NRC·CNRC
Institute for Research in Construction

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construction innovation

New framework for rating the speech privacy of enclosed rooms

NRC-IRC researchers, in partnership with Public Works and Government Services Canada (PWGSC) and the Royal Canadian Mounted Police (RCMP), have recently developed a practical framework for rating the speech privacy of enclosed rooms. The research was in response to concerns expressed by building owners and users who have been under increasing pressure to characterize and improve the degree of speech privacy provided by rooms. There is a need, and in some cases a legal requirement, to be able to provide a rating for a room, to identify problems, and to ensure that adequate privacy is provided.

This new tool developed by NRC-IRC will enable building owners, consultants, architects, and engineers to rate and to plan for adequate speech privacy, and to demonstrate compliance with new requirements.

The framework includes a scale for interpreting a building's physical properties in terms of speech privacy, and a means of measuring the speech privacy provided by a room. The scale for interpreting privacy is based on a new metric called the Speech Privacy Class (SPC), which is defined for specific listener positions outside a closed room. It is a physical measure of the "protection" afforded by the building at that point, for conversations occurring within the room. The degree of protection depends on

The need for speech privacy in enclosed rooms is increasing.

two main building-related factors: the sound isolation between the interior of the room and the listener position, and the background noise level at the listener position. Increasing either will result in greater protection.

The determination of SPC requires an estimation of the difference in sound level between that of a uniform broadband noise sound field in the interior of the room, and that received at a particular listener position outside the room. The background noise levels at the listener position are also required. Measurements needed to generate the data to determine the SPC can be easily done with common acoustical test equipment.

The relationship between SPC and subjective judgments of speech privacy has been demonstrated through extensive listening tests. Values of SPC are related to the probability of speech being audible or intelligible at listener positions using statistics of speech levels measured in a large number of meetings. The greater the SPC, the higher the maximum "safe" speech level, and hence the greater the degree of speech privacy.

The framework developed by NRC-IRC includes descriptions of SPC values in terms of the frequency of speech being audible or intelligible, and defines categories for setting speech privacy requirements. The measurement procedure and guidance for interpreting SPC, including definitions of speech privacy categories, are described in the newly approved ASTM E 2638-08 "Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room." The complete framework is described in a new NRC-IRC Research Report titled "Guide for Assessment of the Architectural Speech Privacy and Speech Security of Closed Offices and Meeting Rooms," available at http://irc.nrc-cnrc.gc.ca/pubs/index_e.htnl.

Specific questions can be directed to Dr. Brad Gover at 613-993-7985, fax 613-954-1495, or e-mail brad.gover@nrc-cnrc.gc.ca.

Highlights

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Canada

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2005 NATIONAL CONSTRUCTION CODES

new On-line subscription service!

The 2005 National Building, Fire and Plumbing Codes and supplementary Guides, as well as the 2006 Alberta Building and Fire Codes, are now available through an on-line Web-based subscription service.

Benefits of new on-line subscription service

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The 2005 National Building, Fire and Plumbing Codes of Canada are used as models for virtually all building and fire regulations in Canada. They establish the minimum requirements for a safe and healthy built environment and they contain new information describing the goals that the Codes' provisions are intended to achieve and the conditions that help satisfy the intended objectives. Considered as an indispensable source of information for building, fire and plumbing officials, as well as construction professionnals and educators, the Codes are also available in printed formats – binder and soft cover – and practical CD-ROM formats.

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Special public review: relocation of technical requirements in the national model codes

The Canadian Commission on Building and Fire Codes (CCBFC) invites interested Canadians to take part in a special public review from April 6 to May 29, 2009. The review will deal with a single subject, the relocation of technical requirements from the 2005 National Fire Code (NFC) to the 2005 National Building Code (NBC), as well as the addition of appropriate cross-referencing. The intent of the public review is not to introduce technical changes but rather to draw a clear line between the roles of the NFC and the NBC.

