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***Housing Technology Research
February 1994***

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HOUSING TECHNOLOGY RESEARCH

Institute for Research in Construction
National Research Council Canada
Ottawa, Canada.
K1A 0R6

FEBRUARY 1994

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HOUSING TECHNOLOGY RESEARCH

Foreword

The Institute for Research in Construction (IRC) at the National Research Council Canada (NRC) is a centre of excellence in construction research critical to Canadian industry. It develops leading technologies, model codes and provides evaluation services in support of competitiveness, technological infrastructure and public safety. It is staffed by highly motivated and quality-oriented people who work in integrated, multi-disciplinary teams. A great deal of its work is undertaken in partnerships with private and public sector organizations. IRC is recognized by its clients and stakeholders for its objectivity, relevance and excellence.

The Institute is organized into 5 major branches. They are Research, Codes and Evaluation, Industry Liaison, Marketing and Contracts, and Administration and Program Support. The Research Branch is led by Dr R. C. Biggs and comprises the Acoustics Laboratory, Building Performance Laboratory, Infrastructure Laboratory, Materials Laboratory, National Fire Laboratory, and Structures Laboratory. The Codes and Evaluation Branch is led by R. P. Bowen and comprises the Canadian Codes Centre and the Canadian Construction Materials Centre. The Industry Liaison Branch is led by Dr F. R. S. Clark and includes the Technology Diffusion Service, Publication Service, Information Service, Client Services and Network Service. The Marketing and Contracts Branch is led by J. V. Nolen.

Enquiries

IRC offers a wide range of information, research and evaluation services to the housing industry. Through its national and international contacts and participation in many industry networks, IRC can be of assistance to industry in accessing information and technology from other agencies. Local access to IRC can be made through the Industrial Research Assistance Program (IRAP), which has Industrial Technology Advisors in every region of Canada. In addition IRC can be contacted at (613) 993-2607, or by FAX at (613) 952-7673.

Housing Technology Research

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This report was prepared by:
John Archer
Industry Liaison Branch
(613-993-5569)

ACOUSTICS LABORATORY

Laboratory Head: Dr J. D. Quirt (613-993-2305)

The Acoustics Laboratory at the IRC develops technology to solve room acoustics and noise-control problems in buildings. It is an internationally respected laboratory with facilities unmatched in North America. The following research projects affecting housing are under way or have been recently completed.

PROJECTS

Sound Transmission through Gypsum Board Partitions

Much of the current data on the sound-transmission characteristics of gypsum board partitions is unreliable because of product changes and the inadequate accuracy of older test methods. A major study to be completed in 1994 addresses this problem. Sound transmission is being measured for more than 250 wall constructions, and a procedure is being developed to calculate the change in sound transmission if slightly different materials are used. This research is closely coupled to research on the fire performance of these wall constructions. The project has substantial support from a consortium of partners, including the Canada Mortgage and Housing Corporation, Fiberglas Canada, Roxul, the Cellulose Insulation Manufacturers Association, and the Gypsum Manufacturers of Canada.

Research Officer:

Dr. A. C. C. Warnock (613-993-9370)

Sound Insulation in Coupled Floor/Wall Systems

A joint research project supported by CMHC is under way to examine sound transmission through floor/wall junctions in wood-frame buildings. Lightweight walls and floor/ceiling systems can separately get good ratings in ASTM standard laboratory tests, but exhibit significant noise problems when combined in a complete building. This pilot project is both developing test methods and evaluating the performance of specific construction details. The specimens include a floor/ceiling and partition wall, which divides the test chamber into four rooms, and a wall along one side of these rooms. Inter-connection between the walls and floor is altered to evaluate sound and vibration transmission with specific junction details. This first phase of research will be completed in 1994. It will be followed by a second phase of research to evaluate retrofit measures for poorly performing assemblies.

Research Officer:

Dr. T. R. Nightingale (613-993-0102)

Noise from Home Air-Conditioning Systems

IRC has completed a series of studies developing ways of reducing the noise from air-conditioning systems. The research began with a survey of annoyance experienced due to the noise of neighbours' air-conditioning systems, undertaken in collaboration with provincial regulators and the industry. The survey indicated that annoyance was closely related to the difference between the level of background noise in the environment and the noise generated by the individual air-conditioning unit. A 5 dBA difference was necessary for annoyance to be experienced. Criteria were established for regulating airconditioner noise, and installation guidelines for assessing potential noise impact were tested. From this work, The Heating, Refrigerating and Airconditioning Institute (HRAI) and the Ontario government have published guidelines and standards for the installation of residential air-conditioning devices.

Research Officer:

Dr. J. S. Bradley (613-993-9747)

Noise from Exhaust Fans

Inside the home, noise from fans can be a significant source of annoyance. Bathroom fans and kitchen exhaust fans are especially bothersome. However, there is no specific standard for fan noise. Research has been completed which related sound generated by bathroom and range hood exhaust fans in actual homes to laboratory ratings based on the CAN/CSA-C260-M90 standard. Results indicate that the selection of ventilation equipment can be based on sound power ratings as if they were measures of sound pressure (or "loudness"). That is, a fan with a CSA rating of 50 dB will be quieter than one with a rating of 60 dB. These results helped guide the development of proposed new mechanical ventilation requirements for the 1995 National Building Code of Canada.

Research Officer:

Dr. J. S. Bradley (613-993-9747)

Effect of Electrical Outlets on Sound Transmission

The sound-transmission characteristics of even the best acoustically designed gypsum board wall can be significantly compromised when mechanical and electrical services are installed. Research, with support from CMHC, is under way to evaluate the impact of electrical outlets in walls and to determine ways to minimize problems. This work, to be completed in 1994, will be used to develop recommendations for builders.

Research Officer:

Dr. T. R. Nightingale (613-993-0102)

Noise Exposure Forecasting

The rapid expansion of many Canadian cities in the 1960's and 1970's created pressure to develop land for homes near airports. Research was undertaken to develop Noise Exposure Forecasts (NEF) to guide planning. With the support of Transport Canada, new research is being undertaken to examine the fundamental assumptions behind this early work. To be completed in 1994, the results will improve the ability to predict airplane noise characteristics. It will likely lead to changes in the criteria used to regulate the development of residential land around airports.

