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construction innovation

NRC · CNRC

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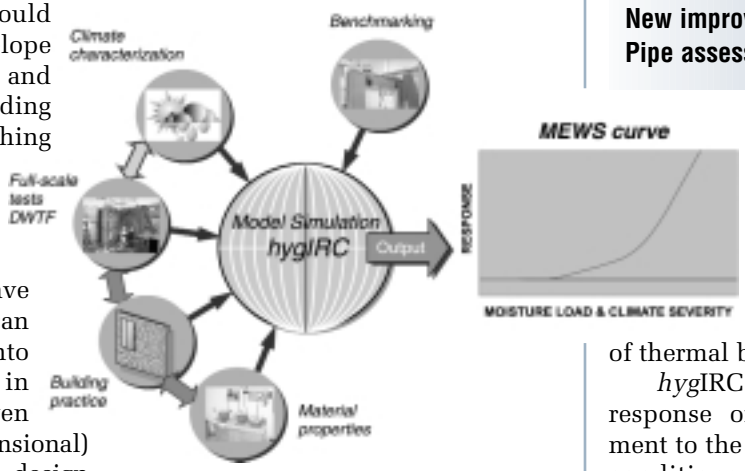
*hyg*IRC helps design community choose optimal building envelope components and systems

If designers and builders could see how their building envelope design responds to heat, air and moisture loads before a building goes up, would they do anything differently? It sounds like a hypothetical question, but researchers in IRC's Building Envelope and Structure (BES) Program have come up with a tool that can give them some insights into how different walls respond in different climates. And even better, a simplified (one-dimensional) version will be available to design practitioners at the end of 2003. (This version will be demonstrated at the BSI seminar—see page 7 for more information.)



*hyg*IRC's capability

Developed and continually refined over the past 10 years, IRC's state-of-the-art computer hygrothermal modelling tool called *hyg*IRC is a powerful tool for identifying and developing the critical design considerations needed to prevent moisture accumulation. It can be applied to a variety of climatic conditions and now contains the most up-to-date database of building material properties in North America.

*hyg*IRC creates a computational two-dimensional cross-section of the building envelope as an ensemble of several hundred closely packed rectangular elements. For the outside of the building envelope, the model subjects the structure to hourly weather variations, including temperature, relative humidity, solar radiation, wind speed and direction, and rain. For the inside of the building envelope, the model subjects the interior to changing temperature and humidity conditions. The model is also tailored to account for other types of moisture and thermal sources, such as those due to unintentional air leakage through openings and cracks, rainwater entry from wind-driven rain, rising damp from the ground and in crawl spaces, and moisture deposition as a consequence of thermal bridges.

*hyg*IRC then simulates the response of each rectangular element to the changing environmental conditions. This simulation produces information on temperature and relative humidity distributions within the building envelope assembly and how they will change with time. The reliability of this simulation depends on three key sets of input: the heat, air and moisture transport properties of each building material in the envelope, information about the way in which these materials are assembled and a detailed set of weather conditions recorded for a given location.

To ensure accurate weather information, IRC has developed a software system called *WeatherSmart* that helps users analyze multi-year

Continued on page 6

Highlights

Published by
Institute for Research in Construction
IRC

Public consultation on National Code Documents now complete

Canada's National Code Documents—the National Building Code, National Fire Code and National Plumbing Code—are not static documents, but must change to keep up with new technologies and emerging issues. A large portion of the work of the Canadian Commission on Building and Fire Codes (CCBFC) and its seven standing committees is dealing with requests for changes to these documents—there is a steady stream of such requests from code users across the country. Standing committee members and staff of the Canadian Codes Centre identify needed changes as well.

Each of these potential code changes is considered by the relevant standing committee, but the changes developed by the committees at this stage of the review process don't automatically get incorporated into the next edition of a particular code. First, the code-using public is given a chance to identify concerns it may have with the proposed changes and to point out issues that the standing committees may have overlooked.

Such a public consultation was held early this year, and for the first time, it was coordinated at the national, provincial and territorial levels and was primarily Web-based. More than 1300 proposed changes to the three National Code Documents were posted in PDF format on the CCBFC's Web site (www.nationalcodes.ca). Code users were invited to visit the site and post their comments regarding the proposed changes.

In addition, staff from the Codes Centre fanned out across the country putting on forums to outline the more significant changes and to help code users better understand what is proposed and why. These forums were all organized by provincial/territorial government staff. A total of 1300 people attended 20 forums in all regions of the country.

By the end of the public consultation period in April, more than 3000 people had logged onto the consultation site and posted more than 1600 comments.

As part of this first-ever coordinated consultation, British Columbia and Ontario had their own consultation sites. Each province received more than 1900 comments, and all of these comments that were relevant to the national process were passed on to the CCBFC standing committees for their consideration.

The standing committees will meet this fall to consider the comments received. The proposed changes accepted in this review process will then be submitted for final approval by the CCBFC. As part of its approval process, the CCBFC will take into account any concerns identified by provincial and territorial officials. The final changes will appear in the next editions of the National Code Documents, to be published in 2005.

IMPORTANT NOTICE TO INDUSTRY
Interior bearing wall offsets with I-joist floors — standard detail solution on its way

The practice of offsetting interior bearing walls when using prefabricated I-joist floors was recently brought to the attention of CCMC. Although offsetting may be common practice with lumber joist floors, as permitted by the National Building Code (NBC), it must be recognized that this is **not** the case with prefabricated I-joist floors (see figure).