The proposed changes were originally recommended by the Task Group on Relocating Requirements and Cross-Referencing in the NFC and NBC, which was set up by the CCBFC in 1998 to review the role of each code. The task group agreed that the NBC is a design document for new buildings and major alterations to existing buildings, while the NFC should be a fire safety document for ongoing operation of buildings as well as maintenance of fire safety systems and equipment in existing buildings. As a result, the group recommended that:

1. Operational fire safety requirements presently in the NBC be moved to the NFC (for example, fire safety requirements at construction and demolition sites)
2. NFC requirements duplicating information already contained in referenced standards (e.g., sprinkler design and portable extinguisher standards) be deleted
3. Building design requirements presently in the NFC be moved to

Continued on page 5

Changes proposed for NBC to improve radon requirements

In June 2007, Health Canada reduced the guideline for acceptable radon concentrations within homes from 800 Bq/m^3 to 200 Bq/m^3. Even before this announcement, the Canadian Commission on Building and Fire Codes (CCBFC) had begun the process of setting up a task group to determine the effectiveness of current building practices in light of this new guideline. The task group determined that houses built according to current code specifications (air barrier below ground, proper sealing, etc.) had adequate resistance to radon ingress.

Given the difficulty in determining areas where radon might be a risk, the task group's proposed solution addresses both large buildings and small buildings. The solution for small buildings would require the rough-in for a future radon exhaust system in addition to a good air barrier system in below-ground assemblies. Proposed changes to the 2005 National Building Code of Canada (NBC) will also restructure existing requirements and make them more effective. These proposed changes will go to public review in September 2009 and, if approved, will be published in the 2010 NBC.

For more information, please contact Frank Lohmann at 613-993-9599, fax 613-952-4040, or e-mail frank.lohmann@nrc-cnrc.gc.ca.

Newsbrief

CCBFC to add energy efficiency for houses objective to the National Building Code

As previously reported (see *Construction Innovation* December 2008), the Canadian Commission on Building and Fire Codes (CCBFC) agreed it would undertake work to consider energy efficiency in houses. This decision, made in response to requests, was in keeping with the current interest in addressing energy efficiency at the provincial and territorial levels. In addition, the Commission is now updating the Model National Energy Code for Buildings (MNECB) for publication in 2011. The MNECB applies to all buildings, regardless of size, with the exception of housing within the scope of Part 9 of the National Building Code (NBC).

In November 2008, the Provincial/Territorial Policy Advisory Committee on Codes (PTPACC) advised the CCBFC of its preferred approach, that an objective for energy efficiency requirements for houses be added to Part 9 of the NBC for 2012. Accordingly, the CCBFC approved formation of a joint task group in February 2009, to develop the objective. The objective, once developed, will undergo public review prior to the development of technical requirements.

To request more information on the progress of this project, please contact Anne Gribbon at 613-993-5569, fax 613-952-4040, or e-mail anne.gribbon@nrc-cnrc.gc.ca.

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New features added to the online edition of the Registry of Product Evaluations

The NRC Canadian Construction Materials Centre (NRC-CCMC) is pleased to announce that the online edition of the 2008 *Registry of Product Evaluations* can now easily be downloaded to your laptop or PC. What's more, the December update to the online Registry was the first time that the evaluated products were indexed using the 2004 MasterFormat. Previously published Web Registries used the 1995 MasterFormat.

The *Registry of Product Evaluations* contains evaluation reports and listings for over 500 products evaluated by CCMC. The documents can easily be found according to report or listing number, manufacturer's name, product name, or MasterFormat number.

The *Registry* is available free of charge on the NRC-IRC Web site at: http://irc.nrc-cnrc.gc.ca/ccmc/index_e.html or on CD-ROM. To order the 2008 CD-ROM edition (published annually), please visit the NRC Virtual Store at www.nrc.gc.ca/virtualstore or contact NRC-IRC Publication Sales at 1-800-672-7990 or 1-613-993-2463 (Ottawa-Gatineau and U.S.).

