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construction innovation

NRC · CNRC

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The COPE project: building a better workstation

The single most common workplace in North America is the open-plan office. People who work in this type of office spend more waking hours in this environment than in any other, and there is abundant evidence that they do not generally enjoy the experience. The success of Dilbert™ is one manifestation of this malaise.

With this in mind, IRC and its consortium partners (see sidebar) initiated the Cost-effective Open-Plan Environments (COPE) project, which examined the effect of office design choices on the workplace environment, and the effect of that environment on occupant satisfaction. Researchers used laboratory studies in mock-up offices, a field study, computer simulation and literature reviews to investigate the effects.

The four-year project produced a body of knowledge that can help designers make more appropriate choices for open-plan office layouts.

COPE partners

Public Works and Government Services Canada, Building Technology Transfer Forum, USG Corporation, Ontario Realty Corporation, British Columbia Building Corporation, Steelcase Inc., Natural Resources Canada

The results can be summarized by three broad conclusions:

1. **Indoor environments matter**. There is a significant link between environmental satisfaction and job satisfaction. The review of the literature points to a significant relationship between job satisfaction and measures related to organizational productivity.
2. **Good design can improve open-plan office environments**. In the acoustics domain, most office workers desire speech privacy. Increasing ceiling absorption, adding masking noise, increasing workstation size and increasing partition height all improve speech privacy. With respect to lighting and daylighting conditions: both are improved with lower partition heights and lighter coloured surfaces. Systems that offer individuals dimming control of their lighting also improve satisfaction. Similarly, mechanical systems that provide individual control

Continued on page 7

Highlights

Is this the perfect partition design?
With the windows to the right, the use of transparent panels makes the partition low enough for daylighting purposes and high enough for speech privacy. However, after installation these transparent panels are often covered with posters or coats by occupants seeking visual privacy. Note: to really improve daylight penetration into the second row of cubicles from the window, the upper panels of the partitions to the left should also be transparent.

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How public comment on technical changes to the national model code documents is being handled

The final steps in the process by which public comment on proposed technical changes to the 1995 national model codes—National Building Code, National Fire Code and National Plumbing Code—is dealt with are underway. These steps are as follows:

Step 1

The public consultation on proposed technical changes to the national model codes, as well to the provincial and territorial codes, was completed in the spring of 2003. Over 1400 technical changes were released for public review and several thousand comments were received. All comments were reviewed, collated and entered into a database.

Step 2

All of the technical standing committees of the Canadian Commission on Building and Fire Codes (CCBFC) met in September and October 2003 to consider stakeholders' comments on the proposed technical changes. The standing committees were generally not permitted to introduce new technical changes or significantly modify a proposed technical change at this stage of the code development process. Discussions focused on issues identified during the consultation, and in cases where technical problems appeared that could not be resolved, the affected proposed changes were either set aside for further work, or abandoned.

At the end of their meetings, the standing committees came forward with recommendations to the CCBFC on the new technical content of the national model code documents.

The provinces and territories have been closely involved in the process at every stage. Each jurisdiction received copies of the standing committee agenda packages as they were prepared. If they had a concern with any of the comments received from stakeholders, these were brought to the attention of the appropriate standing committee. Soon after the completion of the standing committee meetings, the changes to the national model codes recommended in the course of these meetings were sent to the provincial/territorial jurisdictions for their comments.

During the first three months of 2004, the Commission will try to address any objections the provinces and territories might have while proceeding to Steps 3 through 5.

Step 3

The recommended technical changes to the national model code documents will then be sent to the CCBFC members in the form of a ballot. The ballot comprises the original requirement, the recommended change or addition, and the reasons for the change, including information on cost and enforcement implications. Where a standing committee is not able to resolve a recorded negative vote, this will be reported to the Commission in the ballot. The last ballot is expected to be sent out in January 2004.

If comments or negative ballots are returned, discussion between the CCBFC member, the chair of the responsible standing committee and technical staff at the Canadian Codes Centre will take place and an attempt will be made to resolve the issue.