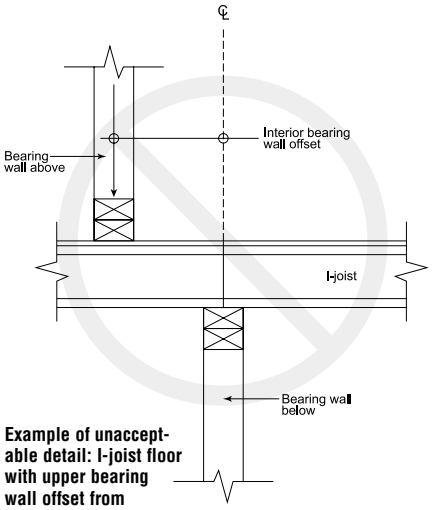
The installation details for I-joists published by their respective manufacturers do not currently address the issue of offsetting interior bearing walls. As a result, this requires an engineer to verify the shear capacity of the joist and specify the web reinforcement necessary to ensure proper load transfer from the bearing wall above to the one below.

CCMC has brought this issue to the Wood I-Joist Manufacturer's Association (WIJMA) and they have responded by forming a task group to develop a standardized detail for offsetting bearing walls.

> CCMC has prepared evaluation reports for all wood I-joist manufacturers selling in the Canadian market. Each evaluation report references the manufacturer's publication containing installation details.

Until the detail is published by the respective manufacturers to address the situation, builders and building officials alike must be aware that this type of installation is beyond the scope of what has been evaluated and published, and requires an engineer's review on a case-by-case basis.

For more information, please contact Bruno Di Lenardo at (613) 993-7769, fax (613) 952-0268, or e-mail bruno.di_lenardo@nrc-cnrc.gc.ca.



Example of unacceptable detail: I-joist floor with upper bearing wall offset from lower bearing wall

New CSA standard provides performance-based approach to qualifying structural wood adhesives

The quality and performance of engineered wood products is predicated on the grade of the wood components, and the quality of both the structural wood adhesive and the in-plant manufacturing process. The grade of the wood components is, for the most part, based on published design values within the design standard CSA O86, *Engineering Design in Wood*. The in-plant manufacturing of engineered products follows a regimented quality control program, which is usually overseen by a third-party certification agency as mandated by industry and the design community.

The choice of adhesive and of joint configuration also play a role in the overall performance of the engineered wood product. But until recently there has been little choice in adhesives other than the traditional phenolic-based ones, which have been governed by two CSA standards published in 1977.

Although phenolics have had a longstanding record of good performance, in the 1990s new adhesives began to appear. These newcomers offered a cleaner look and paler colours (relative to the dark brown phenolic adhesives), as well as advantages with respect to the in-plant environment. Their manufacturers claimed equivalent performance to that of the darker adhesives. However, the prescriptive nature of the existing standards could not automatically be applied to the new innovative adhesives that manufacturers wanted to get accepted by the market. As a result, CCMC was approached to help establish an equivalency protocol for qualifying alternative structural wood adhesives.

Features of the new standard

The new standard is very comprehensive, and there is no preconception of the types of formulations that may be submitted to the tests. The protocol includes typical tests of fungal properties, block-shear strength tests, percentage wood-failure criteria, de-lamination and creep tests. Enhancements to the procedure include better wood-block selection criteria, innovative boil-dry-freezing cycles for durability assessment, and the use of 'median' values, as opposed to the 'mean,' for data assessment; the creep performance qualification involves four extreme environmental conditions under load: high humidity, elevated temperature/long duration, high temperature/low duration, vacuum soaking.

CCMC equivalency approach

As part of developing an equivalency protocol, CCMC first sought the expert advice of Forintek Canada Corp., the research arm of the lumber industry. This resulted in a protocol using a known performing adhesive, phenol resorcinol formaldehyde (PRF), as a control on which equivalent durability performance could be based. This performance-based equivalency approach established by CCMC has helped new adhesives enter the marketplace (see CCMC evaluation reports 12846-R, 12905-R, 13052-R, 13078-R) and bridged the gap until industry and the engineering community were able to develop a new structural adhesive standard.

New CSA O112.9 adhesive standard

In 2000 a CSA subcommittee was struck to produce a performance-based standard for qualifying new adhesives, resulting in CSA O112.9, *Standard Specification for Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)*. This standard is expected to be ratified soon (Fall 2003) and published shortly thereafter (Spring 2004). As no further technical changes to the draft standard are likely, CCMC is already using it in its evaluations. And with the support of industry and the engineering community, CCMC is also encouraging manufacturers to use the new comprehensive standard.

Within the next year, the CCMC reports and listings will begin to include the innovative adhesives meeting the new CSA standard and the engineered wood products making use of these adhesives. In addition, as this standard is intended for severe in-service wet environmental conditions, there is an initiative to produce a dry-service class adhesive standard intended for protected assemblies. CCMC will be participating in this initiative and will seek to keep users informed on the growing classification of adhesives and their appropriate intended use in the field.

For more information, please contact Bruno Di Lenardo at (613) 993-7769, fax (613) 952-0268, or e-mail bruno.di_lenardo@nrc-cnrc.gc.ca.

Registry of Product Evaluations

Now on the Web!

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Fire researchers develop water-mist fire-suppression technology for large industrial oil cookers

In a collaborative research project with CAFS Unit Inc., researchers in IRC's Fire Risk Management Program have shown that water-mist fire-suppression technology works well in extinguishing fires in large industrial oil cookers. These cookers are used in food-processing plants to deep-fry chicken, fish, potato products, doughnuts and other foods.