New product evaluations

Company	Product Name	CCMC #	Description
Building Products of Canada Corp.	Enermax	13356-R	Air Barrier Materials
Duradrive Systems International Inc.	Duravapor 30 Minutes	13398-L	Wall Sheathing Membranes (Asphalt Impregnated)
Tolko Industries Ltd.	TK-40 and TKO-60 Prefabricated Wood I-Joists	13389-R	Prefabricated Wood I-Joists

For further information on the performance, usage and limitations of these products, as well as for other reports and listings by NRC-CCMC, see the Web Registry of Product Evaluations located at **http://irc.nrc-cnrc.gc.ca/ccmc/regprodeval_e.html**.

Special public review: relocation of technical requirements in the national model codes

Continued from page 3

the NBC (except for spill control measures, which should be retained in the NFC), and

4. Proper cross-referencing be established between the two codes.

The CCBFC accepted these recommendations and implemented the first two in the NBC and the NFC for 2005. It is now seeking public input on the remaining two recommendations.

This is a unique opportunity for the public to help improve the content of the codes. Interested persons can review the proposed changes and provide comments on the National Codes web site, www.nationalcodes.ca, from April 6 to May 29, 2009. All comments submitted will be reviewed by the relevant standing committees at their fall 2009 meetings. The proposed changes recommended by the standing committees will then be submitted to the CCBFC for approval and incorporation into the 2010 editions of the NFC and the NBC.

For more information on the CCBFC and on the national code development process, please visit www.nationalcodes.ca, or contact the Secretary to the CCBFC at 613-993-5569, fax 613-952-4040, or e-mail codes@nrc-cnrc.gc.ca.

NRC-IRC completes Phase I of Fire Performance of Houses project

Canadians have always looked for ways to improve the quality of their homes, and this trend has never been stronger than in the past three decades. Manufacturers are continuing to meet new demands by producing engineered products and systems.

The increasing use of new materials and innovative construction products and systems in houses has created a need to better understand their performance and their impact on the life safety of occupants under fire conditions. To address this need, the Canadian Commission on Building and Fire Codes and the Canadian Commission on Construction Materials Evaluation asked NRC-IRC to undertake research into fires in houses to better understand the factors that affect the life safety of occupants in the event of a fire (see *Construction Innovation* September 2003 and June 2006).

In Phase 1 of the project, researchers examined the behaviour of commonly used floor assemblies and conducted fire experiments in a full-scale test facility that simulated a two-storey single-family house with a basement. The experiments utilized relatively severe, fast-growing fires set in the basement, which had an unprotected (unfinished) ceiling. A test fire was located in the basement to challenge the structural integrity of the floor system above the basement, which provides the normal egress route on the first storey for occupants. The objectives were to understand the factors that affect the ability of occupants on the upper storeys to escape in the event of a basement fire, and to establish the sequence of fire events such as fire initiation, smoke alarm activation, onset of untenable conditions, and structural failure of the floor assembly above the basement.

A range of floor assemblies constructed with various types of engineered floor joists and trusses (including wood I-joists, steel C-joists, metal plate wood trusses and metal web wood trusses) and with solid-wood joists, were used in the experiments. The joists and trusses were selected to represent a broad range of products that are available in the marketplace. These floor assemblies were unprotected (unsheathed) on the basement side, leaving them exposed to the fire during the experiments.

Facility used in study of fire performance of houses.

Phase 1 is complete. Some of the key findings are as follows:

- In all tests with an open stairwell to the basement, fire events followed a chronological sequence: initiation of the fire, activation of smoke alarms, loss of tenable conditions in open areas on upper storeys, and finally structural failure of the test floor assembly above the basement (loss of first-storey egress route). Untenable conditions for occupants in open areas on upper storeys, due to heat, toxic gases and smoke, were reached at approximately the same time regardless of the type of floor joists and trusses used to construct the test floor assembly. The untenable conditions were reached before structural failure of the test floor assemblies occurred.
- A closed door to the basement reduced the rate of fire growth in the basement, slowed the transport of combustion products from the basement to the upper storeys, and also delayed the time for the test floor assemblies above the basement to reach structural failure. Limited experiments using the closed basement doorway scenario were conducted with the solid wood-joist assembly and two of the engineered floor assemblies. One engineered floor assembly failed structurally in this test scenario before the untenable conditions were reached in open areas on the upper storeys.
- In all tests, the time to reach structural failure for the engineered floor assemblies above the basement (constructed with the wood I-joists, steel C-joists, metal plate wood trusses and metal web wood trusses), was 35-60% shorter than for the solid wood-joist assemblies. There was a structural deflection of all of the floor assemblies prior to their structural failure.
- Untenable conditions were not reached, for the duration of the tests, in the second-storey bedroom where the door to the bedroom was kept closed.

The results of this research reinforce the importance of continued public education on fire safety in the home and the need for occupants to be prepared for a fire emergency. They also support the National Building Code of Canada requirement for working interconnected smoke alarms on each level of a house to alert occupants as early as possible in the event of a fire. The findings confirm the importance of immediate evacuation by occupants upon a fire alert.

Besides providing valuable information on fire science and fire safety, the findings will contribute to code development and the evalua-

tion of the fire performance of future innovative structural products and their use in houses.

This Phase 1 work is the starting point for a series of full-scale experiments that will investigate other structural systems for houses. The overall research includes several phases of studies with each investigating a specific structural system of single-family houses based on specified fire scenarios. Phase II, which is expected to begin in 2010, will explore the fire performance of wall assemblies for single-family houses.

The Phase I summary report can be downloaded at http://irc.nrc-cnrc.gc.ca/pubs/rr/rr252/.

For details about the project, go to http://irc.nrc-cnrc.gc.ca/fr/fph/index_e.html.

Specific questions can be directed to Dr. Joseph Su of the NRC-IRC Fire Research Program at 613-993-9616, fax 613-954-0483, or e-mail joseph.su@nrc-cnrc.gc.ca.

ICBEST 2010
NRC-IRC to host Building Envelope Conference in Vancouver in 2010

Are you interested in staying up to date on the latest trends and technology in the building envelope engineering? If so, then you should reserve June 27 to 30, 2010 in your agenda immediately. On those dates, leading experts in building envelope engineering from the construction industry and the education and research communities will meet in Vancouver for the International Conference on Building Envelope Systems and Technology (ICBEST) 2010.

"ICBEST 2010 is a unique event, offering an exclusive worldwide forum for the exchange of information and discussion of recent developments in building envelope engineering. It aims to bridge the gap between researchers, engineers, designers and manufacturers to enhance the exchange of ideas between them. An equally important objective is the application of new findings to the development of design, manufacturing and construction methods and the codification of information for practising engineers and architects," say Drs. Bas A. Baskaran and Ralph Paroli, Conference Co-Chairs.

The event will provide an excellent forum for the presentation and assessment of new research results and application findings on a wide range of timely issues in building envelope engineering. Topics will include:

- Green building envelope
- Exterior building envelope (walls, windows, facades)
- Effects of climatic loads (moisture, thermal, wind, rain, snow, solar, etc.) on building envelopes
- Heat, air and moisture transport through buildings
- Environmental loads
- Integrated building designs
- Building envelope design process
- Performance specification
- Building envelope construction
- Sustainability of building envelope
- Building materials
- Whole building design
- Training and education

As the countdown to ICBEST continues, regular updates will be posted on the Web site at: http://icbest.ca/.

Newsbrief

Thermal insulation research for sustainable construction

As a cold northern country, Canada is a nation with a high per capita energy consumption. A reduction in overall energy consumption is considered to be a key to addressing the issue of climate change and its effects on the environment.

With buildings accounting for more than 30% of Canada's national energy consumption, an improvement in the performance of thermal insulation has the potential to be an important contributor to increased energy efficiency in the built environment.