Continued on page 9

New Revisions to the User's Guide – NBC 1995, Structural Commentaries (Part 4) now available

Second Revisions to the User's Guide – NBC 1995, Structural Commentaries (Part 4) were approved by the Canadian Commission on Building and Fire Codes and are now available to all users of the Part 4 Guide. The document features replacement pages with the revisions, identified by an ***r2***.

Second Revisions packages have been mailed to the clients who purchased their User's Guide directly from NRC or who returned the reply card at the front of their book to NRC. Users who did not receive a copy of the revisions and CD-ROM users can download the pages with the revisions (PDF format) from IRC's Web site at http://irc.nrc-cnrc.gc.ca/catalogue/part4.html. To obtain a hard copy of the Second Revisions, you can also contact IRC's Publication Sales Department:

Telephone: 613-993-2436 or 1 800 672-7990
Fax: 613-952-7673
E-mail: IRC.Client-Services@nrc-cnrc.gc.ca
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Institute for Research in Construction
National Research Council Canada
Ottawa, Canada K1A 0R6

Please provide your name, affiliation, address and phone number, and specify whether you require the English or French package.

Training needs assessment for 2005 objective-based codes now complete

In a survey carried out between February and June 2003, prospective users of the 2005 objective-based building, plumbing and fire codes validated the need for training on key concepts of the new codes objective-based format. They also said that they wanted classroom-based training that includes practice in applying the new information—objectives, functional statements, intent and application statements—that will be attached to each requirement.

The survey questionnaires were distributed to attendees at code consultation forums held across Canada to help determine the type of training needed to facilitate the transition to objective-based codes. (The questionnaire was also available online and can still be viewed at www.nationalcodes.ca/consult/obc/index_e.shtml.)

There were 303 respondents, in three distinct groups:

1) building, plumbing, and fire officials (45%)
2) architects, consulting engineers and technologists (40%)
3) contractors, educators, home builders and tradespersons (15%).

Under a contract to assess training requirements, jointly funded by NRC, Canada Mortgage and Housing Corporation (CMHC), and the provinces and territories, the consultant, Humber College Corporate Education Services of Mississauga, Ontario, analyzed the questionnaires and presented the following key findings:

- Respondents endorsed the following training topics:
  - structure and organization
  - new key concepts (intent, application and functional statements; alternative solutions; and objectives)
  - submitting, evaluating and approving equivalent/alternative solutions;
- New key concepts were ranked to be of greatest importance;
- Classroom training is preferred by 70% (only 13% selected Web-based independent learning);
- Training modules should include case studies;
- Code authorities and practitioners want in-depth training of a day or more.

In addition to being asked in the questionnaire about their training needs and their preferences for delivery, code users were asked to make suggestions concerning additional tools that should be developed to support the application of objective-based codes. The favourite suggestion was a Web-based repository of alternative solutions accepted by authorities having jurisdiction (32%); other popular choices were a "best practices" document (24%) and "guidelines" (22%).

The consultant also analyzed the in-depth feedback from stakeholders who had met in focus groups orga-

Continued on page 7

National Building Code of Canada and National Fire Code of Canada now available on Special Edition CD-ROMs

The Institute for Research in Construction is pleased to announce the release of two new national code documents on Special Edition CD-ROMs:

- National Building Code of Canada 1995 (NBC), and
- National Fire Code of Canada 1995 (NFC).

The complete English and French versions of the documents are included on the CD-ROMs with a comprehensive list of bookmarks for easy access to content. Hyperlinks throughout each book facilitate cross-referencing so you can quickly retrieve all the related information you want. Acrobat Reader is all you need to take advantage of the improved search capabilities. The CD-ROMs are readable on Windows, Macintosh and Unix platforms.

All five series of revisions and errata are included in the National Building Code of Canada, and both series of revisions and errata are included in the National Fire Code of Canada.

The NBC and NFC Special Edition CD-ROMs are available respectively for $179 and $125 (stand-alone installations).