Research Officer:

Dr. J. D. Quirt (613-993-2305).

Controlling Sound Transmission into Buildings

The acoustic requirements in the National Building Code of Canada are concerned with the transmission of sound through internal walls, floors and ceilings. The acoustic performance of external walls and roofs is not similarly treated. This research, supported by CMHC and planned for completion in 1994, is evaluating the acoustical characteristics of various types of envelope construction. It will provide a more accurate way to characterize external noise sources and lead to the formulation of improved guidelines for exterior envelope design.

Research Officer:

Dr. J. D. Quirt (613-993-2305).

BUILDING PERFORMANCE LABORATORY

Laboratory Head: Dr. S. A. Barakat (613-993-9580)

The Building Performance Laboratory at IRC has a broad program of research developing technologies for the design of durable and energy-efficient building envelope systems, and technologies for the design of the indoor environment that maximize occupant safety, comfort and productivity. Research affecting housing that is under way or recently completed include the following projects.

PROJECTS

Hygrothermal Behaviour of Building Materials and Components

The objective of this research is to develop analytical and experimental procedures to assess the long-term thermal and moisture (hygric) performance and durability of building materials and components as they respond to combined heat, air and moisture processes. The work is based on state-of-the-art computer modelling capability which IRC has acquired through collaboration with Valtion Teknillinen Tutkimuskeskus (VTT) Finland. More sophisticated numerical modelling techniques are being introduced to handle complex building geometries.

Examples of how the models are used include the analysis of the curing of freshly poured concrete in basement construction, and requirements for vapour barrier performance that reflect geographic location. Under way is work using the models to develop technical guidelines for air barrier performance. The models are also being used, in a joint project with CMHC, to examine the performance of high-rise residential building wall systems.

As a part of the project the gamma-ray equipment developed at IRC and used to measure the moisture content of materials in situ, was upgraded by integrating it with a three-laser system. Now, accurate information on temperature and relative humidity gradients and air-flow velocities in air spaces adjacent to experimental systems can be obtained. The equipment was used in an extensive series of tests examining heat and moisture transport processes in building materials such as drywall, glass-fibre insulation and cellulose insulation.

Research Officers:

Dr. M. K. Kumaran (613-993-9611)

Dr. A. N. Karagiozis (613-993-0582)

Cellular Plastic Insulation

The objective of this joint IRC/SPI project is to assist Canadian industry to develop procedures to assess the long term performance of cellular plastic insulations. The current focus is on board-stock products. An experimental technique to determine the thermal properties of products exposed to weather conditions, in situ, was developed and successfully applied to follow the performance of many experimental products. The current work is expected to be completed in one year.

The work completed over the last five years has resulted in a methodology for predicting the long-term thermal performance of cellular plastic insulations by identifying several experimental techniques. A computer model interprets the information from all these experimental techniques and predicts the long-term performance of the insulations. This methodology has been successfully applied to several new products.

Research Officers:

Dr. M. K. Kumaran (613-993-9611)

Dr. M. T. Bomberg (613-993-9672)

Pressure-Equalized Rainscreen Walls

Pressure-equalized rainscreen (PER) walls are intended to control all rain-penetration forces, especially pressure differences across the exterior cladding. Design methods for control of some of these forces are well understood. However, current design methods for pressure-equalization are only loosely based on engineering principles.

A project to develop a comprehensive set of design guidelines for PER walls is being executed. It consists of both experimental and modelling tasks. The experimental program involves laboratory and field evaluations of the performance of different wall systems. The modelling program is founded on a Computational Fluid Dynamics computer program that was acquired for the project. The experimental results will be used to validate the model and the validated model will be used to investigate the effects of various parameters on the performance of PER walls. The project is supported in part by CMHC. Manufacturers of external insulated finish systems (EIFS) and precast wall systems are contributing two test specimens to the experimental part of the project. Metal curtain wall and brick veneer/steel stud test specimens are also being delivered.

Preliminary laboratory results indicate that a) some zero cavity walls, i.e., walls with fibrous insulation in the cavity, will not equalize completely under typical wind conditions and b) only a small amount of venting may be required to obtain complete equalization of an empty cavity. In support of the field evaluations, the recently retrofitted walls of a building on the NRC campus have been instrumented to obtain data on cavity wall performance.

Research Officers: Mr. W. C. Brown (613-993-9673)

Dr. A. Baskaran (613-990-3616)

Window Performance Standards

IRC has participated in efforts to develop standard procedures to evaluate the thermal performance of windows. Specifically, two complementary ASTM standard test methods and practice documents (ASTM E1423-91 and ASTM C1199-91) for determining the R-value of windows by means of a guarded hot-box have been developed. CSA published a standard procedure (CSA A440.2) for determining an Energy Rating for windows (ER), and the ASTM standards were referenced in the CSA standard.

Air leakage of windows under temperature and pressure differences has been the subject of considerable interest and a facility to measure such performance is being developed. When the facility is completed, a series of tests will be conducted to determine whether window air leakage is significantly affected by temperature difference. The results will be used to upgrade the information in CSA A440.2. This work is co-sponsored by NRCan.

Research Officer:

Dr. A. H. Elmahdy (613-993-9752)

Warm-Edge Technology

A preliminary investigation of the effect of spacer bar type on the surface temperature of the edge of insulating glass units is completed. The project was jointly funded by NRC and the Swiss Federal Institute for Materials Testing and Research (EMPA). The results were presented at the winter meeting of the Insulating Glass Manufacturers Association of Canada (IGMAC). A detailed technical paper was presented at ASHRAE and SIGMA meetings in 1993.

The results indicated that glass surface temperature in the edge of the glass region and the overall thermal resistance of the glazing system is strongly dependent on the material and the design of the spacer bar. As a result, the project is being extended to look at new types of spacer bars and to investigate their effects on the thermal performance of windows.