Mock-up used to test effectiveness of water mist in extinguishing large-scale cooking oil fires.

When fires occur in these cookers, they are challenging to extinguish. With oil varying in quantity from hundreds to tens of thousands of litres, the fire can spread rapidly over the oil surface to form a large fire. The oil becomes very hot (up to 407°C) after ignition, and if the oil is not cooled sufficiently as the fire is being extinguished, the fire can re-ignite.

IRC researchers have … found that fine-droplet water mist … does a good job in extinguishing commercial cooking oil fires and preventing re-ignition.

Until now, carbon dioxide has been the most commonly used fire-control agent for industrial oil cookers. Although it works well in extinguishing flames over the oil surface, it does not have sufficient cooling capacity to bring the oil below its auto-ignition temperature and prevent it from re-igniting. Chemical extinguishing agents are not an alternative because they are not allowed in food-processing plants.

IRC researchers have come up with a viable option: they have found that fine-droplet water mist (large water droplets splash the oil from the cooker) does a good job in extinguishing commercial cooking oil fires and preventing re-ignition. This work builds on IRC research on water-mist fire-suppression technology over the last decade.

Based on this experience, the researchers have taken on this challenge and developed two water-mist systems for extinguishing these large cooking oil fires. Using a simulated industrial oil cooker 2.44 m wide and 3 m long, and holding up to 1000 litres of canola oil, they studied both the characteristics of water mist and the required design parameters for use of water mist in extinguishing such fires.

Both of the water-mist systems they had developed were effective in extinguishing the cooking oil fires with short extinguishing times. The fine water droplets penetrated the fire plume and reached the oil surface. Oil temperature quickly decreased with water-mist discharge. No burning oil was splashed outside the cooker, and no cooking oil re-ignited in the pan. The effectiveness of water mist in fighting large cooking oil fires was influenced by the spray pattern and coverage, water density distribution, and water spray momentum. With the success of these fire tests, water-mist systems based upon this research will soon become available to the industry.

Both of the water-mist systems [researchers] had developed were effective in extinguishing the cooking oil fires with short extinguishing times.

Specific questions on this project can be directed to Dr. Zhigang Liu at (613) 990-5075, fax (613) 954-0483, or e-mail zhigang.liu@nrc-cnrc.gc.ca.

IRC to study fire performance of Canadian houses

New facility for testing fire performance of Canadian houses

The risk of fire is always there, presenting an ongoing challenge for the fire-protection community. While most recent fire research has focused on addressing safety in high-rise buildings (commercial and residential), industrial facilities and multi-family dwellings, a project recently initiated by IRC's Fire Risk Management Program is studying fires in single-family dwellings.

Modern Canadian houses generally perform well in fires. However, over the years there have been changes in construction practices, building designs and materials, and construction technologies. Questions have been raised by the fire-protection community, the Canadian Commission on Building and Fire Codes (CCBFC) and the Canadian Commission on Construction Materials Evaluation (CCCME), regarding the effect of these changes on safety for single- and double-family dwellings.

In response to these questions, IRC is conducting basic research on fires in single-family dwellings and on the factors affecting fire safety. A primary objective of this research is to determine the impact of new, innovative residential construction products and systems on fire safety.

To enable this research to take place, IRC has built a new three-level experimental facility, representing the typical basement and first and second storeys of a single-family house. The new facility will allow IRC to study structural fire performance, as well as smoke movement and tenability under conditions typical of fires that are likely to occur in different areas of a house. The key question is: How long will egress routes from the house remain viable? Other research topics may include the effects of

- open as compared to partitioned design
- interior furnishings
- fire-protection measures.

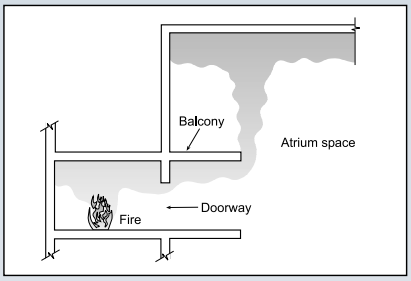
The data produced will also help validate and refine fire modelling and simulation.

IRC will keep stakeholders informed about the formulation and development of the research and will provide them with opportunities for feedback. All interested parties are invited to participate in a special interest group, which will contribute to the development of specific research projects, receive updates on the progress of the research, and have early access to the research results. The input provided by this group will help IRC make decisions about the direction of the research to address the concerns raised by the fire-protection community, the CCBFC and the CCCME.

Questions about this project can be directed to Dr. Joseph Su of IRC's Fire Risk Management Program at (613) 993-9616, fax (613) 954-0483, or e-mail joseph.su@nrc-cnrc.gc.ca.

Newsbrief

ASHRAE/IRC joint research project will investigate atrium smoke-management design to deal with balcony spill plumes



Spill plume from fire beneath balcony

One approach to smoke management for atriums or other large-volume spaces, such as arenas and malls, involves using a mechanical exhaust system to remove the smoke. Such a system maintains the base of the smoke layer above the highest evacuation route from the atrium and above the highest opening between the atrium and adjacent areas of the building.

In North America, the design of atrium smoke-management systems has typically assumed that the fire is located on the floor of the atrium. Validated methods for estimating the smoke-production rate for such fires are provided in engineering design guides published by ASHRAE and NFPA.