Here's how to order:
Fill out the enclosed order form or contact our Publication Sales Department:
Tel.: (613) 993-2463 or 1 800 672-7990
Fax: (613) 952-7673
E-mail: IRC.Client-Services@nrc-cnrc.gc.ca

Fire researchers develop new tool for assessing fire resistance of wall assemblies using numerical modelling

IRC fire researchers have recently completed a joint project with Forintek Canada Corp. (FCC) that can provide an alternative to costly fire-resistance testing and that addresses the issue of risk assessment.

To obtain a satisfactory level of safety, buildings must comply with various requirements, including those dealing with the fire resistance of wall and floor assemblies used to form separations between dwelling units in multi-family residential applications. Adequate fire resistance lowers the risk for building occupants and minimizes the damage to property.

A wood-stud wall buckles during a fire test.

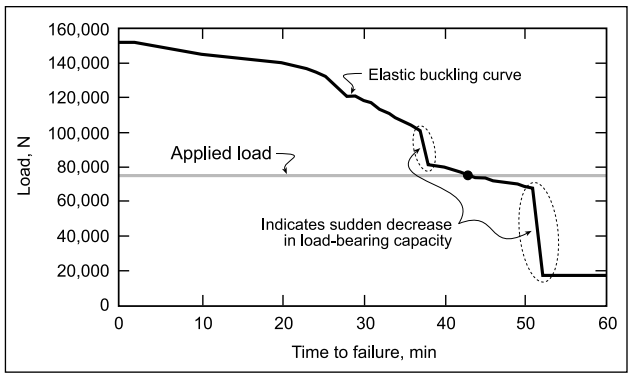
The adequacy of fire resistance can be assessed using computational techniques (engineering calculations), which are becoming increasingly important as research tools in the area of fire protection because they can help reduce the high costs and time required for testing, and provide engineers with a better insight into the performance of assemblies in fire tests. This is particularly so in cases where the results of standard fire tests are not available, and when non-typical specimen sizes, loading conditions and fire scenarios must be considered.

In the project, researchers focused on the development of a numerical model to predict the fire-resistance behaviour of lightweight wood-stud wall assemblies subjected to fire. The numerical model, which is based on observed behaviour from experimental data (see photo above), is used to trace the complex thermal and structural interactions in a given wall assembly exposed to fire, by coupling two models—a thermal response model and a structural response model.

The thermal response model, called WALL2D (developed by FCC), determines the time it takes for the wall to fail thermally, the temperature distribution across the wall, the rate of advance of the char layer into the wood and the joint openings while taking into account various material properties.

To determine the structural response, a critical elastic buckling-load model (developed by NRC) is used in conjunction with WALL2D. This model calculates the degradation of the thermo-mechanical properties of wood, the reduction in the cross-section of the studs, the critical elastic buckling load of the stud and, using the charring calculation and the temperature profile in the studs predicted by WALL2D, the time it takes the wall assembly to fail structurally.

The numerical model was validated against a number of full-scale tests conducted at NRC. Typical fire-resistance performance of a wood-stud assembly (under standard fire test conditions), as predicted by the structural response model, is shown in the figure below. The figure illustrates the time of failure of an assembly under load. The intersection of the horizontal line with the elastic buckling curve represents the theoretical time it takes for the wall to fail structurally for a particular applied load.



Typical fire-resistance performance of a wood-stud assembly as predicted by structural response model

The integrated fire-resistance model for lightweight wood-frame wall assemblies has shown itself to be suitable for assessing the time it takes load-bearing wood-frame wall assemblies to fail, using both thermal and structural failure criteria. The model can also be used to plan experimental programs and to develop design guidelines. Further validation of the model is planned using the non-standard fire exposures derived from the design fires project (see article below).

Specific questions can be directed to Dr. Noureddine Bénichou at (613) 993-7229, fax (613) 954-0483, or e-mail noureddine.benichou@nrc-cnrc.gc.ca.

Realistic fire simulations will be used in fire-safety analysis and design

The fire resistance of building assemblies has traditionally been evaluated by subjecting them to a standard fire test. However, some fire researchers believe that real fires may be more severe than the fire exposure defined in standard fire tests.