Research Officer:

Dr. A. H. Elmahdy (613-993-9752)

Canada/United States Joint Research Project on Windows

A project co-sponsored by NRCan, NRC and US Department of the Environment (DOE) on window performance has been expanded to include the thermal performance of sloped glazing and skylights. IRC is developing a test procedure to determine the thermal performance of window components using the guarded hot-box apparatus. Preliminary results showed that the window component R-values could be determined using these measurements. The next step is to simulate and test a series of windows to confirm the accuracy of the developed procedure. In addition a research project to investigate the use of infra-red (IR) thermography to determine

glass surface temperature is under way. Further joint work will be determined early in 1994.

Research Officer:

Dr. A. H. Elmahdy (613-993-9752)

Durability of High Performance Glazing Units

A project to study the durability of high performance glazing systems, co-sponsored by IRC, NRCan, Ontario Hydro, Insulating Glass Manufacturers' Association of Canada (IGMAC) and the Ontario Ministry of Environment and Energy, is in progress. The work is concentrating on developing a test method to determine the argon gas concentration of insulated glass (IG) units. Phase I and II of this project are complete, and a report is being prepared to document the test procedure to determine argon concentration of gas filled IG units. This procedure will be submitted to CAN/CGSB 12.8 standard committee for review and possible adoption as a Canadian standard.

Research Officer:

Dr. A. H. Elmahdy (613-993-9752)

Evaluating Innovative Basement Insulation pPacement

With collaboration and funding from NRCan, IRC has updated a method to analyze the energy performance of innovative basement insulation configurations. The method is consistent with the original technique of basement heat-loss analysis developed at IRC and has been mounted on a PC to facilitate future evaluations. The results of this work will be included in the HOT2000 program to increase access by home builders and designers. Preliminary calculations have compared combined interior and exterior basement insulation with a 0.6 m overlap below grade to full height insulation on one side of the wall. This information has been used to develop recommendations for the National Energy Code for Houses.

Research Officer:

Mr. M. C. Swinton (613-993-9708)

Basement Condensation

In collaboration with the Association provinciale des constructeurs d'habitations du Québec (APCHQ) and with partial funding from CMHC, IRC is investigating the mechanisms producing excessive condensation during the curing of concrete in freshly poured and finished basement walls. The objective is to determine through detailed simulations whether judicious choice of materials, construction techniques and scheduling can reduce or avoid the condensation problem. The detailed simulations performed to date suggest that a number of practical measures can be taken to improve condensation resistance of fully insulated basement walls. One of these may

be a return to the use of building paper between the concrete foundation wall and the wood-frame/insulation interior wall.

Research Officers:

Mr. M. C. Swinton (613-993-9708)

Dr. A. N. Karagiozis (613-993-0582)

Full Depth vs Part-Depth Basement Insulation

IRC has evaluated the cost-effectiveness of various levels and placements of insulation for basements, crawl spaces and slabs-on-grade for the National Energy Code for Houses. At the request of CHBA's representative on the Standing Committee on Energy Conservation in Buildings, the scope of the cost-effectiveness study was broadened to include an evaluation of full-depth basement wall insulation relative to part-depth (0.6 m below grade) insulation. Evaluation of part- and full-depth insulation measures for 37 locations across Canada have shown the full-depth basement insulation is cost-effective in most locations and for most heating fuels, except for gas-heated houses in southern and central Alberta and in the lower mainland of British Columbia.

Research Officer:

Mr. M. C. Swinton (613-993-9708)

Performance of Compact Fluorescent Lamps

This study, jointly funded by CEA, NRCan and IRC, reviewed and measured the key economic and performance aspects of compact fluorescent (CF) lamps that may affect the success of retrofit rebate programs, and ultimately the energy conservation goals that rely on CF technology. The results of a psycho-physical experiment did not support to claims that properly operated CF lamps are not perceived as being as bright as the incandescent lamps they are intended to replace. Therefore, CF systems can likely only be satisfactorily applied when proper attention is paid to fixture design and other physical aspects of lighting.

Of particular relevance to the operation of CF systems in the Canadian context were the results on cold-temperature operation. Many of the systems tested showed considerably decreased performance below +10°C; at -9°C several of the CF systems actually cost more to operate than the incandescent lamps they are intended to replace. Frost on the lamp wall also led to increased failure rate, in some cases. On the other hand, there were some systems that performed adequately down to -18°C.

Electrical performance characteristics were also investigated in detail. Some CF systems, particularly those that are electronically ballasted, display high total-harmonic-distortions (THD) and low power-factors (PF). There was also a wide range of performance across the CF systems when tested for disturbances at the electrical supply, including high supply THD, and low supply voltage ("brown-out"). Some systems were relatively unaffected, whereas one system failed electrically.

These observations stress the need to consider the detailed performance characteristics under the proposed operating conditions before investing in CF systems. A correctly chosen CF system operated under suitable conditions will pay for itself within its lifetime.

Research Officer:

Mr. M.J. Ouellette (613-993-9619)

Full-Spectrum Lighting and Well-Being

The IRC Lighting Group receives many inquiries about the effects of full-spectrum fluorescent lighting on people. The general public has been led to believe that full-spectrum fluorescent lighting contributes to improved health, better mood, and greater performance. One current project is a comprehensive review of the scientific literature on this subject. The quality of much of this literature leaves many questions unanswered. However, the evidence to date shows that for the general population and most tasks, full-spectrum fluorescent lighting is neither better, nor worse, than any other fluorescent lamp. The exception to the above statement is in the case of tasks requiring very fine discriminations of colour, for which the improved colour rendering qualities of full-spectrum lighting make it the better choice.

There are suggestions, as yet unsupported by scientific evidence, that full-spectrum lighting may be beneficial in other circumstances. For example, it is possible that some especially sensitive individuals may benefit from changes to the spectral content of their indoor lighting. There may also be some benefit to the use of a broader spectrum in the far North or in other daylight-deprived circumstances (e.g., chronic care hospitals, nursing homes), although this has yet to be examined. However, for most applications one would do as well with a conventional cool-white lamp as with a full-spectrum lamp.