With the introduction of performance-based design approaches, there is an increasing demand for consideration of the smoke produced by a fire located either under a balcony or in a room opening onto a balcony (producing a balcony spill plume). Currently, there are several design methods for estimating the smoke-production rate. They are based on scale-model testing conducted in the U.K. and assume that the fire is in an adjacent room. However, there are considerable differences in the capacity of the required smoke-exhaust system as calculated using these various approaches. These differences become particularly significant when applied to the large atriums often found in North American buildings. While over-sizing the fans can be uneconomical, under-sizing them results in failure to maintain the smoke layer above evacuation routes.

ASHRAE and IRC have recently initiated a joint research project to investigate existing design equations for the balcony spill-plume scenario. The project will include both full-scale testing and CFD modelling, and will also examine the situation where the fire is located under a balcony, since at present, there are no design methods that address this situation.

Specific questions can be directed to Dr. Gary Lougheed at (613) 993-3762, fax (613) 954-0483, or e-mail gary.lougheed@nrc-cnrc.gc.ca.

Building envelope and structure

*hyg*IRC helps designers and builders choose optimal building envelope components and systems

Continued from cover page

weather records for any location. They can then select the exterior and interior environmental conditions, as well as the air-pressure difference across the envelope, that are most appropriate to the problem under investigation.

… IRC's state-of-the-art computer hygrothermal modelling tool called hygIRC is a powerful tool for identifying and developing the critical design considerations to prevent moisture accumulation.

Information on building material properties used in the model comes from experimental procedures used at IRC. In fact, the model has been updated extensively in the past three years in parallel with a number of important research projects in IRC's Building Envelope and Structure Program.

The just developed freeze-thaw index and the RHT index (see *Construction Innovation* Volume 8 Number 1 for more about the latter), are examples of such information. They are both products of the Envelope Retrofit of High-rise Masonry Buildings project and the Moisture Management in Exterior Wall Systems (MEWS) project, and have recently been added to *hyg*IRC. These new features allow the model to quantify the amount of moisture in all parts of the building envelope in terms of relative humidity and temperature over a specified amount of time. This, in turn, gives designers important information about potential problems from moisture accumulation and the freeze-thaw cycle, which they can then use to choose the best possible wall assembly.

Similarly, now that the physics applied in the air (drainage) spaces have been fine-tuned, *hyg*IRC can supply information on the effect of air leakage in the building envelope for both low- and high-rise buildings. This information assists in simulating realistic wind pressure, stack pressure, mechanical ventilation pressure, as well as the envelope leakage-rate coefficient and flow exponent, which will help building design professionals make decisions about insulation and air-sealing strategies.

Specific questions about *hyg*IRC and its capabilities and how it may help you can be directed to Dr. Kumar Kumaran at (613) 993-9611, fax (613) 998-6802, or e-mail kumar.kumaran@nrc-cnrc.gc.ca.

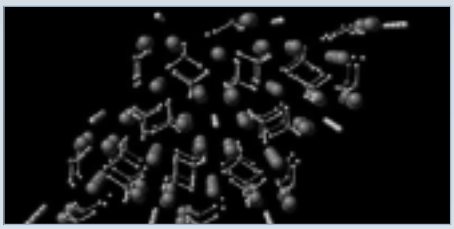
*hyg*IRC hygrothermal model on the world stage

As part of the European Union HAMSTAD (***H***eat, ***A***ir and ***M***oisture ***STA***ndards ***D***evelopment) strategic research project, *hyg*IRC was chosen to provide benchmarking information to develop a European CEN (European Community for Standardization) standard for hygrothermal models. This standard has been proposed as a draft ISO standard that could be adopted as a CSA standard for the calculation, prediction and evaluation of moisture performance of building envelopes.

For more information, visit the HAMSTAD Web site at http://www.buildphys.chalmers.se/research/HAMSTAD-e.htm.

Newsbrief

NRC-led team looks at new approaches to waste disposal of hazardous materials



Molecular structure of a synthetic rock-like material (apatite)

Disposal of garbage is a worldwide problem that often involves landfill or incineration. In densely populated places where space is at a premium, incineration is often the most popular solution, and in some cases, such as in Singapore, it is the only solution. In Canada, pressures towards cleaner energy and resource recovery make incineration an option worth investigating.

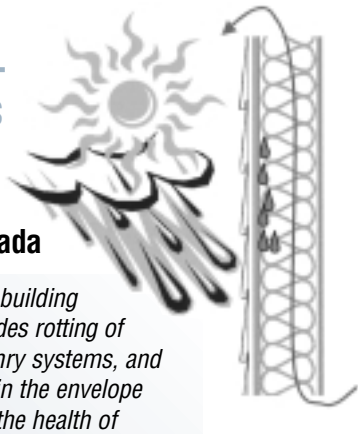
But, incineration does not mean complete waste elimination. Facilities are forced to deal with a substantial accumulation of fly ash—lightweight particles entrained in the gases released during burning. Fly ash, which collects in the flues of incinerator smoke stacks, can be classified as a hazardous material because of the range of heavy metals it contains, making it difficult and expensive to dispose of. Chances for safe disposal, and even reuse, are much more promising if the toxic metals can be trapped.

A new collaborative research project between NRC and Singapore will focus on creating these new trapping materials by exploring innovative advanced ceramic processing to stabilize the heavy metals found in industrial residue. The plan is to use synthetic rock-like material to trap the heavy metals. IRC and another NRC institute, the Institute for Chemical Process and Environmental Technology (ICPET), will work with Singapore's Institute of Environmental Science and Engineering (IESE), conducting fundamental studies to determine the material's resistance to environmental leaching. Results could lead to the recycling of incinerator residue as cement-replacement material, helping achieve CO_2 reduction in products such as roof tiles.