To evaluate the effect of real fires on building assemblies, researchers use simulation fires, or "design fires." A design fire is essentially a quantitative description of the characteristics of a fire, such as rate of release of heat energy, size of the fire and its rate of spread, yield of products of combustion, and hot gas temperatures, and is based on fire scenarios that replicate real fires.

But the central question is: How can researchers be confident that the design fires they are using do, in fact, approximate reality? The answer to this question entails accounting for factors that affect the intensity of a fire: the fire load, the ignition source and process, the growth and spread of the fire from the first to subsequent items ignited, and the effects of building features, such as openings for ventilation (windows and doors), construction materials, and the dimensions of the compartment where the fire originated.

IRC's Fire Risk Management Program (FRM) recently initiated a research project to develop realistic design fires for residential occupancies. The fire loads to be used in this project will be derived from a survey of combustible household contents found in Canadian homes. A pilot survey of 75 homes has been completed and there are plans to extend the survey to a wider cross-section of the population.

One use of this data will be in contributing to experiments with selected party-wall assemblies tested in previous projects with standard fire exposures, to determine the effects of the design fires on time of failure. Another use of the data will be in further validating the model that predicts the fire-resistance behaviour of lightweight wood-stud wall assemblies, which has been developed by FRM in conjunction with Forintek Canada Corp (see article, p. 4).

Invitation to join the project

IRC is currently seeking partners for this research project. If you are interested in participating, please contact Dr. Alex Bwalya at (613) 993-9739, fax (613) 954-0483, or e-mail alex.bwalya@nrc-cnrc.gc.ca.

SiF' 04 Workshop for fire resistance experts to be held in Ottawa

A workshop that brings together experts in fire-resistance research from around the world will be held in Ottawa on May 10 and 11, 2004. The focus of the Third International Workshop on Structures in Fire, SiF' 04, will be on determining the behaviour of structures exposed to fire by various means—testing, calculation and numerical modelling. Topics to be addressed include the behaviour of materials, systems, and buildings and structures, when exposed to fire.

With the presentation of more than 25 papers, the workshop is expected to stimulate discussion among the experts in attendance and to provide an opportunity for design engineers, regulatory officials and others in the construction industry to interact with these experts.

Time
May 10-11, 2004

Location
National Research Council Canada
Building M-55
1200 Montreal Road
Ottawa, ON K1A 0R6

Organized by
National Research Council Canada

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Web site:
http://irc.nrc-cnrc.gc.ca/frm/SiF2004

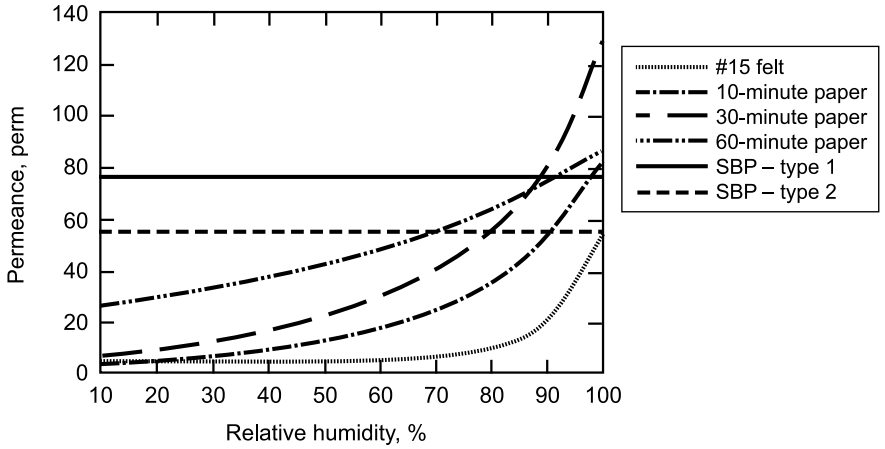
Results of IRC's material properties studies now available

To optimize design for exterior and interior heat, air and moisture movement conditions, building designers need current, accurate information on the fundamental properties of each component of the building envelope. Although some of these properties are readily available for some materials, they are not available for all.