Research Officer:

Dr. J. A. Veitch (613-993-9671)

Indoor Air Quality, Ventilation Efficiency and Air Leakage

Research continued on analytical tools to evaluate indoor air quality and ventilation efficiency in buildings. A joint project with PWGSC is under way to investigate the impact of indoor environment measures by relating occupant reactions to measurable parameters of the indoor environment such as ventilation rate, and the thermal comfort and lighting conditions. Also, the effects of airtightness and airtightening retrofit measures on the building envelope of office buildings are being examined.

Research Officers:

Dr. C.Y. Shaw (613-993-9702)

Dr. M. N. Said (613-993-5938)

Dr. J. T. Reardon (613-993-9700)

Dr. J. S. Zhang (613-993-9538)

Dr. J. A. Veitch (613-993-9671)

Dwelling Unit Pressure Design Requirements

An NRCan/IRC joint project to assess the implication of the "Dwelling Unit Pressure Design Requirements" as included in the CSA Standard F326 "Residential Mechanical Ventilation Systems" has been completed. The final report will be available soon. This project examined the relationships between pressure differences across the building envelope of a residential-type building and the factors that create them – wind and temperature differences, and the operation of air-handling appliances in the building.

The results gave a realistic basis of measured data to support the adoption into the 1995 NBC of the CSA Standard F326, particularly its limits for house pressurization and depressurization by operation of mechanical ventilation appliances, and the allowable imbalance between supply and exhaust flow rates.

Research Officers:

Dr. C.Y. Shaw (613-993-9702)

Dr. J.T. Reardon (613-993-9700)

Alternatives to Ducted Ventilation Systems

A project has begun to examine low-cost alternatives to completely ducted ventilation systems suitable for houses with no air-distribution systems. Support for this project has been received from various organizations including the Canadian Electrical Association, CHBA, NRCan, EEMAC and CMHC. Preliminary results from the project are expected in the Fall of 1994, with the completed publication in early 1995.

Research Officers:

Dr. C.Y. Shaw (613-993-9702)

Dr. J.T. Reardon (613-993-9700),

Renovation for Hypersensitive Occupants

A CMHC/IRC joint project is under way to measure the ventilation rates, air-distribution patterns and indoor air quality in five houses before and after they are renovated to improve air quality. Although the work is directed specifically at improving the indoor environment for people who have hypersensitivity to indoor air contaminants, the results should have useful general application. The work is expected to be completed by the end of 1994.

Research Officer:

Dr. C.Y. Shaw (613-993-9702)

Material Emissions

IRC has initiated a five-year project on material emissions and IAQ modelling. The main objectives are to:

1. Develop procedures for measuring the emission characteristics of various building materials and furnishings under laboratory and field conditions;
2. Develop a database of measured emission characteristics for various building materials and furnishings under both laboratory and field conditions; and,
3. Modify/develop air-flow and contaminant-flow models for predicting the concentrations of various contaminants generated by building materials and furnishings in buildings based on the measured emission characteristics.

A full-size test chamber which can be used to test furniture and large samples of building materials is being constructed. Support for this project has been received from various organizations including NRCan, CMHC and CHBA.

Research Officers:

Dr. C.Y. Shaw (613-993-9702)

Dr. M.N. Said (613-993-5938)

Dr. J.T. Reardon (613-993-9700)

Dr. J.S. Zhang (613-993-9538).

CANADIAN CODES CENTRE

Centre Head: Mr. R. J. Desserud (613-993-9960)

The Canadian Codes Centre at IRC is responsible for the development of the national system of model building codes adopted by the provinces and territories. The codes are revised on a five-year cycle through an extensive consultation process with industry, regulators and the public. The next updated version of the National Building Code will be published in 1995.

ACTIVITIES

National Energy Code for Houses (and National Energy Code for Buildings)

Please note the new names that the Standing Committee is using now. They replace "Canadian Code for Energy Efficiency in New Houses" and "Canadian Code for Energy Efficiency in New Buildings."

Standing Committee on Energy Conservation in Buildings

In October 1993, the Standing Committee held its final meeting prior to the Codes' being published for public review. All necessary decisions were made and staff is now engaged in finishing the public review documentation. A major part of this process is consultation with the provinces and territories on the life-cycle-costing analysis on which the Codes' regionally-sensitive requirements will be based. The Standing Committee reviewed the results of the first round of this consultation process and concluded that it is going well enough and producing results that are reasonable enough that the Standing Committee will not need to intervene further. The consultation process is establishing regional values for such requirements as minimum R-values and whether or not heat recovery ventilation is required.

The public review draft is expected to be available in March 1994. Written comments will be accepted up to the end of May 1994. A cross-country series of 18 seminars to introduce the energy codes will be held in March 1994 (see schedule at end of this section). The objective of these seminars is to enhance the general level of understanding of the energy codes so that those wishing to submit written comments will be able to do so from a sound base.

National Building Code Part 9, Housing and Small Buildings

More than 250 proposed changes to Part 9 were published for public review in early September 1993. Twenty-one seminars were held across the country to explain the proposed changes and encourage comment. The Canadian Codes Centre was also pleased to see the active role that CHBA (through its publication "Proposed Code Changes - Your Chance to be Heard") played in encouraging its members to send in comments.

By the closing date of 17 December 1993, many additional comments had been received. Staff is now collating and analyzing these for review by the Standing Committee on Housing and Small Buildings at its next meeting in April 1994.

Committee Membership Renewals

All memberships on all standing committees are up for review in 1994. A number of vacancies are expected. CHBA members may be interested in membership on the Standing Committee on Housing and Small Buildings and the Standing Committee on Energy Conservation in Buildings. Those interested in being considered for membership on any of the standing committees should write to:

*The Secretary
Canadian Commission on Building and Fire Codes
Canadian Codes Centre
Institute for Research in Construction
National Research Council of Canada
Building M-24, Montreal Road
Ottawa, Ontario
K1A 0R6*

Please indicate the committee(s) you are interested in (a complete list of committees can be found in the front of the NBC) and enclose a recent résumé that lists your qualifications in the area of responsibility of that committee. Written expressions of interest must be received by the end of February 1994 to be considered by the Nominating Committee in this round of membership renewals.