The project, which will begin in the next few months, is made possible through a Memorandum of Understanding (MOU) between NRC and the National Science and Technology Board of Singapore, known as A*Star. Under the agreement, both sides will provide funding for joint collaboration.

For more information about this project, please contact Dr. Lyndon Mitchell at (613) 998-0064, fax (613) 954-5984, or e-mail lyndon.mitchell@nrc-cnrc.gc.ca.

Seminar Series – 2003
Effective Moisture Control for Light-Frame Walls of Low-Rise Buildings



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

Moisture is a primary agent of premature deterioration of building materials. Damage induced by uncontrolled moisture includes rotting of wood-based materials, efflorescence and spalling of masonry systems, and rusting of metal studs and fasteners. Excessive moisture in the envelope may promote the growth of moulds, and thus may affect the health of occupants. This seminar will provide insight into the factors that contribute to effective management of moisture in light-frame walls of low-rise buildings, both in terms of building science principles and the application of these principles. Presentations will highlight results and new design tools derived from IRC's most recent research on moisture management in exterior walls.

- ***Ottawa***
  October 7, 2003
- ***Toronto (West)***
  October 9, 2003
- ***St. John's***
  October 24, 2003
- ***Halifax***
  October 27, 2003
- ***Charlottetown***
  October 29, 2003
- ***Fredericton***
  October 31, 2003
- ***Toronto***
  November 6, 2003
- ***Whitehorse***
  November 14, 2003
- ***Vancouver***
  November 17, 2003
- ***Calgary***
  November 19, 2003
- ***Winnipeg***
  November 21, 2003
- ***Yellowknife***
  November 28, 2003
- ***Edmonton***
  December 1, 2003
- ***Saskatoon***
  December 3, 2003
- ***Sainte-Foy (French)***
  January 13, 2004
- ***Montreal (French)***
  January 15, 2004

See Web site for details.

Design principles for performance and durability. *Performance requirements for wall assemblies include provisions for structural strength and rigidity, and for the control of fire, noise, rain penetration, heat, air and water-vapour flow. In addition, the wall must be durable.* The seminar will feature various means of assessment of wall performance related to moisture control and the relevance of each to design, performance testing and modelling. An understanding of the relationship between environmental effects and deterioration mechanisms, and the response of assemblies to these effects will provide a useful backdrop for relating climatic loads to the long-term performance of walls.

Assessing climate loads. *Climatic phenomena can affect the long-term performance and durability of exterior walls. Different types of exterior walls respond differently to the same climate exposure. Understanding the nature of and estimating the magnitude of climate loads are important steps in the selection of moisture management strategies for assemblies.* One of the presentations will explain several indicators of climate severity related to the control of rain penetration, condensation and the potential drying of assemblies, and will describe the Moisture Index, a new indicator developed at IRC, that merges the wetting and drying potentials inherent in various climates.

Rain penetration control strategies. *Wall assemblies are not inherently free of deficiencies, hence water can enter through openings in the cladding during rainfall.* There will be a presentation focusing on key design strategies for achieving walls that can mitigate the effects of water entry. It will include discussion of results from IRC's latest research on water entry into large-scale wall specimens with windows and other components that penetrate the wall assembly.

Control of heat, air and moisture flow. *Effective control of condensation in exterior walls depends on applying strategies to minimize air movement and vapour diffusion into the assembly, as well as on maintaining critical elements above the dew point temperature.* Another presentation will examine the requirements for air barrier systems and vapour barrier materials and how these affect the design of other wall elements.

Putting principles into practice. *To help manage moisture in buildings, practitioners must integrate theory with practice, adapting both to local conditions.* The presenters will analyze several case studies of field problems related to rain penetration and condensation in buildings, and the particular regional practices that have been applied (on the West coast, the Prairies and the North, and in Ontario, Quebec and the Atlantic provinces). There will be an emphasis on lessons learned and how they have been implemented to improve these practices.

Applications of hygrothermal computer modelling. *Different wall assemblies respond differently to moisture and temperature, depending on their characteristics as well as on their exposure to indoor and outdoor climates. Because of the vast range of possible responses, computer modelling provides a useful tool for quickly obtaining comparative information on the moisture and temperature responses of a large variety of (virtual) wall assemblies to a range of climatic conditions and indoor environments.* The seminar will discuss the method developed by IRC to analyze the thermal and moisture response of different wall designs in different climates and will review key results derived from the Institute's latest studies on wetting and drying of wall systems.

Demonstration of IRC *hyg*IRC (1-D) hygrothermal computer model. There will be a presentation that demonstrates how IRC's hygrothermal model can be applied to wall assemblies typical of low-rise construction for different environmental loadings.

New improved IRC Web site delivers solutions to practitioners

The IRC Web site home page

The rapidly increasing popularity of IRC's Web site **http://irc.nrc-cnrc.gc.ca** is demonstrating that the Institute is a prime source of information for construction practitioners in Canada.

The Web site receives over 120,000 "hits" each month and most of these visitors are accessing IRC publications.

"Our site is a key part of our technology transfer and communication efforts," says Mike Culhane, IRC's Head of Library and Internet Services. "With so many people coming to the site for publications, we decided to make more of them available and make them easier to find."

The IRC site contains over 2,000 publications, with many geared toward the practitioner. Among the most popular publications are the practice-oriented *Construction Technology Updates*. The Updates are concise distillations of IRC research results and reviews of building science principles.