To help remedy this situation, researchers in IRC's Building Envelope and Structure Program have been developing high-precision experimental methods and analytical procedures to reliably determine the heat, air and moisture transfer properties of building materials currently used in North American buildings. These studies were conducted in collaboration with the construction industry, other government departments and organizations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

The result of the studies is a database of over 100 building materials, including several types of bricks and mortars, stucco and other cladding products, building membranes, wood and wood-based materials, concrete and all types of insulating materials. The properties measured and documented include:

- heat capacity;
- thermal conductivity and its dependence on temperature;
- water vapour permeance and its dependence on relative humidity;
- equilibrium moisture content and its dependence on relative humidity;
- water absorption coefficient;
- liquid water diffusivity (a property that determines the rate of diffusion of liquid water in porous materials) and its dependence on water concentration; and
- air permeance and its dependence on pressure differentials.



Measured vapour permeances of various building membranes. (This is typical of the type of information that can be found in the database.)

This information is available from a combination of sources. A research report called "RP-1018: A Thermal and Moisture Property Database for Common Building and Insulating Materials" lists the properties of 39 materials. A second report called "Summary Report from Task 3 of MEWS Project: Hygrothermal Properties of Several Building Materials" lists the properties of a further 40 materials. A third report is nearing completion and will make the properties of 22 more materials available in Spring 2004.

In addition, IRC researchers have produced a PC-based, user-friendly electronic database of the heat, air and moisture transfer properties of common building and insulating materials for use in hygrothermal computer models, such as IRC's *hyg*IRC. This database, IRC Hygrothermal Properties Database, is available on request from IRC for a fee.

For more information about how to obtain these databases and their respective reports, go to http://irc.nrc-cnrc.gc.ca/bes/hygro/dbase.html.

Specific questions can be directed to Dr. Kumar Kumaran at (613) 993-9611, fax (613) 998-6802, or e-mail kumar.kumaran@nrc-cnrc.gc.ca.

Note to readers

IRC has just issued a new publications catalogue incorporating new titles published in recent years. It is available free of charge. Readers wishing to obtain a hard copy may contact Publication Sales, Institute for Research in Construction, National Research Council of Canada, Ottawa, K1A OR6. Telephone 1-800-672-7990. Fax 1-613-952-7673.

Readers will note in this issue of *Construction Innovation* that four new Construction Technology Updates—Nos. 57-60—have been published (see advertisement for Construction Technology Updates inside back cover of this issue). With the publication of these four titles, IRC will no longer be offering subscriptions to this series. Future Updates beyond No. 60 will be published singly.

The COPE project: building a better workstation

Continued from cover page

over temperature and airflow are beneficial to occupants. In whatever way ventilation is delivered, the literature shows that outside airflow rates of lower than 10 l/s/person are associated with reduced occupant satisfaction.

Software tool

As part of the project, researchers developed an online software tool that can assist in evaluating the effects of various choices to help find designs that are truly cost-effective—i.e., designs that are likely to create a satisfactory environment at a reasonable cost.

Users can make various choices concerning the design of workstations and the surrounding office space. They can also input the costs of these choices, indicating first- and life-cycle costs. The software calculates physical effects and can compare them to specified criteria; it also indicates which features of the design might be positive or negative with respect to occupant satisfaction. These calculations are supplemented by abundant text advice.

3. **To be successful, design must be holistic**. The above discussion regarding partition height shows that there are conflicts in some design choices: high partitions are good for speech privacy but bad for daylight access and lighting distribution. Which of these factors is actually most important will vary according to the situation. There is no perfect solution (see photo, p. 1), but full consideration of the most important factors in each workplace can improve the chances of a good compromise. A successful office design should consider all aspects of the environment so that solving one problem doesn't create another.

More information on the COPE project can be found at http://irc.nrc-cnrc.gc.ca/ie/cope/. Specific questions can be directed to Dr. Guy Newsham at (613) 993-9607, fax (613) 954-3733, or e-mail guy.newsham@nrc-cnrc.gc.ca.

Building Science Insight
Seminar Series – 2004

BSI 2004, which will draw on the findings of the COPE project, will address how open-plan office design factors—acoustics, privacy, lighting, ventilation and temperature—affect the workplace environment and occupant satisfaction with this environment. As well, the seminar series will include information on the linkages between workplace satisfaction, job satisfaction and organizational productivity. It will also discuss ergonomics issues relevant to open-plan offices.

