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construction innovation

NRC · CNRC

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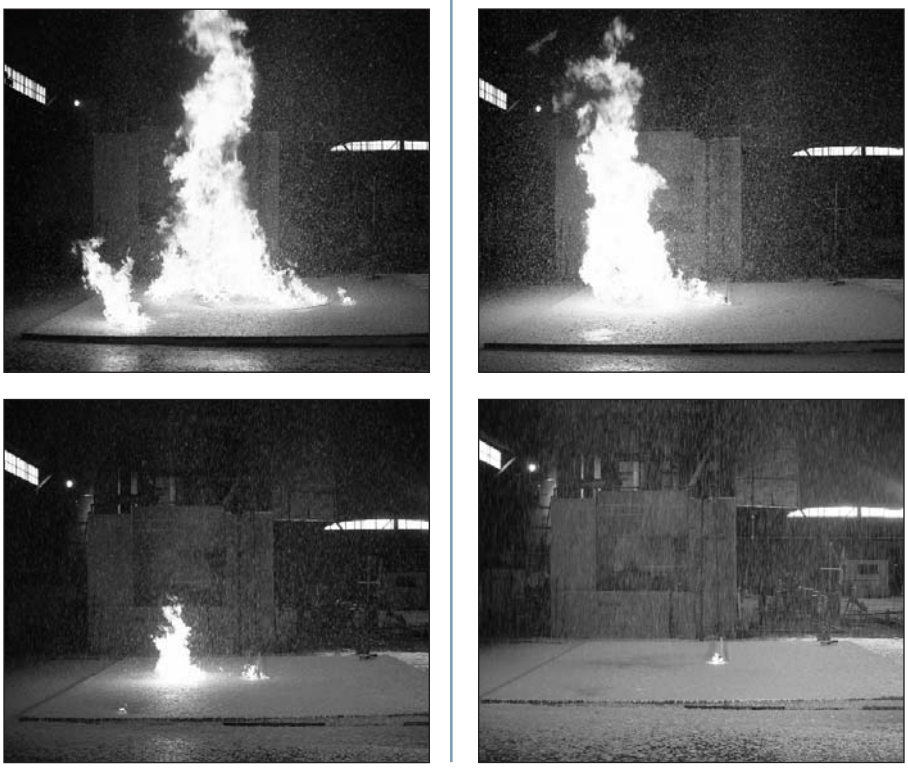
Compressed air foam an IRC commercialization success story

Sometimes it's the performance of a product that comes to IRC for testing that catches a researcher's eye. Sometimes it's the promise of real progress that attracts attention. Whatever it is, when a researcher sees something in a new technology and pushes it to reach its full potential, breakthrough discoveries can reach the Canadian marketplace.

This is certainly the case with compressed-air foam (CAF), a product developed to fight wildfires that came to IRC's Fire Research program as part of a project from the Department of National Defence. DND asked IRC to test and compare the effectiveness of CAF with sprinklers and water-mist systems. Although there were problems with CAF in the testing, IRC researchers George Crampton and Dr. Andrew Kim saw something in the performance of CAF that made it stand out.



CAF extinguishes a free-flowing heptane spill fire in 38 seconds.

Because of this potential, they have worked for over 10 years and conducted over 200 full-scale tests to develop and verify new ways of delivering CAF. Crampton has also developed several patented nozzles, a computational flow model and a fixed piping and distribution system to allow CAF to perform to its full potential.

These efforts have definitely paid off. In 2001, IRC signed a license agreement with a Canadian company called FireFlex Systems Inc., a sprinkler company with experience in halon and water-mist systems. The IRC team felt that this blend of expertise and reputation in manufacturing both gas and water-based systems would make FireFlex the right partner to develop commercial CAF systems.

Continued on page 7

Highlights

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2005 National Construction Codes available in September

Since their publication in 1995, all three National Construction Codes—the National Building Code (NBC), the National Fire Code (NFC) and the National Plumbing Code (NPC)—have undergone extensive reviews and changes that will make the 2005 Codes clearer, easier to apply to renovation and more accommodating to technological advances.

New information … has also been added to the Codes to help users understand the reason why a particular requirement must be met and to help them evaluate alternative solutions.

In the 2005 Codes, you will find the same Parts and provisions you are familiar with plus important technical changes. New information, namely objectives and functional statements, has also been added to the Codes to help users understand the reason why a particular requirement must be met and to help them evaluate alternative solutions.

In order to accommodate this new information, the 2005 NBC, NFC and NPC will have a new organizational layout. Each Code will comprise three divisions: **Divisions A, B and C**. Division A will include the compliance options, the objectives and the functional statements. Division B will provide the acceptable solutions, which consist of the 1995 Code provisions updated to reflect the many technological advances and the health and safety concerns that have been expressed since the 1995 editions. Close to 1,300 technical changes are incorporated in the code provisions, which are now located in Division B. Finally, Division C will contain administrative provisions.

Printed versions of the 2005 NBC, NFC and NPC will be available in September in two practical formats: full-size binder and soft-cover versions.

