials Online 264
 - SERLINE 264
 - service conditions 157
 - sharp minds 241
 - sheathing damage 23
 - shelving 163
 - shut-down devices 137
 - sick buildings 227
 - siding problems 23
 - smoke 62,97
 - smoke particles 208
 - smoking 17,73,110
 - social scientists 136
 - socio-economic impact 44,57
 - sociologists 278
 - sodium bisulphite 122
 - sodium bisulphite spraying 205
 - soil 149
 - soil gas 93,138,141
 - soil permeability 139
 - soil surface 138
 - solar design 80
 - solutions 190
 - solvent 73
 - solvents 31,55,73,147,189
 - soot 199
 - sore throats 55
 - sour-gas 44
 - source and sink strength 122
 - source contributions 163
 - source controls 79
 - source strengths 167,182
 - sources 83,90
 - sources of moisture 169
 - space conditioning 20
 - space heating 197,200
 - space planning 278
 - special interest groups 260
 - spectrophotometry 91
 - spirit duplicator 89
 - spirometry 222
 - spray system 216
 - sprayed-in-situ 158
 - stack action 171
 - stack design 6
 - stack gas emissions 73
 - stack height 6
 - stagnant water 202
 - Standard 62-1981 19,62
 - standards 34,223,227,263
 - standards evaluations 109
 - standards information centre 33
 - Standards Writing Organization 223
 - standards-writing 33
 - statistical analysis 121,123,213
 - stock shot-bank 67
 - stores 62
 - stoves 150
 - stress factors 110
 - structural details 24
 - structural effects 205
 - structural effects of UFFI 123
 - structural fragments 263
 - students 239
 - sulphur compounds 38
 - sulphur dioxide 26,34,103,122,145, 162,222,237
 - sulphur hexafluoride 7,97
 - sulphur oxides 148
 - Sunnyhill Research Centre 107
 - super-insulation 80
 - survey 15,16,109
 - susceptibility 172
 - Susceptibility Report 172
 - suspended particulate matter 78
 - symposia 256
 - systems 255
 - TAGA 128
 - tandem 128
 - TDB 263
 - teaching centre 43
 - technical approaches 79
 - technical reports 256,258
 - technical services 251
 - technical support 174
 - techniques 256
 - technology 108,254,261,262,275
 - telecommunications 109
 - telemetry systems 71
 - telephone advisory service 144
 - telephone numbers 251
 - temperature 31,110,177

Subject Index

-
- tempering 233
 - Tenax 156
 - test chamber 162,221
 - test devices 226
 - test population 115
 - testing 100
 - testing laboratories 33
 - theoretical mathematics 258
 - theories 256
 - therapeutic period 107
 - therapeutic program 87
 - thermal and flow performance 190, 211
 - thermal environment 110
 - thermal performance 206
 - theses 255,256
 - Thoron interference 142
 - Threshold Limit Values (TLVs) 55,65, 263
 - tight building syndrome 110,200
 - tight homes 182
 - tight houses 137
 - tightening 202
 - tightness 184
 - time-averaged air quality tests 207
 - titles 249
 - tobacco smoke 85,111,148,202
 - Toronto air pollution 222
 - total suspended particulates 34
 - townhouse 109
 - toxic chemicals in the home 183
 - toxic constituents 60
 - toxic effects 122
 - toxic gases 122
 - toxic potential 60
 - toxicity 40,60
 - toxicity data 263
 - toxicity studies 262
 - toxicity values 263
 - toxicological data 148
 - toxicology 43,122,127,193,196,263
 - toxicology data bank 263
 - Toxicology Information Online 262
 - toxicology of UFFI 151
 - TOXLINE 262
 - trace analyses 82
 - trace atmospheric gas analyzer 128
 - trace metals 75,214
 - trace organic chemicals 68,178
 - trace organic contaminants 156
 - tracer dilution techniques 75
 - tracer gas 12,211
 - tracer gas measurement 97,166
 - track-etch 228
 - translations 261
 - Translations Index 275
 - treatment 108,163,220,253
 - tree line 204
 - trouble-shooting 200
 - tumor promoters 199
 - Twentieth Century Disease 87,200
 - UFFI 98,100,154,155,174,177,185,205, 211,213,216,217,218,219
 - UFFI centre 120
 - UFFI-containing homes 13
 - UFFI-contaminated masonry products 121
 - UFFI dust 1,122
 - UFFI gases 172
 - UFFI Laboratory Registration Program 75
 - UFFI National Testing Survey 211
 - UFFI particles 122,185
 - UFFI related research 120
 - UFFI residues 205,220
 - UFFI samples 40
 - undergraduate 193
 - undiluted furnaces 70
 - UNION 250,262
 - Union List of Scientific Serials in Canadian Libraries 262
 - universities 201
 - university laboratories 226
 - unpublished information 241
 - unvented 225
 - unvented space heaters 70
 - update services 251
 - Uranium City 142
 - URBAMET 278
 - Urban Abstracts 278
 - urban facilities 118
 - urban matters 278
 - urea-formaldehyde foam insulation 1, 9,12,31,40,58,60,64,65,68,87,98,100, 119,120,124,127,131,147,151,152,172, 173,174,177,182,185,192,196,217,220, 226,230
 - user-friendly 168
 - user-interactive 109
 - user needs 118

Subject Index

user-oriented 89
 user requirements 118
 vapours 85
 variable air volume systems 63
 VDTs 89
 vent failures 137
 vent openings 170
 ventilating systems 59
 ventilation rates 61
 ventilation 18,19,20,25,30,56,59,62,
 75,110,113,169,178,196,200,206,220
 ventilation bypass procedure 211
 ventilation measurements 110
 ventilation problems 98
 ventilation rate 37,93,160,171,202,
 207
 ventilation remedial measures 121
 ventilation requirements 144
 ventilation standards 19,35,65,80,
 204
 ventilation surveys 31
 ventilation system 55,73,177,227
 ventilation systems design 116
 ventilation techniques 93
 venting 25,238
 venting failure 137,238
 very low frequency fields 89
 viable 110
 viable particles 202
 vibration 226
 video display terminals 89
 video images 67
 video production 67
 videos 67
 vinyl chloride 34
 viruses 85
 visual planning 278
 Volatile Organic Compounds (VOCs)
 73
 volatile products 147
 vulnerable populations 86
 walk-through 177
 wall 64
 wall cavities 1,122,169,205
 wall sealing 192
 wall sheathing 230
 water 206
 water heaters 238
 water spray air scrubber 216
 water spray scrubber 121
 water vapour 109,148,206
 weather variables 213
 weather conditions 166
 weathersealing 187
 weatherstripping 67,182
 well-insulated buildings 209
 well-sealed houses 167
 wet building materials 202
 white collar workplace 111
 wind 171
 wind conditions 97
 wind direction 138
 wind tunnel study 138
 wind velocities 12
 windows 64,169
 winter conditions 171
 winter season 206
 wood 95
 woodburning 146
 woodburning furnaces 199
 woodburning stoves 18
 woodstoves 18,31,70,150
 work 193
 working conditions 226
 working environment 62,106,153
 Working Levels 141,149
 workplace air quality 61
 workshop 151,152,173,200
 X-ray diffraction 132