If you would like more information about this seminar, please contact Monique Myre at (613) 993-0435, fax (613) 952-7673, or e-mail monique.myre@nrc-cnrc.gc.ca.

Training needs assessment for 2005 objective-based codes now complete

Continued from page 3

nized by the provinces of British Columbia, Alberta, Manitoba, Ontario and Nova Scotia. As well as providing further support for the findings of the survey, participants said that curriculum developers should address the documentation of alternative solutions. They also said that a user's manual should be available for those unable to attend a formal training session.

From the consultant's analysis of the questionnaires and the feedback from the focus groups, it became clear that training to facilitate the transition to objective-based codes should focus on the new concepts (intent, application and functional statements; alternative solutions; and objectives).

The National Steering Committee on Training and Education met November 7, 2003 in Ottawa to review the study's recommendations and to decide on the specifications for the training materials.

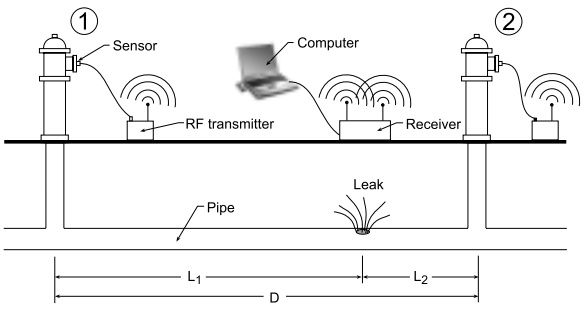
The next step is to issue a request for proposals early in 2004 to develop the training materials. Pilot testing is planned for the fall of 2004. The provinces and territories will "own" the training material and will be responsible for distributing it to colleges and other authorized code training providers.

For more information, please contact Madeline McBride at (613) 993-0045, fax (613) 952-4040, or e-mail madeline.mcbride@nrc-cnrc.gc.ca.

New LeakfinderRT technology: how it works

LeakfinderRT is an NRC-IRC patented technology used to detect and locate leaks in pressurized water pipes. It works by correlating acoustic leak noise sensed at two locations on a pipe—one on either side of a suspected leak.

The system uses vibration or sound sensors equipped with wireless signal transmitters and receivers to pick up leak noise. It then calculates the difference between the arrival times of the leak noise at the two sensors, and uses it with the velocity of leak noise in the pipe and the distance between leak sensors to determine the leak position. The difference between arrival times corresponds to the maximum correlation of leak noise.



Schematic of LeakfinderRT correlation method

In recent testing, the LeakfinderRT system was able to accurately locate leaks as small as 0.5 litres (0.13 gallons) per minute in ductile iron pipes. In addition, it was able to accurately locate very small leaks at low pressures in PVC pipes—a service leak at pressures as low as 139 kPa (20 psi) and leak flow rates as small as 2 litres (0.5 gallons) per minute and a joint leak at 139 kPa (20 psi) pressure and 3 litres (0.8 gallons) per minute flow rate. This performance is unprecedented for a leak noise correlator.

All of the system's activities take place on a PC in a Windows-based environment. LeakfinderRT uses the PC's soundcard and other multimedia components to record and play back leak noise. It also uses the PC's computational resources to calculate the correlation function and leak location.

This PC-based approach eliminates the high cost and difficulty of use traditionally associated with leak noise correlators. More importantly, thanks to its new enhanced correlation function, the system works on plastic pipes and in situations where there may be multiple leaks, sensors placed close together, weak leak noise and high background noise.

Specific questions about this patented technology can be directed to Dr. Osama Hunaidi at (613) 993-9720, fax (613) 952-8102, or e-mail osama.hunaidi@nrc-cnrc.gc.ca. Further information about LeakfinderRT is available at http://irc.nrc-cnrc.gc.ca/leak/leakfinder/.