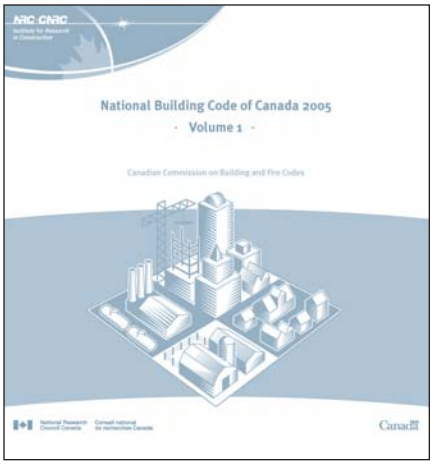
The CD-ROM versions of the 2005 NBC, NFC and NPC will be released a few months after the September launch together with User's Guides to the 2005 NBC, NFC and NPC containing the intent and application statements. These three User's Guides will be available on CD-ROMs only. Finally, the User's Guide to the 2005 NBC Part 4 will be released in printed and CD-ROM formats.

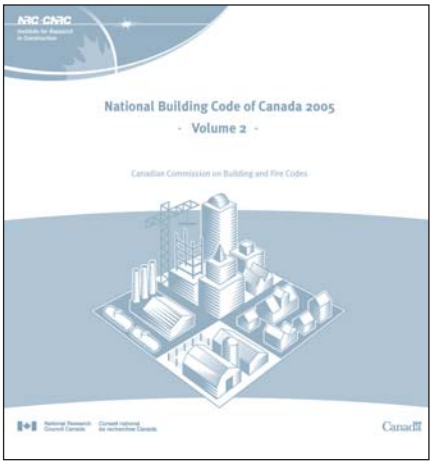
Beginning in December, IRC, in collaboration with the provinces and territories, will present seminars throughout Canada on the most significant technical changes in the 2005 NBC, NFC and NPC.

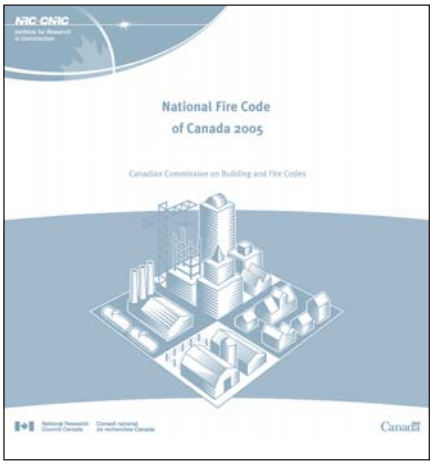
Complete information on these seminars and on how to purchase the Codes will be presented in the September issue of *Construction Innovation*.

Further details on the 2005 National Construction Codes are available at http://www.national-codes.ca.

For more information on the 2005 National Construction Codes, please contact John Archer, Secretary, Canadian Commission on Building and Fire Codes at (613) 993-5569, fax (613) 952-4040, or e-mail john.archer@nrc-cnrc.gc.ca.







Acoustics researchers find ways to assess and predict speech security of offices and meeting rooms

A major problem with many offices and meeting rooms used for private discussions is that they may not in fact be private. Conversations occurring "behind closed doors" can frequently be overheard in adjoining spaces. In the current climate of heightened security and strengthened privacy legislation, this is becoming more than just an annoyance.

To address this issue, and as part of an ongoing collaboration with Public Works and Government Services Canada (PWGSC) and the Royal Canadian Mounted Police (RCMP), researchers at IRC have been studying the problem of speech security in buildings, finding methods of rating, assessing and predicting it.

A description of the "level of security" can be given in terms of three thresholds: the Threshold of Intelligibility (below which speech is not intelligible), the Threshold of Cadence (below which the rhythm or cadence of muffled speech is not audible), and the Threshold of Audibility (below which the speech sounds themselves are not audible).

One practical problem in achieving speech security is to gauge whether an existing room already provides an adequate level of security. A second is to specify criteria for new or renovated construction to guarantee such security. In either case, an objective index indicating the degree to which speech will be audible or intelligible outside the room is necessary.

The degree to which "transmitted" speech is understandable outside the room depends on the talker's voice level, on the sound attenuation provided by the building elements, on the competing background noise level where the listener is positioned, and on the listener's hearing ability. (It is prudent to design for listeners with negligible hearing loss and strong language skills, which means the index can be considered to depend only on the speech and noise levels outside the room.)

Extensive listening tests were conducted at IRC, using volunteers with negligible hearing loss, measured with a standard hearing test. The volunteer subjects listened to a large number of sentences, each made to sound as if it had been transmitted through one of several typical wall constructions, in combination with ventilation-type noise. They responded by stating the words they were able to understand, or if they weren't able to understand any, whether they could hear the muffled speech sounds. From these responses, it was possible to define an index calculated from the measured spectra of the speech and noise at the position of the listener that accurately predicts the level of audibility or intelligibility of the speech.

To apply this index in rating existing rooms, two types of measurements were made in numerous offices and meeting rooms. First, talker voice levels and background noise levels inside and outside actual meetings were obtained. The statistics derived from these measurements can be used to predict the probability of various occurrences; for example, the likelihood of very loud speech at the same time as very little noise (quiet), a condition detrimental to security. Second, the sound transmission from inside the room to the adjoining spaces was measured, revealing how much attenuation is provided by the building elements. This information can be used to predict the speech levels outside the room.

The measurement and assessment protocols are being incorporated into a practical guide for rating the speech security of meeting rooms. This guide is expected to have broad applicability and relevance for all building types. The procedures are also being included as part of a proposed new National Security Code for Buildings, developed through an ongoing collaboration among IRC and various federal government partners. Additionally, the guide material is being prepared for presentation to a newly formed working group at ASTM, which is developing standard procedures for rating speech privacy and security.

Components of this work are described in IRC Research Reports 170, "Speech and Noise Levels Associated with Meeting Rooms" and 171, "Measures for Assessing Architectural Speech Security," which can be found at http://irc.nrc-cnrc.gc.ca/fulltext/rr170 and http://irc.nrc cnrc.gc.ca/fulltext/rr171 respectively.