CCBFC Task Group to Prepare a Strategic Plan

Organizations that prepare and enforce building and fire regulations around the world are encountering new challenges as they attempt to perform their function. Questions are raised as to the scope and purpose of model codes and the changing role of building regulations, such as: What will be the impact of globalization and free trade on building regulations? How will code developers account for fiscal pressures on the enforcement community and on the Canadian codes- and standards- writing organizations? What will be the impact of the apparent trend towards

performance-based requirements? Can the code change process be improved? Is there a move towards privatization of the regulatory authority? What will be the role of electronic information technology? Who will do and pay for research in support of codes and standards?

To address these concerns and others, the Canadian Commission on Building and Fire Codes (CCBFC) has created a task group to recommend a strategic plan that will guide the Commission in its work over the next five to ten years and beyond. Under the Chairmanship of Dave Monsen of Alberta Labour and with the help of a consultant, this task group intends to provide the draft plan to CCBFC at its last meeting in the 1995 code cycle. Members include Eugène Arrelle, Régie du bâtiment, Québec; Bruce Clemmenson, Canadian Home Builders' Association (CHBA); Jonathan Rubes, Fire Protection Consultant; Casey Skakun, Alberta Public Works; Bob Switzer, City of Richmond, B.C.; and C. Ross Thomson, incoming Chairman of the Board, American Society for Testing and Materials (ASTM).

Consultation with code users and the Provincial/Territorial Committee on Building Standards (PTCBS) will be part of the process and proposals and briefs from interested parties will be welcome. The Canadian Codes Centre is particularly pleased to note that CHBA is already well along in the process of developing positions on many of these issues and looks forward to the presentation of the CHBA position paper to the Task Group.

Fall Meeting of the Canadian Commission on Building and Fire Codes

Among the topics discussed at the CCBFC's November 1993 meeting was a recommendation from the Standing Committee on Housing and Small Buildings that changes to Part 9 to recognize sprayed-in-place urethane insulation (already agreed to by the Standing Committee) be issued as a "special change" to the 1990 NBC; i.e., that this change not be held for public review and publication in the 1995 NBC but be published immediately as an interim revision to the 1990 NBC. The Executive Committee of the CCBFC had reviewed this proposal in the spring and recommended that the change be held at least until the end of the public review period. It felt that if no significant adverse public comment were received, the fall meeting of the full Commission could decide that this special change proceed. Unfortunately, delays in publishing the proposed changes for public review resulted in the deadline for public comment falling after the CCBFC's fall meeting. Thus, it was not known at the time of the meeting whether there would likely be any adverse public comment on this proposed change. Because of this and bearing in mind that this material is already being extensively used on the basis of CCMC evaluations, the CCBFC decided not to proceed with a special change.

Codes Officers:

Ms. G. A Chown (613-993-0352)

Mr. J. C. Haysom (613-993-0043)

Mr. M. Lacroix (613-993-0056)

Seminars to Introduce the National Energy Codes for Houses and for Buildings

City	Date	Location	Registration	Fee	Contact for More Information
Ottawa	1 March 1994	Ottawa Congress Centre	08:00	\$40	Ms. Chantal Bois National Research Council Ottawa 613-993-4983 FAX 613-952-4040
St. John's	21 March 1994	Nfld. Power Building Training Centre	08:30	\$15	Mr. John Drover Dept. of Mines and Energy St. John's 709-729-5755 FAX 709-729-2508
Montreal (English)	23 March 1994	to be announced	to be announced	tba	Service d'accueil et de renseignements Ministère de l'Énergie et des Ressources Ville de Québec 418-646-2727 Télécopieur 418-644-7160 1-800-463-4558
Halifax	23 March 1994	Ramada Renaissance Hotel	08:00	\$55	Mr. George Foote Nova Scotia Dept. of Natural Resources Halifax 902-424-8168 FAX 902-424-7735
Winnipeg	23 March 1994	to be announced	to be announced	tba	Mr. Ken Klassen Manitoba Energy and Mines Winnipeg 204-945-2792 FAX 204-945-1406
Regina	23 March 1994	Delta Regina	08:00	\$45	Ms. Marge Martin Saskatchewan Municipal Government Regina 306-787-4347 FAX 306-787-9273
Fredericton	25 March 1994	Hugh John Fleming Forestry Centre, UNB	8:30	tba	Mr. Robert Murray Dept. of Natural Resources and Energy Fredericton 506-453-3949 FAX 506-457-4999
Toronto	25 March 1994	to be announced	to be announced	tba	Mr. Allan Jenkins Ministry of Environment and Energy Toronto 416-327-2985 FAX 416-327-2993
Calgary	25 March 1994	Blackfoot Inn	08:00	\$35	Mr. Chris Tye Alberta Labour Edmonton 403-427-8265 FAX 403-422-3562
Vancouver	25 March 1994	to be announced	to be announced	tba	Mr. Bill Jones Building Inspectors' Association of BC Vancouver 604-922-6756 FAX 604-922-6536
Sudbury	28 March 1994	to be announced	to be announced	tba	Mr. Allan Jenkins Ministry of Environment and Energy Toronto 416-327-2985 FAX 416-327-2993
Whitehorse	28 March 1994	to be announced	to be announced	tba	Mr. Pat Hogan Dept. of Economic Development Whitehorse 403-667-5445 FAX 403-667-7209

Seminars to Introduce the National Energy Codes for Houses and for Buildings (continued)