IRC helps launch new company

NRC-IRC recently signed an exclusive licensing agreement with Echologics Engineering Inc. of Toronto for the ongoing development and commercialization of LeakfinderRT, a new technology developed at IRC. LeakfinderRT is the first truly PC-based system that employs enhanced leak noise correlation techniques to locate leaks in all types of piping materials, including plastic pipes.

IRC has expended considerable effort in field-testing the system in municipal water infrastructure, and end-users have reported excellent accuracy in pinpointing the leak location, which has resulted in reduced costs due to a reduction in unnecessary excavations.

Thanks to the NRC-IRC technology, municipalities of all sizes throughout North America will be able to afford to locate and fix leaks in their water distribution systems that, if left undetected, could eventually result in significant costs to the community. The system can be used for water, oil and natural gas distribution systems.

IRC's leak detection technology: Because of the significant cost reduction made possible by this technology, municipalities of all sizes throughout North America will be able to afford to locate and fix leaks in their water distribution systems that, if left undetected, could eventually result in significant costs to the community.

Echologics Engineering Inc. is a new venture, which was formed specifically to commercialize the LeakfinderRT technology. Additional information about Echologics can be found at www.echologics.com.

Specific questions about the marketing of LeakfinderRT can be directed to Marc Bracken at (416) 249-6124; fax (416) 249-8833, or e-mail marc@echologics.com.

IRC will host world building congress in Toronto

Register online at www.cib2004.ca

If your work depends on staying up to date on the latest trends and technology in the building and construction industry, reserve May 2 to 7, 2004 in your agenda. On those dates, the leading experts on building and construction from industry, education and the research community will meet in Toronto for the CIB World Building Congress 2004.

With its theme "Building for the Future," this action-oriented event will bring together both practitioners and researchers from among CIB's member organizations and beyond to discuss the latest research and advances in the building and construction industry, and to focus on creating solutions to the key issues affecting the sector.

In addition to the main conference, there will be concurrent international conferences on

- ❑ indoor air quality, ventilation and energy conservation, and
- ❑ multi-purpose high-rise towers and tall buildings

adding significantly to the substance of the event.

"CIB 2004 is a unique event, offering three conferences in one to provide a forum for communications among construction practitioners, building managers and researchers on a host of critical building-related issues," says Dr. Sherif Barakat, president of CIB and director general of IRC.

The Congress will provide an excellent forum for the presentation and assessment of new research results on a wide range of timely issues in building construction. Topics will include:

- ❑ the construction process
- ❑ trends in codes and regulatory systems
- ❑ construction in developing countries
- ❑ ventilation requirements
- ❑ strategies and control systems
- ❑ safety considerations in HVAC systems design
- ❑ indoor air quality and energy conservation
- ❑ occupant environment in high-rise buildings
- ❑ fire and structural safety
- ❑ security in tall buildings

Leading professionals from around the world make up the various committees responsible for organizing the Congress, which is expected to draw around 700 participants from 40 countries.

As the countdown to the Congress continues, regular updates will be posted on the Web site at www.cib2004.ca.

How public comment on technical changes to the national model code documents is being handled

Continued from page 2

Those proposed technical changes that cannot be resolved will be discussed and put to a vote (see Step 4 below). Where a provincial or territorial jurisdiction has comments or concerns with a standing committee recommendation, a similar process will take place.

Step 4

The next step is the approval of the new content of the national model code documents by the CCBFC at its meeting scheduled for April 2004. Unresolved comments and negative votes will form the bulk of the discussion, and contentious proposed changes will ultimately be decided on through a voting procedure that requires a two-thirds positive vote. (Those that fail to gain the required positive vote will not be included in the new code.)

Step 5

At the conclusion of the CCBFC April 2004 meeting, the final details of the new technical content of the national model codes will be completed to reflect the decisions made. The new codes are expected to be published in June 2005. Because the national model codes development process is now integrated with the provincial/territorial process, it is anticipated that the provinces and territories will begin to adopt the new codes shortly after they are published.

Specific questions can be directed to 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.