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

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CCMC revises product evaluation guidelines

Later this year, IRC's Canadian Construction Materials Centre (CCMC) will introduce a streamlined approach to the evaluation of new and innovative construction materials, products, systems and services. Four new objective-based guidelines will focus primarily on health and safety and point directly to the soon-to-be-released objective-based National Building Code of Canada 2005 for product requirements. This new approach promises to smooth the evaluation process for evaluators and clients alike by providing greater transparency and clearer expectations for product evaluation.

In 1998, the Canadian Commission on Construction Materials Evaluation (CCCME), which oversees CCMC, approved seven guidelines for CCMC to use in product evaluations. After these guidelines had been in use for several years, however, CCMC product evaluators began to see ambiguities in them that led to inconsistency in their application, and a perception among manufacturers that the evaluation requirements were too onerous. For example, evaluators often had to make assumptions about the objectives and sub-objectives of what appeared in the building codes, which could then be subject to different interpretations.

To find a better approach, CCCME formed a task group in 2004 to determine the adequacy of the guidelines and the path forward. That group recommended condensing the seven guidelines into four, making them more specific, more pointed and easier to apply equitably. The group also recommended that the revised guidelines refer directly to the objectives and sub-objectives in the building codes to provide greater clarification for product evaluators and manufacturers alike.

The resulting new guidelines, approved by CCCME in late 2004, allow CCMC to evaluate a product on the basis of four principles, and according to the explicit requirements of the code and any pending code changes approved by the Canadian Commission on Building and Fire Codes. These requirements would then be applied to all similar products evaluated by CCMC. Finally, the guidelines also allow CCMC to evaluate performance claims made by proponents.

Because the guidelines refer directly to the objectives and sub-objectives in the building codes, they reduce the need for individual interpretation. For CCMC, the result should be a clearer, more consistent approach to product evaluation. For manufacturers, the result should be a better understanding of requests from CCMC for additional information to complete their evaluations.

Specific questions about the new guidelines can be directed to Ron Waters at (613) 993-6602, fax (613) 952-0268, or e-mail ron.waters@nrc-cnrc.gc.ca.

The full text of CCMC's revised guidelines

The Canadian Commission on Construction Materials Evaluation, which oversees IRC's Canadian Construction Materials Centre (CCMC), has approved the following four revised guidelines for CCMC evaluations:

1. Code[a] explicit requirements shall be addressed.[b] These requirements shall be addressed in relation to a product's intended use, based on scientific justification and linked to objectives.
2. Evaluation criteria could be established on anticipated Code changes that have been approved by the Canadian Commission on Building and Fire Codes.
3. Once a requirement (other than proponent requested claims) is established for an intended use, then that requirement shall be addressed for all similar products or materials, with the same intended use.
4. Proponent requested performance claims beyond Code explicit requirements shall be subjected to the same scientific rigour as in point #1.[c]

Notes:

(a) Code refers primarily to the National Building Code of Canada. The same guidelines would also apply to provincial code requirements.

(b) Addressed is achieved by scientific justification (such as test evidence, calculable solutions, modelling, field studies) or professional judgement that attain the minimum level of performance against acceptable code solutions with respect to the applicable objectives and the functional statements of the Code.

(c) The performance issues beyond the Code be identified separately in the evaluation strategy.

New CCMC Evaluation Reports

Company	Product Name	CCMC #	Description
BPB Canada Inc.	GlasRoc Sheathing and GlasRoc Sheathing type X	13095-R	Glass mat gypsum boards that combine reinforcing glass mats embedded in water-resistant gypsum core with a protective acrylic coating to act as a backerboard in new or existing construction.
Ainsworth Lumber Co. Ltd.	32 mm 0.8E Durastrand Rimboard	13143-R	Oriented strandboard (OSB) to act as a rim board around the perimeter of engineered wood joists.
Cosella-Dörken Products Inc.	Delta MS-Clear	13164-R	Dimpled profile membrane to provide dampproofing on outside of foundation walls.
Basement Systems Inc.	Cactus Board	13170-R	Dimpled profile drainage board to provide perimeter drainage between the inside of the foundation wall and the basement slab.

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

Research consortium addresses rain penetration of claddings

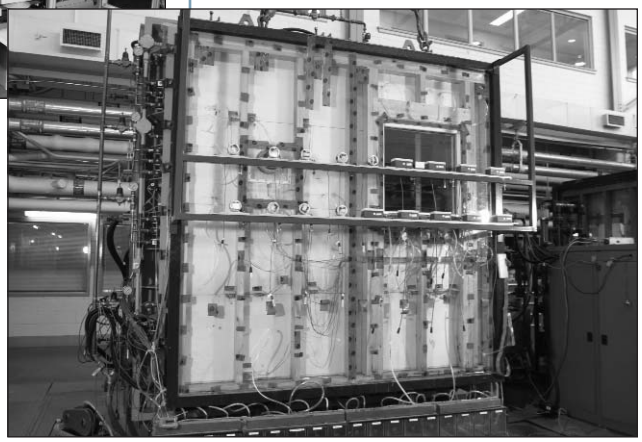
In 1996, in response to ever increasing problems related to water penetration, CCMC initiated a policy requiring exterior claddings to have a rain penetration control strategy. One solution was to use a rainscreen design approach, which consists of a first and second line of defence along with other elements to manage any water penetration, and which also includes a 10-mm (minimum) air space behind the cladding. This approach has been incorporated into the National Building Code 2005 (NBC) as one of the acceptable solutions for use in geographical regions with high moisture loads.