Another extremely popular series is the *Canadian Building Digests*. When IRC decided seven years ago to add its highly regarded collection of 250 Digests to the Web site, it had an immediate impact with practitioners. The Digests represent a veritable history of building science in Canada covering the period 1960 to 1990, and putting them on the Web was an inexpensive way to keep them accessible to users. Their popularity continues unabated.

Culhane and his staff add new publications on a weekly basis and

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Newsbrief

International tall structures conference to run concurrently with CIB 2004

For the past 27 years, Toronto has been home to the world's tallest structure, the 553-m multi-purpose CN Tower. What better venue, then, for the 6th International Conference on Multipurpose Highrise Towers and Tall Buildings? From May 2–7, 2004, Toronto will host this conference in conjunction with CIB 2004 to provide conference participants with the maximum opportunity to exchange ideas on building and construction issues.

Organized by IRC on behalf of the International Federation of Highrise Structures (IFHS), the conference will focus on practical issues facing tall structures. These include design features for wind and earthquake resistance, severe impact and explosion, security and safety systems, and special services, such as water, elevators and communication. Occupant issues, such as crowd control and factors affecting comfort in tall structures, will also be a consideration.

"We intend to offer opportunities for participation to the wide-ranging teams of specialists and suppliers who provide expert advice, technology, materials and systems for highrise construction," says Prof. Dr. Ing. H.R. Viswanath, Chairman of IFHS, who is organizing the event in cooperation with IRC. "Owners, clients, architects, engineers, contractors and researchers will all find topics of interest at the conference."

This approach is very much in keeping with the IFHS mandate, which takes an interdisciplinary approach to assembling, publishing and distributing information related to the unique problems of highrise structures. The organization was founded in 1994 and has members representing 13 countries, including Canada.

For more information on the 6th International Conference on Multipurpose Highrise Towers and Tall Buildings, or on IFHS, contact Prof. Dr. Ing. H.R.Viswanath by e-mail at hrviswas@vsnl.net. To register for this conference, go to the CIB Web site at http://www.cib2004.ca.

As the countdown to the World Building Congress continues, go to http://www.cib2004.ca for regular updates.

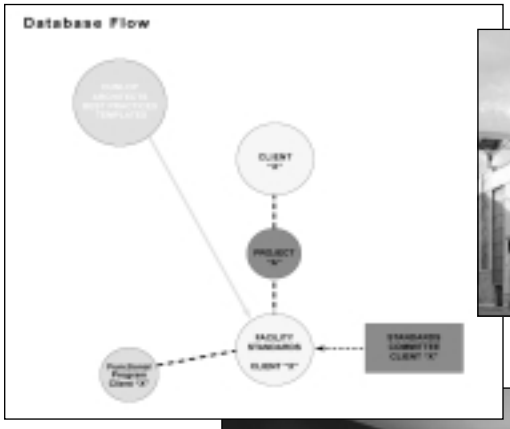
IRC sponsors award to encourage innovation in architecture

In May 2003, Canada's architects gathered to celebrate the best in Canadian architecture with the Royal Architectural Institute of Canada (RAIC) Awards of Excellence, an event held every two years. These awards recognize outstanding work in four categories: innovation, contract documentation, advocacy for the profession of architecture, and leadership in the profession by an architectural firm. NRC's Institute for Research in Construction (IRC), an active promoter of innovative ideas within the construction sector, was the main sponsor in the innovation award category.

The innovation award recognizes excellence in the research, development and applied use of new technology and the unique adaptation of existing technology. It also recognizes new project delivery methods and design processes, and new approaches to the construction process.

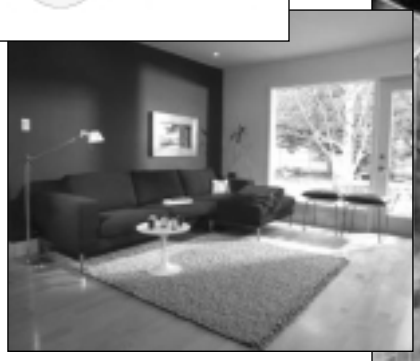
This year there were four winners of the innovation award—the Dunlop Project Information of Best Practices Database, the Centre CDP Capital Exterior Wall System, Housebrand, and the Winnipeg Mountain Equipment Co-op store. The architectural profession was represented on the jury by Norman Hotson of Vancouver and Barry Hobin of Ottawa.

The jury found the Dunlop Project Information of Best Practices Database to be an adaptable and interactive design information database, allowing 50 years of past experience to become present knowledge for designers, clients and users, and also allowing team members to access, customize and share information about previous designs for specific facility types. The jury felt that the system's potential to organize past experience could be used to guide design development in the future.

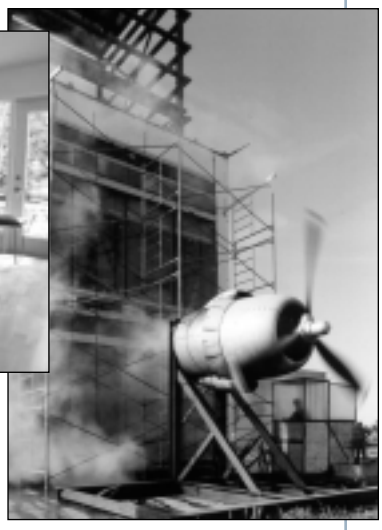


Dunlop Project Information of Best Practices Database

Mountain Equipment Co-op store



Housebrand community, practice and business model



Centre CDP Capital exterior wall system

The Centre CDP Capital Exterior Wall System, dubbed the "smart skin system" by the jury, integrates architectural and engineering innovations to produce a unique building envelope design. Designed by Montreal-based Gauthier, Daoust Lestage Inc.; Faucher, Aubertin Brodeur Gauthier; and Lemay et associés, the system includes innovations in bio-climatic design, energy systems, lighting, and the use of open corridors to an atrium within a highrise structure.