National Research Council Canada
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Conseil national de recherches Canada
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CONSTRUCTION CODES ORDER FORM

DOCUMENT*	PRINTED COPY				CD-ROM FORMAT				
						STAND ALONE	NETWORK PACKS		
	Binder	Specify Quantity	Soft Cover	Specify Quantity	# of Users (concurrent) ⇨	1 user	1-2 users	3-5 users	6-10 users
					Specify Quantity ⇨				
					Select (√) Document(s) ⇩				
National Building Code 1995	*$99*		*$94*			*$179*	*$358*	*$715*	*$1,073*
Practical NBC User's Guides:									
What's New in the National Building Code 1995	n/a**		*$27*			n/a	n/a	n/a	n/a
Fire Protection, Occupant Safety, Accessibility (Part 3)	n/a		*$47*			*$71*	*$142*	*$284*	*$426*
Structural Commentaries (Part 4)	n/a		*$47*			*$71*	*$142*	*$284*	*$426*
Environmental Separation (Part 5)	n/a		*$47*			*$85*	*$170*	*$341*	*$511*
Housing and Small Buildings (Part 9)	n/a		*$47*			*$71*	*$142*	*$284*	*$426*
Application of Part 9 to Existing Buildings	n/a		*$47*			*$85*	*$170*	*$341*	*$511*
Quebec Construction Code – Chapter 1, Building, and National Building Code 1995 (amended)	*$120*		*$110*			*$179*	*$358*	*$715*	*$1,073*
Same as above, with proof of purchase of NBC 1995	*$90*		*$83*			n/a	n/a	n/a	n/a
National Housing Code 1998 and Illustrated Guide	n/a		*$94*			*$179*	*$358*	*$715*	*$1,073*
National Fire Code 1995	*$69*		*$64*			*$125*	*$300*	*$600*	*$900*
What's New in the National Fire Code 1995	n/a		*$22*			n/a	n/a	n/a	n/a
National Plumbing Code 1995	*$59*		*$54*			*$89*	*$178*	*$356*	*$534*
User's Guide on the National Plumbing Code	n/a		*$47*			*$85*	*$170*	*$341*	*$511*
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Upcoming events

2004 JANUARY

11-15

83rd Annual Meeting of the Transportation Research Board. Washington, DC. www.TRB.org/trb/meeting

Building Science Insight
Regard sur la science du bâtiment
http://irc.nrc-cnrc.gc.ca/bsi/2003/index.html

Seminar series – 2003
Séries de séminaires – 2003
(Remaining seminars in French only)

13

Sainte-Foy Hôtel Gouverneur Sainte-Foy
3030, boulevard Laurier
Sainte-Foy, QC G1V 2M5

15

Montreal Holiday Inn Montreal-Midtown
420 Sherbrooke Street W.
Montreal, QC H3A 1B4

FEBRUARY

24-25

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

MARCH

7-10

Earth and Space 2004. 9th Aerospace Division International Conference on Engineering Construction and Operations in Challenging Environments. Houston, TX. http://www.asce.org/conferences/space04/

21-24

International Symposium: Advances in Concrete through Science & Engineering. Evanston, IL. http://acbm.northwestern.edu/symposium.html

21-24

No-Dig Show 2004
North American Society for Trenchless Technology (NASTT). New Orleans. http://www.nastt.org/nodig.html

APRIL

4-5

Canadian Commission on Building and Fire Codes Meeting. Victoria. Contact: John Archer at (613) 993-5569; e-mail john.archer@nrc-cnrc.gc.ca

MAY

2-7

CIB World Building Congress 2004. Toronto. www.cib2004.ca

7-8

CIB W78 Workshop – IT in Construction: "Integrated Systems to Support Sustainability." Toronto. www.civ.utoronto.ca/i2c/

22-26

Structures 2004. Nashville, TN. http://www.asce.org/conferences/structures2004/

JUNE

2-5

Canadian Society for Civil Engineering National Conference (including many speciality conferences). Saskatoon. http://www.csce2004.ca/en/index.htm

13-17

AWWA Annual Conference & Exposition 2004. Orlando, FL. http://www.awwa.org/ace/

JULY

4-7

13th International Brick/Block Masonry Conference. Amsterdam. www.13-IBMaC.bwk.tue.nl

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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