Since the implementation of the approach involving a minimum air space, the industry has developed a wide variety of alternative solutions to the prescribed one. These innovations have posed technical challenges to CCMC in terms of how to assess water penetration and moisture management, particularly in the case of new cavity devices and innovative claddings. For many of these products and systems, the manufacturers claim that water penetration can be managed with a reduced air space behind the cladding.

In response to these claims, CCMC has initiated a consortium project and, working with IRC researchers, has developed a protocol to assess these systems in the laboratory under controlled and repeatable conditions. The joint research project has been developed as an industry consortium and presented to a number of manufacturers.

The initial challenge was to categorize the different types of cladding according to their water and moisture management capabilities, with the next step being to develop a technical assessment program for each category.

The categorization has been done and is based on the method of attachment, the drainage medium, and the configuration and complexity of the cladding system. For example, fibre cement and synthetic stone, which are the main focus of this consortium project, represent two different design approaches to rain water management, and will be evaluated separately according to their distinctive strategies.



Wall undergoing testing in IRC's Dynamic Wall Testing Facility

Industry members of the cladding assessment consortium include:

Centurion Stone
Cultured Stone, Division of Owens Corning
G.S. Harris, INC.
Coronado Stone
Eldorado Stone, LLC
Prairie Stone International
CertainTeed Corp

In order to be able to address industry requests to use cladding products with reduced drainage and venting and/or systems with innovative solutions for the second line of defence, it was necessary for CCMC, in conjunction with the Canadian Codes Centre (CCC) and researchers in IRC's Building Envelope and Structure program, to develop a method to evaluate the water and moisture management capabilities of these products under a variety of climate and moisture loads.

The CCC has analyzed the NBC 2005 requirements that apply to cladding and supporting wall assemblies, and has developed specifications for traditional cladding systems to be used as benchmarks for purposes of comparing the water and moisture management performance of the claddings being evaluated. As well, IRC has constructed new facilities to accommodate the large-scale walls that will be built and tested using IRC's Dynamic Wall Testing Facility.

The planned work will take about two years to complete, with the first results expected later this year.

Inaugural meetings were held with interested parties in December, 2004, at which time the researchers explained key elements of the research program and led a discussion on benchmark cladding systems, tolerances, testing, characterization of products, and modelling. To date, seven manufacturers have entered into a contract with CCMC (see sidebar), while a number of others are considering joining the project.

Parties interested in participating in this project can contact Dr. John Flack, Manager, CCMC, at (613) 990-8518, fax (613) 952-0268, or e-mail john.flack@nrc-cnrc.gc.ca.

IRC investigates fire that killed six office workers in Chicago

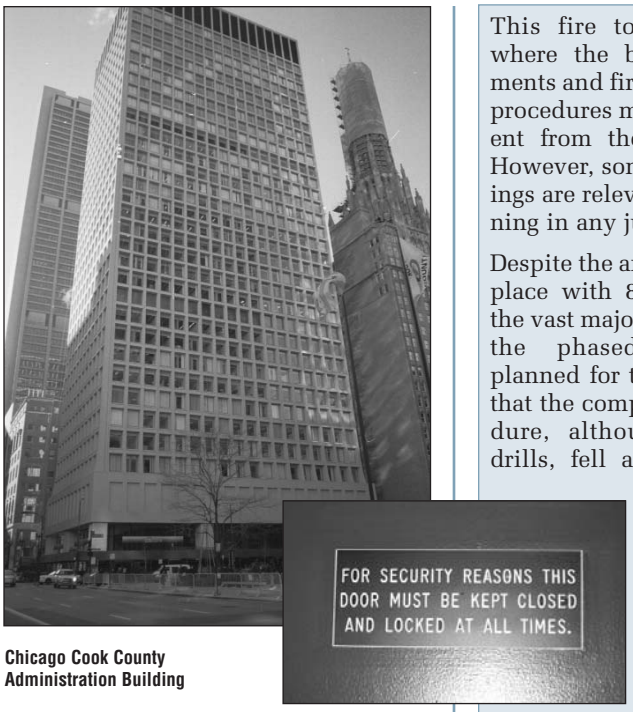
A fire in the 36-story unsprinklered Chicago Cook County Administration Building on October 17, 2003, resulted in six people killed and a dozen injured. Although such a catastrophic fire is rare in a high-rise office building, it was essential to investigate this event in great detail to learn from this tragedy and make recommendations to prevent further such tragedies.

James Lee Witt Associates (JLWA) was asked by the State of Illinois to gather experts from several organizations to conduct an exhaustive review of the fire. As part of the review, the National Institute of Standards and Technology recreated the fire using computer modelling, while a group of fire investigators reviewed the fire department operations and conducted an examination of whether the building complied with the applicable code (see sidebar). In addition, IRC's Fire Research program was retained to conduct a human behaviour study.

The IRC study aimed at learning what had helped and what had hindered the safe evacuation of occupants during the fire. A survey was used to interview all building occupants. In total 1,862 surveys were distributed, 551 of which were returned. Of these, 89 were from occupants who were in the building at the time of the fire.

The fire began on a Friday at around 5 p.m., when most employees had already left for the day. Security camera recordings indicate that only 250 occupants were still in the building at that time.