City	Date	Location	Registration	Fee	Contact for More Information
Edmonton	28 March 1994	Convention Inn South	08:00	\$35	Mr. Chris Tye Alberta Labour Edmonton 403-427-8265 FAX 403-422-3562
Montreal (français)	28 Mars 1994	to be announced	to be announced	tba	Service d'accueil et de renseignements Ministère de l'Énergie et des Ressources Ville de Québec 418-646-2727 Télécopieur 418-644-7160 1-800-463-4558
Ville de Québec (français)	30 Mars 1994	to be announced	to be announced	tba	Service d'accueil et de renseignements Ministère de l'Énergie et des Ressources Ville de Québec 418-646-2727 Télécopieur 418-644-7160 1-800-463-4558
Saskatoon	30 March 1994	Holiday Inn	08:00	\$45	Ms. Marge Martin Saskatchewan Municipal Government Regina 306-787-4347 FAX 306-787-9273
Kamloops	30 March 1994	to be announced	to be announced	tba	Mr. Bill Jones Building Inspectors' Association of BC Vancouver 604-922-6756 FAX 604-922-6536
Yellowknife	30 March 1994	Explorer Hotel	08:30	tba	Ms. Cara McCue NWT Dept. of Energy and Mines Yellowknife 403-920-3216 FAX 403-873-0254

CANADIAN CONSTRUCTION MATERIALS CENTRE

Centre Head: Mr. J. F. Berndt, (613-993-6189)

The Canadian Construction Materials Centre (CCMC) at IRC provides an evaluation service for manufacturers of building products. CCMC evaluations demonstrate a product's fitness for intended use and facilitate acceptance by regulatory authorities. Recent activities at CCMC related to housing include the following.

ACTIVITIES

CCMC Consolidates its Evaluation Listings and Reports

In an effort to improve access to its product evaluations, CCMC has consolidated all its Evaluation Listings and Reports into a single "Registry of Product Evaluations." Conveniently sized for travel to construction sites, the Registry will be updated and re-issued semi-annually. It contains detailed references to hundreds of evaluated products, all classified numerically according to the 16-division North American Masterformat system. To obtain a free subscription, contact IRC Client Services, Fax # (613) 952-7673.

Endorsements for CCMC Evaluations

In addition to the long-standing CMHC statement of acceptance of CCMC evaluated products, the Registry of Product Evaluations now contains the following endorsements:

Provincial/Territorial Support

The Provincial/Territorial Committee on Building Standards, composed of senior officials from provincial and territorial departments responsible for building regulation, supports the use of CCMC evaluations as a basis for determining the acceptability of products within the context of building code requirements.

Ontario

In Ontario, CCMC is the only organization designated as a materials evaluation body for the purposes of supporting Minister's Rulings on innovative materials, systems and building designs under the Building Code Act.

Public Works Canada

Public Works Canada accepts the construction products listed in this volume for use on PWC projects.

CWDMA Window Certification

The Executive Committee of the Canadian Commission on Construction Materials Evaluation met on 29 April 1993 and recommended that a joint survey be conducted of all CWDMA members and CCMC clients to determine their wishes regarding the withdrawal of the CCMC evaluation program for windows and patio doors. A final decision would have been made by the Commission itself based on the results of that survey. CWDMA considered it premature to conduct a survey in the Fall of 1993 and recommended reconsideration in approximately six months.

Although the Executive did not consider that Standards Council of Canada accreditation of the CWDMA Certification Program was essential, they did request information on the following indicators of impartiality and credibility:

- existence of an independently controlled board which reviews and accepts the responsibility for the certification work
- use of accredited testing laboratories or their equivalents to conduct tests
- existence of an in-house team of experts or reliance on a network of recognized experts that sets evaluation criteria and evaluates results
- evidence of quality control in the manufacturing process in accordance with ISO 9000 series of standards or equivalents.

Manager:

Mr. J. F. Berndt, (613-993-6189)

NATIONAL FIRE LABORATORY

Laboratory Head: Mr. J. K. Richardson (613-993-2204)

The National Fire Laboratory (NFL) at IRC develops technologies to reduce fire losses and the costs of fire safety. The Laboratory's column furnace is unique in North America and its 10-storey tower is unique in the world. On-going and recently completed research related to housing includes the following.

PROJECTS

Sprinklers and Smoke Control

A joint project with ASHRAE to investigate the effect of sprinklers on smoke movement is completed. The work focused on multi-storey buildings (such as apartment buildings) in which sprinklers are intended to provide some control of smoke movement. The research indicates that the quantities of smoke generated in situations where the fire is shielded from the sprinklers are much greater than previously assumed (including significant quantities of carbon monoxide). These results are leading to a re-evaluation of the smoke control strategies in Measure A of the National Building Code. Alternative approaches to these requirements are being considered.

Research Officer:

Mr. J. R. Mawhinney (613-993-7229)

Fire Risk-Assessment Model

NFL scientists, in collaboration with experts from Victoria University of Technology in Australia, have perfected a risk-cost model for assessing fire risks in new and retrofitted apartment and office buildings and completed a study on the fire risks and protection costs in three-storey, wood-frame apartment buildings. The latter results indicate that wood-frame apartment buildings can be built to the same level of fire safety as those built of concrete. This work encourages the international adoption of wood-frame construction and expands markets for Canadian softwood products.

Research Officer:

Dr. David Yung (613-993-9739)

Gypsum Board

The NFL has under way a project to assess the fire resistance of gypsum board-protected frame assemblies. This project reflects changes to the CSA standard for normal (non-Type-X) gypsum board. In addition, preliminary

tests indicate some anomalies in the NBC Appendix and Supplement ratings for assemblies incorporating normal gypsum board. This research work is closely coupled with work on the acoustic performance of the same types of assemblies. It is planned that the results of this work be presented to the Standing Committee on Housing and Small Buildings at its Spring 1994 meeting.

Major funding for this work was provided by CMHC. Many industry participants are also involved, including Fiberglas Canada, Roxul, the Cellulose Manufacturers Association, Gypsum Manufacturers Association of Canada, Forintek and the Canadian Sheet Steel Institute.

Research Officer:

Dr. M. A. Sultan (613-993-9771).

Materials Laboratory

Laboratory Head: Dr. J. J. Beaudoin (613-993-6749)

The Materials Laboratory at IRC undertakes a wide range of research related to the performance of organic and inorganic building materials. Roofing materials account for a large share of the work in the organic area, utilizing the Laboratory's facilities which can simulate ten years of weather exposure in six months. Concrete, masonry and coatings are the primary focus of the inorganic research.