Researchers at the NRC Institute for Research in Construction (NRC-IRC) have made great strides in their studies of the long-term thermal resistance of foam insulation. In recent years, they have also been investigating high-performance thermal insulation materials, characterized primarily by their high thermal resistance values compared to conventional materials. Particular progress has been made in the characterization and development of high-performance vacuum insulation panels or VIP's (see *Construction Innovation*, June 2006).

Although a variety of insulation products has been used in the Canadian construction industry, little is known about their environmental impact. A comprehensive analysis is needed to determine the energy consumption and environmental impacts of these products. This information, combined with data on insulation values, would help users choose a material that is not only thermally efficient for application in buildings but is also eco-friendly. This in turn would assist the construction industry to further its sustainability goals.

NRC-IRC recently embarked on a new research project whose aims are as follows:

- to identify eco-friendly high-performance thermal insulation materials, i.e., those that are renewable, energy efficient, biodegradable and indigenous;
- to develop a thermal insulation selection guideline for users.

The work will address other insulation products in addition to VIP's. It will include the aforementioned comprehensive "cradle-to-grave" analysis to provide information on the energy consumption and environmental impacts associated with the development, manufacture and use of these insulation materials.

This project has already attracted substantial participation from a number of organizations. To ensure better representation from the construction industry as a whole, NRC-IRC invites new industry partners to participate in the research. If you are interested in learning more, please contact Dr. Phalguni Mukhopadhyaya at 613-993-9600, fax 613-998-6802, or e-mail phalguni.mukhopadhyaya@nrc-cnrc.gc.ca.

Upcoming events

Meetings of Canadian Commission on Building and Fire Codes

Contact Anne Gribbon at 613-993-5569, e-mail: Anne.Gribbon@nrc-cnrc.gc.ca

Spring 2009

Standing Committee Meetings. Consult Canadian Codes Centre Web site at http://www.nationalcodes.ca/ncd_calendar_e.shtml.

September 2009

Commission Regular Meeting. Saskatoon.

APRIL

7-9

Well-Being and Place: An International Conference, Durham University, U.K.

19-20

Second Symposium on Heat-Air-Moisture Transport: Measurements and Implications in Buildings. Vancouver. http://www.astm.org/SYMPOSIA/

29-May 1

International Conference on Sustainability in Energy and Buildings, Brighton, U.K. http://seb09.sustainedenergy.org/

30-May 1

Symposium on Building Envelope Sustainability, Washington, D.C. NRC-IRC is an organizer of this conference. http://www.rci-online.org/Anno-RCIF-09Symp.html

MAY

6-8

12th Canadian Conference on Building Science and Technology, Montreal. http://cebq.org/NBEC.htm

12-15

2nd Climate Change Technology Conference (CCTC 2009), Hamilton. http://www.cctc2009.ca/en/index.html

18-19

Leveraging Innovation for Sustainable Construction, Edmonton. http://irc.construction.ualberta.ca/html

24-27

International Symposium on Automation and Robotics in Construction (ISARC 2009) http://www.caee.utexas.edu/isarc2009/Template/site_flash/index.html

in collaboration with

ASCE International Workshop on Computing in Civil Engineering, Austin, TX. http://www.caee.utexas.edu/asceIT2009/Template/site_flash/index.html

27-30

Canadian Society of Civil Engineers Annual General Meeting and Conference, St. John's, NL. http://www.csce.ca/2009/annual/

JUNE

1-2

Coastal Engineering: Future Challenges and Risks: CSCE 2009 Triennial Conference, St. John's, NL. http://www.csce.ca/2009/triennial/

22-24

Passive Low Energy Architecture (PLEA) 2009, Quebec. http://www.plea2009.arc.ulaval.ca/E/welcome.html

AUGUST

23-26

Inter-noise 2009. Ottawa. http://www.internoise2009.com/

2010 MAY

10-13

CIB World Building Congress, Salford, U.K. http://isec-5.ce.unlv.edu/

JUNE

27-30

ICBEST 2010–International Conference on Building Envelope Systems and Technology. Vancouver. http://www.icbest.ca/

For a more complete listing, see http://irc.nrc-cnrc.gc.ca/events_e.html

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