The occupants' responses to the fire were strongly influenced by their activities at the time they were alerted. Voice communication messages were issued instructing the occupants to evacuate using the stairwells. Despite these messages, many occupants, who were preparing to leave for the weekend, and were on their way out, left the 'normal' way—that is, by the elevators. Although the voice communication system was used every 15 seconds during the fire, the live messages issued were essentially limited to instructing occupants to evacuate, or to evacuate using the stairwells.



Chicago Cook County Administration Building

Two interacting factors contributed to the loss of life during this fire: the locked stairwell doors and the fact that firefighters attacked the fire from the stairwell. Although stairwell-based firefighting is common in high-rise buildings, it requires the door from the stairwell to the floor where the fire is located to be left open. Under these conditions, a considerable quantity of smoke gathers in the stairwell shaft, which then acts as a chimney. If occupants are also using the stairwell to evacuate, those occupants are at risk of injury or death as a result of smoke inhalation. And if this situation is combined with locked stairwell doors, occupants have no chance to escape from this smoke.

The survey results show that although 85% of the overall respondents had received fire-safety training, they were ill prepared to deal with an actual fire. The official evacuation plan, which called for a phased evacuation, was understood by only 20% of the respondents. Furthermore, 48% were not aware

Continued on page 7

This fire took place in Chicago where the building code requirements and fire department operating procedures may be somewhat different from those found in Canada. However, some of the research findings are relevant for fire-safety planning in any jurisdiction.

Despite the annual training that took place with 85% of the occupants, the vast majority did not understand the phased-evacuation process planned for that building. It seems that the complexity of such a procedure, although workable during drills, fell apart during an actual emergency, for both the trained staff and the building occupants. Furthermore, signs posted in the building led to some misunderstandings. For example, signs were posted to warn occupants that for security reasons stairwell doors were locked at all times (see photo); however, some occupants assumed that these doors would unlock automatically during an emergency.

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that the stairwell doors would lock behind them upon entering the stairwell.

The IRC human behaviour study makes several recommendations:

1) Stairwell doors should be permanently unlocked at least at every fifth floor.
2) Voice communication messages should be provided in real time and should include the following information: what is happening, where it is happening, and what the best course of action is.
3) There needs to be a procedure for clearing the stairwells of occupants prior to and during stairwell-based firefighting activities.
4) Every building should develop a Building Emergency Action Plan (BEAP), which outlines various possible emergencies and provides alternative procedures for occupant safety.
5) Building occupants should be trained according to this BEAP, and there should be full evacuation drills.

The complete report on the review of this fire and its list of recommendations can be found at http://www.wittassociates.com/3934.xml. The Chicago Fire Department and the City of Chicago have reviewed and implemented several of the recommendations, and in some cases, have gone even further; for instance, the stairwell doors are now either unlocked or will unlock upon alarm activation in all high-rise buildings.

Specific questions about this project can be directed to Dr. Guylène Proulx at (613) 993-9634, fax (613) 954-0483, or e-mail guylene.proulx@nrc-cnrc.gc.ca.

Compressed air foam an IRC commercialization success story

Continued from cover

Since 2001, IRC has conducted a further 100 fire tests. These tests have included power transformer protection and Factory Mutual approval tests to evaluate the new technology for both fire-extinguishing performance and hardware ruggedness. In 2004, Factory Mutual approved the FireFlex CAF system.

"The system meets all existing performance criteria and offers many advantages. It can extinguish a fire in half the time of a conventional system using one quarter of the water, and the technology is a good fit for applications where water is in short supply or where there is a high cost to treat the water after it's been discharged"…

In January 2005, the first commercial CAF system in the world was installed at Hydro One's Pickering generating station and activated for demonstration. FireFlex is also scheduled to complete installations in a Yellowknife aircraft hangar and a Quebec flammable liquid storage facility in the summer of 2005. The environmental impact of each of these installations is an order of magnitude lower than that of a conventional system.

"The system meets all existing performance criteria and offers many advantages. It can extinguish a fire in half the time of a conventional system using one quarter of the water, and the technology is a good fit for applications where water is in short supply or where there is a high cost to treat the water after it's been discharged," explained Jean-Pierre Asselin, vice president of FireFlex.

The IRC researchers, in conjunction with Canada Mortgage and Housing Corporation (CMHC), are now adapting CAF for use in protecting residential housing across the Northwest Territories.

"The risk of fire in the North is eight times the national average, and most communities don't have a reliable water supply," said Crampton. "As well, there are the difficulties of fighting fires in extremely cold and isolated areas to contend with."

For more information on the CAF research project, please contact George Crampton at (613) 256-4464, ext. 224, fax (613) 256-1309, or e-mail george.crampton@nrc-cnrc.gc.ca.

What is compressed air foam?

A substance that resembles shaving cream, CAF is a mixture of water, foam concentrate and air in specific proportions. An operator or operating system sends the mixture through a hose or pipe to form the actual fire-fighting foam. The mixture uses up to four times less water and up to six times less foam concentrate than conventional foam systems, which greatly reduces the cost of the product and its environmental impact.

These benefits make it ideal for fighting fires in places where water storage or environmental cleanup of foam mixed with a flammable liquid after the fire could be an issue, such as aircraft hangars. In addition, the benefit of the material's light weight makes it ideal for use in high-rise towers because the amount of energy required to elevate it is greatly reduced.

Building Science Insight
Seminar Series–2005
http://irc.nrc-cnrc.gc.ca/bsi/2005/index_e.html

NRC·CNRC

Organized by: Institute for Research in Construction
National Research Council of Canada

Roofing: Staying on Top of Technology and Change

Attend this comprehensive one-day NRC seminar and you will glean essential technical information on the evaluation, performance, maintenance and durability of roofing materials and systems to help you make the right decisions for your roofing projects—new or existing low-sloped roofs. (Less emphasis will be placed on sloped roofs.)