PROJECTS

Evaluation of Roofing and Waterproofing Membranes

The Materials Laboratory has an on-going program of research evaluating roofing and waterproofing membranes against standard tests of performance as a service to manufacturers. Manufacturers use the results to develop new products and to define the most-effective applications for existing products. The research is closely allied to the evaluation activities of the Canadian Construction Materials Centre.

Research Officer:

Mr. O. Dutt (613-993-4584)

Rubberized Asphalt Membranes

The Materials Laboratory has completed work to evaluate the water vapour transmission properties of rubberized asphalt. Fillers used in rubberized asphalt increase its permeability. When the permeability is high enough, water vapour can pass through and condense under the membrane. This often gives the appearance of roof leak, and can lead to unnecessary re-roofing. The research has assisted manufacturers to determine the ideal thickness and formulation of this material.

Research Officer:

Mr. O. Dutt (613-993-4584)

EPDM Roofing

The chemistry of ethylene-propylene-diene-monomer (EPDM) roofing is very complex. Small changes in the formulation can significantly change properties. This on-going research work is documenting the characteristics of these formula variations. The results are used by manufacturers to select and develop materials with characteristics tailored to specific applications.

Research Officer:

Mr. O. Dutt (61-993-4584)

Polymer Modifiers in Roofing Asphalt

Polymer migration in roofing asphalt is a common cause of roofing failure. The migration is caused by the extremes of temperature experienced by the typical flat roof. This research evaluated the performance of new polymer modifiers having promise of reducing the problem. Results of the research will be utilized in improving the CGSB standard for these products.

Research Officer:

Dr. R. M. Paroli (613-993-9714)

Ice and Water Protection Membrane

A new class of building materials that are intended to serve as both a water protection and ice protection membrane has recently appeared on the market. These materials can be utilized as a second line of defense against wind-driven rain or ice damming under low-sloping shingle and tile roofs. The Materials Laboratory has recently initiated research to evaluate their effectiveness.

Research Officer:

M. O. Dutt (613-993-4584)

Alternate Roofing Materials

The Materials Laboratory has a long-term program of research to assist developing countries to utilize local materials for construction. Recent assistance has been provided to develop a cement and natural-fibre roofing tile. The goal is to achieve standards of performance that will open an export market for the product. The Materials Laboratory has also evaluated a wood fibre-based corrugated structural board for suitability as roof decking. This product will create an economic use for local forest products. In another project, the Materials Laboratory is assisting in the development of a roofing material utilizing local natural fibres impregnated with asphalt. If successful, this will be an affordable product that can replace corrugated metal roofing in many residential applications.

Research Officer:

Mr. O. Dutt (613-993-4584)

Recycled Roofing Materials

No standards presently exist for roofing materials that utilize a high percentage of recycled rubber (such as automobile tires). These are materials that are presently hard to recycle. The Materials Laboratory is evaluating water permeability and long-term performance in an effort to develop a material that meets current performance standards.

Research Officer:

Mr. O. Dutt (613-993-4584)

Low-Temperature Performance of PVC Membranes

The shattering of polyvinyl-chloride (PVC) roofing membranes due to cold temperature has been reported in several areas of North America. The Materials Laboratory is looking at the low-temperature performance and weathering of PVC. The focus of the research is a phenomenon called the Glass Transition Temperature (T_G). A better understanding of what happens at this temperature will allow modifications to the product.

Research Officer:

Dr R. Paroli (613-993-9714)

Freeze-Thaw Performance of Mortars

Modern mortars are much stronger and less water-permeable than the lime-based mortars originally used in old houses. Use of these modern mortars can have significant negative impacts on older brick and stone walls. The research in this project is developing a new freeze-thaw test method for mortars using a uni-directional freeze-thaw testing apparatus. The results will be used to develop performance standards that will allow renovators to select a mortar with characteristics appropriate to the masonry they are repairing or matching.

Research Officer:

Dr. M. L. Thomson (613-991-6841)

Low-E Window Coatings

Low-e coatings on energy-efficient windows are becoming the norm for products sold in Canada. However, the data on the solar performance characteristics of low-e coatings is not uniform. The Materials Laboratory is evaluating low-e coatings to a common set of performance standards through the spectrum of near infrared, visible light and ultraviolet. The work will be completed in 1994. The results will permit builders to be more informed in their selection of window glazing products.

Research Officer:

Dr. R. M. Paroli (613-993-9714)

Parking Garage Membranes

The deterioration of parking garages from road salt is a well-known problem. Many multiple-unit residential buildings have been affected. A typical approach to ameliorating the problem is to install a waterproof membrane over the parking deck. However, there are no standards for this application. This research work has looked at issues of humidity, temperature and workmanship in the installation of these membranes. Standards and guidelines have been developed.

Research Officer:

Mr. N. Mailvaganam (613-993-9713)

Industry Liaison Branch

Branch Director: D. F. R. S. Clark

The Industry Liaison Branch is responsible for IRC's corporate relations and communications with stakeholders. It has an active seminar and publication program, maintains one of Canada's most extensive collection of documents on construction and has extensive links with industry technology networks.

PUBLICATIONS AND PROJECTS

Guidelines for Application of Part 3 of NBC to Existing Buildings

The Canadian Commission on Building and Fire Codes does not consider it appropriate to publish two different codes, one for new buildings and one for existing buildings. This could imply acceptance of substantially different levels of safety between new and existing buildings. To resolve questions concerning the method of applying the NBC to existing buildings, the Commission has decided to publish the guidelines on the intent of the NBC requirements and how those requirements might be applied to existing buildings. It is available from IRC Publication Sales for \$30 plus applicable taxes. In the future, guidelines will be available on other Parts of the National Building Code.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

Registry of Product Evaluations

Issued by the Canadian Construction Materials Centre, the Registry contains detailed references to hundreds of evaluated construction products, all classified numerically according to the 16-division North American Masterformat System. Conveniently sized for easy travel to construction sites, the Registry includes in a single volume all current CCMC Evaluation Reports and Listings. It replaces Volumes 1 and 2 of Evaluation Listings and the two 3-ring binders of Evaluation Reports. It will be updated semi-annually and can be fully recycled. Please call to receive your **FREE** subscription.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

Manual for Screening of Buildings for Seismic Investigation

Prepared by IRC, the manual presents a rapid screening procedure for ranking buildings in an inventory for more detailed seismic evaluations. The procedure is intended to precede and be compatible with the NRC document "Guidelines for Seismic Evaluation of Existing buildings," which is compatible with the National Building Code of Canada.