Housebrand, created by Calgary-based John Brown Architect Ltd., brings together real estate development, residential construction, architecture and interior design to address the needs of the single-family housing market. This approach helped the firm succeed in an untapped market niche. It also helped it develop a methodology that the jury felt could serve as a model for other communities, practices and businesses.

Designed by Prairie Architects Ltd., the Winnipeg Mountain Equipment Co-op (MEC) store is one of a series of MEC retail stores to aspire to "green architecture." With green roofs, composting toilets and a location designed to act as a catalyst for downtown urban renewal, the project succeeds in meeting its goal. The jury singled it out as a model of leading-edge design for sustainable buildings.

Questions about the 2003 RAIC award for innovation in architecture can be directed to Guy Gosselin at (613) 990-0458, fax (613) 952-7673, or e-mail guy.gosselin@nrc-cnrc.gc.ca.

Non-destructive method to assess pipe wall thickness patented by IRC

Water utilities know too well that they face major costs in maintaining and replacing their transmission and distribution pipe networks. And as more and more networks decline each year, these costs are increasing and will peak when water pipes installed during the post-war boom begin to reach the end of their service lives.

The new method relies on measuring how quickly an acoustical signal is transmitted along a section of pipe, using easy-to-access measurement locations such as fire hydrants and control valves.

Gaining access to these pipes to inspect them can be difficult and disruptive—until now. Researchers in IRC's Urban Infrastructure Rehabilitation Program have developed and patented a new non-destructive test method for water utilities to use in evaluating pipe wall thickness without taking the pipe out of service and, even better, without digging, thus minimizing disruption.

The new method relies on measuring how quickly an acoustical signal is transmitted along a section of pipe, using easy-to-access measurement locations such as fire hydrants and control valves. Changes to the signal—specifically changes to its transmission or propagation velocity—can be related to changes in the pipe wall thickness.

The testing methodology is simple. Operators place a pair of vibration sensors or underwater microphones in direct contact with a pipe at a known distance apart.

With IRC's patented non-destructive test method, municipalities can avoid the typical disruption shown here, which occurs when pipes have to be accessed for inspection.

They then send an acoustical signal, either by opening a fire hydrant or service connection or using an existing leak at a known location, and measure the time it takes the signal to travel between the two sensors.

The distance from sensor to sensor divided by the time lag gives the operators the propagation velocity. From this value, they can then determine the pipe wall thickness, based on known parameters of the pipe, such as its diameter, and the theoretical relationship with propagation velocity. The value determined for pipe wall thickness using this method is an average for the section between the two measurement points, which is typically 100 metres.

This method can be used on all types of pipes, including cast and ductile iron, steel, PVC, asbestos cement and concrete, and can be carried out as part of routine leak-detection surveys. It can also be used for other pressurized fluid-carrying pipelines, such as those used for oil or gas. In addition, the required measurements and calculations for the method can be made without a high level of operator skill using IRC's LeakfinderRT system, details of which can be found online at irc.nrc-cnrc.gc.ca/leak/leakfinder/.

Specific questions about the new pipeline assessment tool can be directed to Dr. Osama Hunaidi at (613) 993-9720, fax (613) 952-8102, or e-mail osama.hunaidi@nrc-cnrc.gc.ca.

IRC looking for partners to commercialize new pipe assessment method

IRC has developed and patented a new test method for use in evaluating pipe wall thickness. The method doesn't take the pipe out of service, doesn't require digging, and works on all kinds of pipes. The required measurements can even be carried out as part of routine leak-detection surveys from easy-to-access locations such as fire hydrants and control valves.

Interested? IRC is looking for a company capable of commercializing this technology and marketing it to water utilities and private water services companies worldwide. In addition, IRC is willing to work with large utilities and service companies on a site-specific basis. Letters of interest are currently being accepted. For more information, contact Harris Cunningham, IRC Marketing Manager, at (613) 991-2987, fax (613) 993-3142, or e-mail harris.cunningham@nrc-cnrc.gc.ca.

AwwaRF and IRC combine forces to look at impact of aging water mains on water quality

IRC and the American Water Works Association Research Foundation (AwwaRF) are about to embark on a new research project titled *Effect of aging water mains on water quality in distribution systems*. This effort will enhance the state of both knowledge and practice in managing water quality in distribution systems. For more information about this project, please contact Dr. Rehan Sadiq (613) 993-6282, fax (613) 954-5984, or e-mail rehan.sadiq@nrc-cnrc.gc.ca.

New improved IRC Web site delivers solutions to practitioners

Continued from page 8

the upcoming events section is updated regularly. In addition, anyone can sign up to receive the list of new publications by e-mail or subscribe to the electronic version of *Construction Innovation*.

A new feature of the IRC Web site is the A-Z Index, which allows users to find information quickly on IRC's 5,000+ Web pages, if they know what they're after.

"For users who are just browsing, there are also links on each page to IRC's main activities: research, product evaluations, codes and publications," says Mike Culhane. Other links include a "Join us" page detailing career and business opportunities, and a list of related sites.