Spend a day with a team of NRC roofing researchers and industry experts, and you will learn about

- ✔ the difference between the various types of available roofing membranes
- ✔ the properties of different roofing materials and systems
- ✔ the critical factors in the selection and design of roofing systems (waterproofing as well as water-shedding systems)
- ✔ a new wind design guide for roofs developed by the Special Interest Group for Dynamic Evaluation of Roofing Systems (SIGDERS) and NRC
- ✔ effective detailing of interfaces between roofing and other building envelope components
- ✔ non-destructive evaluation methods and equipment for existing roofs
- ✔ effective solutions to common roofing problems illustrated with case studies
- ✔ alternatives to conventional roofing systems and the issues that are driving change in the industry
- ✔ basic maintenance requirements for extending the service life of roofing components

If you are responsible for the design, construction, maintenance, inspection and repair of roofs, or the re-roofing of large buildings, THIS SEMINAR IS FOR YOU!

Speakers

The roster of speakers includes IRC roofing specialists Dr. Bas Baskaran, Dr. Karen Liu and Nicole Normandin, Dr. Ralph Paroli, and generalist Madeleine Rousseau, along with industry roofing experts, Claude Fregeau at Claude Fregeau architecte, Thomas L. Smith at TLSmith Consulting Inc. and Mr. Paul Yurcich at JPT Roofing Consultants Inc.

2005 – English Seminars

- ***Ottawa, October 4***
- ***Fredericton, October 12***
- ***St. John's, October 14***
- ***Charlottetown, October 17***
- ***Halifax, October 19***
- ***Toronto East, October 31***
- ***Vancouver, November 2***
- ***Whitehorse, November 4***
- ***Calgary, November 7***
- ***Winnipeg, November 9***
- ***Toronto West, November 17***
- ***Yellowknife, November 25***
- ***Edmonton, November 28***
- ***Saskatoon, November 30***

2006 – French Seminars

- ***Sainte-Foy, January 24***
- ***Montreal, January 26***

For more detailed information, go to the Web site at *http://irc.nrc-cnrc.gc.ca/bsi/2005/index_e.html*

Building envelope researchers to develop wall assemblies suited to construction north of 60°

Temperatures that routinely dip well below –40°C. Wind speeds that often exceed 100 km/h. Low outdoor humidity in some areas and high outdoor humidity in others. High indoor humidity. A building season that can be measured in weeks. These are just some of the challenges facing builders in Canada's northern and northern coastal regions. And to add to these challenges, there is very limited information about indoor and concurrent outdoor conditions in these regions.

To help expand the body of available knowledge, researchers in IRC's Building Envelope and Structure program have started a four-year research project to develop durable, energy-efficient wall assemblies that can accommodate both extreme outdoor and indoor climates and handle the high indoor humidity levels that can occur in these regions. The project will provide new information that can result in a healthy and comfortable indoor environment for northern and northern coastal regions.

As part of the project, the research team will consult with northern communities and the construction industry to identify technological issues and community needs. IRC will also conduct surveys in Prince Rupert, British Columbia, Whitehorse, Yukon, and Yellowknife, Northwest Territories, to gather data on indoor conditions, concurrent outdoor conditions and preferences for future living conditions. Later in the project, the survey will be expanded to include communities in Nunavut, northern Quebec and Labrador.

Photo courtesy Harry Baker

Once the researchers have determined climate parameters and gathered data from a review of the literature, the surveys and the consultation with northern communities, they will design and construct a number of wall assemblies that they expect to perform well in these climates. They will then assess the performance of the assemblies using IRC's Envelope Environmental Exposure and Dynamic Wall Testing facilities, as well as computer modelling.

In addition, the researchers will analyze the assemblies to determine their impact on the environment, including their energy consumption. When all the performance data are in place, the researchers will select the wall assembly, or assemblies, that performs best overall, presenting options for industry.

Specific questions on this project can be directed to Dr. Nady Saïd at (613) 993-5938, fax (613) 998-6802, or e-mail nady.said@nrc-cnrc.gc.ca.

Help wanted

IRC is seeking collaborators in northern communities to assist in conducting surveys, monitoring buildings, and maintaining instrumentation used for monitoring. If you are interested, please contact Dr. Nady Saïd at (613) 993-5938, fax (613) 998-6802, or e-mail nady.said@nrc-cnrc.gc.ca.

Project partners

IRC's partners in this project are Canada Mortgage and Housing Corporation (CMHC) and Natural Resources Canada, with additional funding from the Program for Energy Research and Development (PERD).

Excellence in Innovation award goes to Dufferin Construction

Each year, the Canadian Construction Association (CCA) honours the outstanding contribution of individuals, companies and organizations in the Canadian construction industry with a series of awards. The Institute for Research in Construction (IRC) is a proud supporter of the CCA Excellence in Innovation award, as the development and encouragement of innovative ideas in the construction sector are among the institute's priorities.

This year, Dufferin Construction of Oakville, Ontario was named the winner of this award, taking home the Hugh R. Montgomery Memorial Trophy for its new Slipstone Extruded Wall System, used in the construction of median and barrier walls.

By using this system in conjunction with standard, commercially available equipment, it is possible to create customized impressed patterns in different colours to meet a client's specifications. This virtually eliminates the traditional hand-formed barrier construction process, thus reducing labour costs, improving productivity, and providing a high level of predictability.