The methodology adopted in this manual is based on identifying the main features of any building affecting risk of seismic hazards and the importance of the building as determined by its use and occupancy. A numerical scoring system is used which is related to the earthquake requirements of the National Building Code. This method is not an evaluation for seismic adequacy, but rather a screening procedure to rank buildings that should be evaluated in more detail. It is available from IRC Publication Sales for \$30 plus applicable taxes.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

Guidelines for Seismic Evaluation of Existing Buildings

These guidelines were prepared by IRC for the B.C. Housing Management Commission, Canada Mortgage and Housing Corporation, Government Services Canada, Société Immobilière du Québec, and the City of Vancouver. With their agreement these guidelines are available to interested individuals or organizations for their information and review.

The guidelines are not to be interpreted as replacing or superseding applicable building regulations. They were developed from the preliminary version of "NEHRP Handbook for Seismic Evaluation of Existing Buildings" issued by the U.S. Federal Emergency Management Agency (FEMA) and have been adapted to be compatible with Canadian practice and the requirements of the 1990 National Building Code of Canada.

The guidelines identify typical structural deficiencies that have been observed (in past earthquakes) to lead to failure and falling of structural components and to partial or total collapse, with an attendant injury or loss of life. The methodology and criteria are based on life-safety. The guidelines present a set of questions that are designed to uncover weaknesses of the particular building being evaluated. The document is from IRC Publication Sales for \$50 plus applicable taxes.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

Productivity in Construction

The new publication from IRC and the Canadian Society of Civil Engineers (CSCE) provides project engineers, superintendents and foremen with valuable new insights on construction productivity and approaches for improvement. It defines productivity, the key concepts associated with it, and

how it can be measured. By presenting the construction project as a complete system and by explaining the dynamics of this system and the effect various factors have on productivity, it will guide those responsible to improve labour effectiveness or management practices. This important publication is available at a cost of \$30.00 plus applicable taxes.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

Protocols for Building Condition Assessment (Guidelines for Building Audits)

This publication is the result of a joint project with the Office of the Auditor General of Canada. The publication consists of technical protocols and explanatory information intended to give building owners or managers a clear idea of the condition of their buildings, or to provide an assessment of various components or systems that may be creating difficulties. Checklists are provided to assist the users.

Publication Officer:

Mr. E. L'Ecuyer (613-993-2463)

MiniCode Generator

IRC is collaborating with Alberta Labour, Ontario Ministry of Housing and the Fire Commission of Canada to produce a software package that generates the building code requirements for subsets of building types such as housing, small commercial construction or high buildings. To generate this "mini-code," the users choose the desired building features from a selection of classes. The Minicode Generator then selects the applicable NBC provisions and displays them to the user. The client markets of the system are building plan-examiners and designers. Both PC and Macintosh versions are currently under development and a system will be available in 1994.

Research Officers:

Dr. R. L. Thomas (613-993-0817)

Mr. D. J. Vanier (613-993-9699)

NBC Classifier

IRC has undertaken the development of a software expert system which guides a user through the stages of classifying a building according to the National Building Code, as part of the MiniCode Generator project. Although the NBC Classifier is the front end of the MiniCode Generator, it is also a tutorial system for novice building code users, assisting them in understanding the criteria for the selection of the various NBC building types and classes. Both PC and Macintosh versions are currently under development and are available for examination.

Research Officers:

Dr. R. L. Thomas (613-993-0817)

Mr. D.J. Vanier (613-993-9699)

National Codes Documents CD-ROM

Following the market survey of electronic codes products IRC has decided to explore the production of a CD-ROM version of the 1995 edition of the national code documents. This CD-ROM will contain all of the key code documents in both English and French and will provide an electronic viewer that would operate in both English and French. The CD-ROM would be available to run on both the PC platform under Windows 3.x and on the Macintosh platform.

A feature to be included will be the ability for users to obtain access to a document on the CD-ROM on an "as-needed" basis rather than purchasing outright access to all documents on a "may-be-needed" basis. This feature would enable users to control their costs but at the same time enable them to obtain immediate access through an access key provided over the telephone.

Research Officer:

Dr. R. Thomas (613-993-0817)

Lighting Resources

As part of its effort to improve access to relevant technical documentation, IRC has undertaken the development of an electronic publication on lighting research, development, standards and guidelines. This publication contains the technical documentation from the 1992 Building Science Insight seminar on Lighting along with a collection of reference documents and resources from national and international agencies disseminating lighting information. These groups include the Institute for Research in Construction, the Canadian Standards Association, the CIE (Commission Internationale de l'Éclairage), and the Illuminating Engineering Society (IES). Lighting Resources is currently under development will be available in early 1994 on a PC platform running under Windows 3.1.

Research Officers:

Mr. D. J. Vanier (613-993-9699)

Dr. D. K. Tiller (613-993-9539)

Dr R. L. Thomas (613-993-0817)

CCRB National Network

The Canadian Construction Research Board provides a forum for addressing common concerns related to the technological evolution of the industry. Membership in the 12 Chapters of CCRB has been tuned to reflect this function. The network itself has also expanded, with formation of a the Southwestern Ontario Chapter in London, Ontario in conjunction with the Centre for Studies in Construction at the University of Western Ontario. Active liaison is maintained through interlocking memberships with a wide range of construction related associations including key chapters of the CHBA.

Network Manager:

Mr. R. A. Hewett (613-993-0059).