The site contains comprehensive information on IRC's research activities. Another pivotal part of the site is the section pertaining to building codes. IRC provides national leadership to the codes community in Canada and readers can follow code developments by accessing the IRC site. As well, reports of products evaluated by IRC's national evaluation service (CCMC) can be found here.

As Canada's largest construction research organization, IRC also acts as a gateway for Canadians to access global building technology information. From the IRC site it is possible to simultaneously search the Web sites of members of the CIB (International Council for Research and Innovation in Building and Construction).

Culhane says the goal is to make the IRC site as active, relevant and useful as possible, a one-stop source of information. To this end, there are plans to add a searchable database of frequently asked questions about a host of technical issues, as well as to increase linkages and information sharing with other national and international construction organizations.

Questions or suggestions about further ways to improve the site are welcomed and can be directed to Mike Culhane at (613) 993-3774, fax (613) 952-7671, or e-mail mike.culhane@nrc-cnrc.gc.ca.

Change of address

Don't get left behind. Update your list of favourite Web addresses with IRC's new URL: **http://irc.nrc-cnrc.gc.ca**

What we're hearing

Get out those travel planners, and start booking now!

International Conference on Building Envelope Systems & Technology goes Down Under in 2004

Preparations are well underway for ICBEST 2004, the International Conference on Building Envelope Systems and Technology to be held March 31 to April 2, 2004 in Sydney, Australia. Focusing on the design and performance of durable and sustainable building envelope systems, the conference promises to be a landmark event for professionals involved in building design, construction and operations. More than 400 Australian and international delegates are expected to attend.

The conference balances the latest in laboratory and theoretical research with a wide variety of practical applications. Topics range from solar effects, moisture modelling and failure surveys to construction quality control and environmentally responsible design.

This conference is a must for those interested in the building envelope. Visit the conference Web site at www.icbest2004.com for more information on how to register, or contact the organizers at icbest2004@bigpond.com or Dr. A. Baskaran at (613) 990-3616; e-mail bas.baskaran@nrc-cnrc.gc.ca.

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Please note that Updates No. 49 and up are priced at $10 each. They are not available on the IRC Web site.

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The following is a list of the Updates available:

No. 1 Control of Sound Transmission through Gypsum Board Walls
No. 2 Fire Resistance of Gypsum Board Wall Assemblies
No. 3 Maintaining Acceptable Air Quality in Office Buildings through Ventilation
No. 4 Ways to Reduce Blistering in Built-up Roofs
No. 5 Window Condensation in Historic Buildings that Have Been Adapted for New Uses
No. 6 Fire Resistance of Concrete-Filled Steel Columns
No. 7 Corrosion of Metal Ties in Masonry Cladding
No. 8 Six Axioms for Building Durable Concrete Structures
No. 9 Evolution of Wall Design for Controlling Rain Penetration
No. 10 Office Lighting Investments: Payoffs for People and the Environment
No. 11 Effective Use of Bonding Agents
No. 12 Fire Protection of Windows Using Sprinklers
No. 13 Controlling Sound Transmission through Concrete Block Walls
No. 14 Why Houses Need Mechanical Ventilation Systems
No. 15 Current Approaches for Mechanical Ventilation of Houses
No. 16 Sound Isolation and Fire Resistance of Assemblies with Fire Stops
No. 17 Pressure Equalization in Rainscreen Wall Systems
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No. 48 Design Approaches for Smoke Management Systems in Atriums
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Upcoming events

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19

Standing Committee on Environmental Separation. Calgary. Contact: Adaire Chown at (613) 993-0352; adaire.chown@nrc-cnrc.gc.ca

25-27

Standing Committee on Fire Safety and Occupancy. Montreal. Contact: Denis Bergeron at (613) 993-5659; e-mail denis.bergeron@nrc-cnrc.gc.ca

OCTOBER

Building Science Insight
Seminar Series – 2003
For seminar dates and locations go to advertisement on page 7 of this issue.

17-19

Standing Committee on Houses. Ottawa. Contact: Michel Lacroix at (613) 993-0056; e-mail michel.lacroix@nrc-cnrc.gc.ca

18-19

Standing Committee on Structural Design. Montreal. Contact: Cathleen Taraschuk at (613) 993-0049; e-mail cathleen.taraschuk@nrc-cnrc.gc.ca

27-29

Standing Committee on Hazardous Materials and Activities. Calgary. Contact: Denis Bergeron at (613) 993-5659; e-mail denis.bergeron@nrc-cnrc.gc.ca

29

Événement Bâtiment Contech 2003. Montreal. www.contech.qc.ca

NOVEMBER

3-5

Global Summit on Performance-Based Building Codes. Washington, DC. http://www.iccsafe.org/calendar/ircc.html

15-16

The 4th Joint Symposium on Information Technology in Civil Engineering. Nashville, TN. http://www.asce.org/conferences/annual03/an03_symposiumcall.cfm

26

Événement Bâtiment Contech 2003. Quebec City. www.contech.qc.ca

DECEMBER

3-5

Construct Canada/Homebuilder & Renovator Expo/PM Expo/DesignTrends. www.constructcanada.com and www.homebuilderexpo.com

2004 JANUARY

11-15

AWWA Water Sources Conference & Exhibition. Austin, TX. Contact: Rick Harmon at (303) 347-6195

FEBRUARY

24-25

BC Construct. Vancouver. http://www.homebuilderexpo.ca/intro/intro-van.htm

APRIL

8-9

Constructex. Montreal. http://www.expositionsmontreal.com/tor/frame.html

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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