First applied in Canada to barrier wall construction on Highway 420 in Niagara Falls for the Ontario Ministry of Transportation, the system has now been used in projects throughout Canada and the United States.

Dufferin's Slipstone Extruded Wall System

Congratulations, Dufferin Construction!

Infrastructure researchers developing underwater robot for inspection of in-service transmission mains

It could be a perfect match: technology developed for ocean exploration being used to maintain crucial municipal water systems. Researchers in IRC's Urban Infrastructure program are working on a two-year project with NRC's Institute for Ocean Technology (IOT) in St. John's, the NRC-IRC Centre for Sustainable Infrastructure Research (CSIR) in Regina and the University of Regina to adapt an autonomous underwater robotic vehicle (AUV) for use in inspecting in-service large-diameter water transmission mains.

Safe, reliable water systems are essential to urban communities. There are approximately 65,000 kilometres of water transmission pipes feeding water distribution systems across North America. These pipes are the most sensitive—and expensive—components of water networks because they have no backup and cannot be taken out of service without cutting the water supply to the entire system. This makes inspection to assess their condition a difficult undertaking. However, with close to 50 per cent of these pipes already older than 60 years, the need for effective, non-disruptive inspection techniques is becoming more and more pressing because their failure could be catastrophic.

To come up with an effective option, IRC researchers are testing the use of an AUV as a platform to carry cameras and non-destructive testing instruments into in-service pipes. They are also equipping the robot with an on-board data-acquisition system that can store or transmit data from the robot to an operator in real time. Although the torpedo-shaped robots were designed for use in open water, the researchers are modifying them to function in large pipes with flowing water. This development would be a step forward from existing robotic inspection technology, which only works in completely drained pipes.

Autonomous underwater robotic vehicle

IRC's collaboration with IOT provides the perfect place to make the planned changes to the AUV. The St. John's Institute has facilities that are unique in the world and can be used to test large aqueducts, conduits and water mains. IRC researchers will be able to place the large-diameter pipes in these facilities and refine the adaptation of the robots within a readily accessible space. The experience that IOT researchers have with underwater robots will also help to bring the technology used to navigate the robots to a high level of precision.

IRC researchers expect that Canadian pipe inspection companies will benefit from the advances made in this project. Currently, these companies are among the world leaders in transmission pipe inspection. When this project is completed, the researchers also anticipate the uptake of this inspection technology by water utilities, which would further enhance the position of Canadian pipe inspection companies globally.

For more information, please contact Dr. Homayoun Najjaran at (613) 993-3806, fax (613) 993-1866, or e-mail homayoun.najjaran@nrc-cnrc.gc.ca.

Newsbrief

CSIR researchers look at why asbestos cement pipes in Regina fail

For many Canadian municipalities, there are significant ongoing challenges in maintaining water-distribution systems to provide a safe water supply in a cost-effective, reliable and sustainable manner. One of these challenges is the continued use of aging pipes in older neighbourhoods.

In Regina, Saskatchewan, asbestos cement (AC) pipes account for about 68 per cent of those currently in use in the city's water main network. The majority of these pipes were laid in the 1950s and '60s. After decades of service, the number of failures in AC pipes has increased greatly in recent years. Although release of asbestos fibres has not been found to be a problem, increased breakage of the pipes while in service has resulted in high repair costs. To provide more information about why this increased breakage is occurring and to achieve improved management of these assets, it is essential to understand the mechanisms behind their failure.

Three factors that affect the failure of AC water mains are:

1) the physical characteristics of the pipes themselves (actual condition)
2) the environments in which the pipes are in service (climate, soil type, and groundwater conditions)
3) operational characteristics (water quality, operation and maintenance, supply pressures, and repair or replacement procedures).

Although all of these factors may contribute to the failure of AC water mains, the predominant factors may depend on site-specific conditions.

Researchers at IRC's Centre for Sustainable Infrastructure Research (CSIR) in Regina, with the cooperation of the City of Regina, initiated a research project in 2004 to analyze the failure mechanisms of AC pipes buried in expansive Regina clay. The project will help the City of Regina and other municipalities to optimally manage the renewal of their AC water mains, thus minimizing the economic, social and environmental costs of these systems.

If you are interested in learning more about this project, or participating in it, please contact Dr. Yafei Hu at (306) 780-5432, fax (306) 780-3421, or e-mail yafei.hu@nrc-cnrc.gc.ca). You can also visit the Web site at http://irc.nrc-cnrc.gc.ca/csir/index_e.html.

For more information about CSIR, please contact Dr. David Hubble at (306) 780-3332, fax (306) 780-3421, or e-mail david.hubble@nrc-cnrc.gc.ca. (See related article on CSIR in *Construction Innovation*, Volume 9 Number 2, June 2004.)

What we're hearing

Canadian Construction Innovation Council formed to promote innovation in the construction industry

The National Steering Committee for Innovation in Construction (NSCIC) is pleased to announce the formation of the permanent, industry-led organization, the Canadian Construction Innovation Council (CCIC) to provide leadership in promoting and coordinating research and innovation within and for the Canadian construction industry.

John Westeinde, chair of NSCIC, noted that the organization has taken a major step in hiring Mr. Gerry Meade, P. Eng., as the executive director of CCIC. Mr. Meade's mandate is to establish a permanent funding model for the organization and to begin the delivery of valued services to the construction industry.

According to Meade "CCIC needs to begin the work required to change the culture of construction from a lowest initial cost regime to one that is more stable and supportive of research and innovation in the industry."

The CCIC, in collaboration with all partners involved in the construction process, will identify needs and opportunities for sector-related research and innovation, develop national innovation priorities, set targets for assessing industry performance, promote technology transfer, and champion innovation issues that affect the institutional, commercial and industrial sectors.

The almost thirty members on the CCIC Board are recognized leaders in the Canadian construction industry. They come from across the country—from Victoria to St. John's—and represent all aspects of the construction industry: researchers, product and equipment suppliers, designers, contractors, owners and regulators. Board members do not represent the interests of their specific organizations but are expected to offer their knowledge and understanding of the industry in providing direction to the CCIC.

The formation of the CCIC was endorsed by all participants at the 2nd Canadian Construction Innovation Forum held in Calgary in May 2003. The main finding of the symposium was that business and technologies are changing rapidly, requiring innovation in order for the Canadian construction industry to maintain a competitive advantage. Unfortunately, in Canada, innovation in the construction sector occurs only in a fragmented and disorganized manner while in other countries, steps have been taken to manage it in a more strategic fashion.

The industry is facing some significant challenges and opportunities:

- Clients are demanding greater quality and more value;
- E-business and information technologies provide significant opportunities for productivity improvements;
- Governments, clients and industry seek greater environmental sustainability;
- New business arrangements are proliferating; and
- Globalization offers both an opportunity for business expansion and a threat to its continued viability.

In addition, governments throughout Canada have a number of priorities that are interrelated—urban renewal, climate change, commercialization and government renewal—all of which require the support of a strong innovative construction industry to succeed. This situation presents a unique opportunity for the industry and government to work together to change the way in which the construction industry adopts innovation in order to help both parties meet their objectives. Such efforts would provide the Canadian public with greater value for its money.

With no central agency responsible for the construction industry, a primary issue is the need to coordinate research and innovation. CCIC, with its broad industry base, is well positioned to play this coordinating role.

Based on the experience of other countries, the members of CCIC strongly believe that the performance of the Canadian construction industry can be improved with respect to the delivery of products and services, with a resultant improvement in the viability of the industry. Given that total Canadian expenditures on construction are in excess of $100 billion per year, a small improvement in performance would result in savings of several billion dollars per year for the Canadian economy. Clearly the opportunities and potential benefits are large.

For more information about CCIC, please contact Gerry Meade at gmeade@rogers.com.

IRC hosted the 1st Canadian Construction Innovation Forum in 2002 that resulted in the creation of the NSCIC. It also played a critical role in organizing and facilitating the 2nd Construction Innovation Forum that endorsed the formation of the CCIC. IRC staff continue to contribute to the CCIC Board deliberations and provide administrative support.

Interested in becoming a CCBFC standing committee member?

New members of the standing committees of the Canadian Commission on Building and Fire Codes (CCBFC) will be appointed November 1, 2005. If you are interested in becoming a member and participating in this important national code development work, please send an expression of interest, stating what areas of code work you are interested in, to the CCBFC Secretary before July 31, 2005. Please include a recent curriculum vitae.

John Archer, Secretary to the CCBFC
Canadian Commission on Building and Fire Codes
Canadian Codes Centre, Building M-23A
National Research Council Canada
1200 Montreal Road, Ottawa, Ontario KIA 0R6
Fax: (613) 952-4040
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Upcoming events

CROSS-CANADA SEMINAR SERIES

Building Science Insight

http://irc.nrc-cnrc.gc.ca/bsi/2005/index_e.html

Seminar Series – 2005
Roofing: Staying on Top of Technology

Organized by:
Institute for Research in Construction
National Research Council Canada

For more information about this Seminar see page 8 of this issue.

October
Ottawa, October 4, 2005
Fredericton, October 12
St. John's, October 14
Charlottetown, October 17
Halifax, October 19
Toronto East, October 31

November
Vancouver, November 2
Whitehorse, November 4
Calgary, November 7
Winnipeg, November 9
Toronto West, November 17
Yellowknife, November 25
Edmonton, November 28
Saskatoon, November 30

January 2006
Sainte-Foy, January 24 (French)
Montreal, January 26 (French)

construction *innovation*

http://irc.nrc-cnrc.gc.ca

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Canada

SEPTEMBER

5-7
CCWI 2005 - Computing and Control in the Water Industry: Water Management for the 21st Century. University of Exeter, UK. http://www.ex.ac.uk/ccwi2005/

12-14
Leakage 2005. Halifax. http://www.leakage2005.com/

18-21
2005 Annual Conference & Exhibition. Transportation – Investing in Our Future. Calgary. http://tac-atc.ca/english/annual conference/annualconference.cfm

21-26
Annual Conference Association for Preservation Technology. Halifax. www.apti.org

OCTOBER

10-12
IEEE SMC 2005. International Conference on Systems, Man and Cybernetics Hawaii. http://ieeesmc2005.unm.edu/

NOVEMBER

21-23
Infra 2005. Montreal. http://www.ceriu.qc.ca/Envoi_courriel/INFRA%202005/Appelconference/110505ang.htm

21-25
Bases for Design of Structures, International Organization for Standardization (ISO) TC 98 Meeting. Ottawa. Contact: Dave Allen at (613) 993-0104, e-mail dave.allen@nrc-cnrc.gc.ca

This calendar does not include all events scheduled to take place during this time frame. For a more complete listing, see the Web version of "Upcoming events" at http://irc.nrc-cnrc.gc.ca/events.html

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