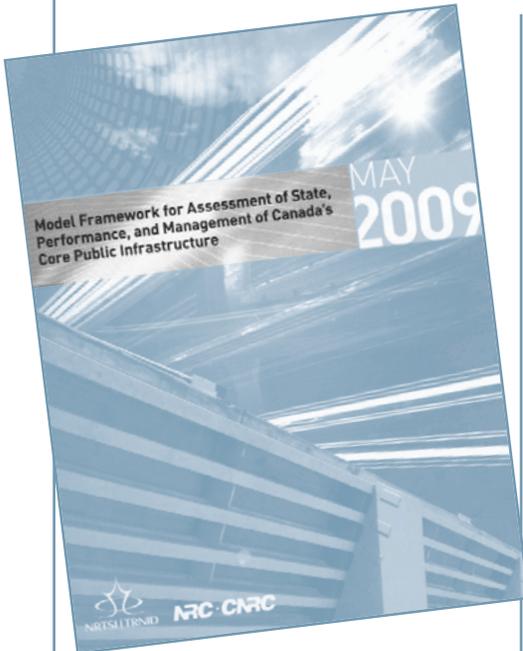


construction innovation

A model framework for assessing Canada's core public infrastructure



Development of a model framework is the first step towards creating a unified approach and decision support tool for assessing the performance and management of core public infrastructure.

Canada's bridges, roads, transit, water supply and wastewater systems enable personal mobility, transport of people and goods, provision of safe drinking water and protection of health and environment. They provide basic and core services that are critical to Canada's economy and quality of life. These core public

infrastructure (CPI) systems are affected by aging and deterioration, increased demand, demographic changes, climate change and maintenance practices, which can have an impact on their condition and long-term performance. Deficiencies in the condition of CPI can have serious consequences on public safety, health, mobility, the environment, and the economy.

A reliable assessment tool for the performance of Canada's core public infrastructure is critical to the development of cost-effective management plans to minimize their risk of failure and to maximize their contributions to the sustainability of communities. Significant knowledge gaps and needs in performance assessment of CPI have been identified through extensive background work and NRC's Workshop on Life Cycle Performance and Management of CPI in July 2008.

A model framework was developed by committees created, supported and directed by the National Research Council, Infrastructure Canada and Engineers Canada through the National Round Table on Sustainable Infrastructure. Representatives from different CPI sectors, levels of government, geographic regions, consultants, associations and academics from various technical disciplines have

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worked collaboratively and constructively to address CPI gaps and needs.

The resulting model framework can be used nationwide by all orders of government (federal, provincial or territorial, municipal, and First Nations) to assess the state and performance of Canada's core public infrastructure and to support an objective-based approach for its management. It enables assessment of the performance of both transportation infrastructure (roads, bridges and public transit) and health/environment infrastructure (potable water production and distribution, and wastewater collection).

The model framework can be used to assess the performance with regard to seven key objectives – public safety, public health, public security, mobility, environmental quality, social equity and the economy – using the appropriate assessment criteria and performance indicators.

It is harmonised with the so-called "Triple Bottom Line"

Continued on page 8

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Construction codes

Addressing energy efficiency in the national model codes

The Canadian Commission on Building and Fire Codes (CCBFC), following consultations with the provinces and territories, has decided that energy efficiency will be considered as a new objective in the National Construction Codes and has agreed on the approach it will follow in developing requirements.

A new edition of the National Energy Code for Buildings (NECB) will be published in 2011 (see *Construction Innovation* June 2009). One of the main steps is to develop an energy efficiency objective, as energy efficiency does not fit within the four current objectives of the Codes (accessibility, safety, health, fire and structural protection of buildings). This is being done using a protocol adopted by the CCBFC last spring to enable the addition of new objectives to the Codes (see box). The objective will form the basis for energy efficiency requirements in both buildings and houses.

The energy efficiency objective will be developed by a joint task group established by the CCBFC and the Provincial/Territorial Policy Advisory Committee on Codes (PTPACC). The task group is considering the results of a bottom-up analysis of the 1997 Model National Energy Code for Buildings and working to finalize the proposed new sub-objectives and functional statements. Meanwhile, a CCBFC standing committee is moving forward on developing proposed changes for the NECB. Consultations on the new objective and its functional statements, as well as the proposed changes, will take place during the fall 2010 public review.

Protocol developed to add new objectives to Codes

Until recently, it was not possible for the CCBFC to address requests to add energy efficiency and water use efficiency to the National Construction Codes, as these topics did not fit within the four existing approved objectives of the Codes (safety, health, accessibility, fire and structural protection of buildings). An objective-based code states what the Code is meant to achieve by clarifying the objective and intent behind its requirements, thus being more accommodating to innovation. As a result, requirements that are not related to an approved objective could not be included in the Code. An approach was therefore required to allow for new objectives to be properly considered and added.

As a result, last spring, the CCBFC developed a six-step protocol that outlines what needs to be done in order to consider and establish a new objective, so that the result is responsive to provincial/territorial needs and transparent to all stakeholders. These include: consulting with the provinces and territories on new requests, developing the objective, and submitting it to full public review. The protocol is now being used to develop an energy efficiency objective that will form the basis for energy efficiency requirements for both houses and buildings.

The task group is considering the results of a bottom-up analysis of the 1997 Model National Energy Code for Buildings and working to finalize the proposed new sub-objectives and functional statements.

As for the Model National Energy Codes for Houses, its fate was determined after consulting with PTPACC. A new edition will not be published, as the CCBFC has agreed that provisions dealing with energy efficiency for housing will be incorporated into a separate section of Part 9 of the 2010 National Building Code of Canada (NBC) and will be published in 2012. A joint task group between the Standing Committees on Energy Efficiency in Buildings and Housing and Small Buildings has been created to develop the technical requirements that should be available for public review in the fall of 2011.

A joint task group between the Standing Committees on Energy Efficiency in Buildings and Housing and Small Buildings has been created to develop the technical requirements that should be available for public review in the fall of 2011.

Finally, the CCBFC also made a decision on the scope of the NECB at its September 2009 meeting, as it was slightly different from how the NBC is organized. To ensure that the two documents are exactly aligned, requirements relating to small, non-residential buildings will be excluded from the NECB 2011 and instead incorporated into Part 9 of the NBC, along with those related to housing.

For more information on this project, please contact Cathy Taraschuk at 613-993-0049 or cathleen.taraschuk@nrc-cnrc.gc.ca.

Fire safety for buildings constructed in close proximity to one another

Numerous significant fires involving multiple buildings over the past five years in Edmonton and Calgary have resulted in the development of new requirements for the 2010 National Building and Fire Codes of Canada. These requirements will address fire safety of buildings constructed in close proximity to each other. The earlier fires prompted the City of Calgary to undertake a study of construction materials typically found in exposed building faces and led to the adoption of interim changes to the 2006 Alberta Building and Fire Codes. This also led to the submission of code change requests to the Canadian Commission on Building and Fire Codes (CCBFC) for revisions to the National Construction Codes.

The CCBFC responded by setting up a joint task group of the Standing Committees on Housing and Small Buildings, and Fire Protection

in fall 2006 (see *Construction Innovation* June 2007). The task group's mandate was to evaluate the current requirements in the 2005 Codes with respect to the new code change requests and develop proposed technical changes, if needed. Proposed changes were submitted for public review in the fall of 2008 and officially approved by the CCBFC in September 2009, after the public comments were addressed.

The new requirements for the 2010 Codes, as well as guidance provided on options for meeting them, will make it easier for other Canadian jurisdictions to deal with the issue of conflagration.

The new provisions impose additional fire protection requirements for the construction of all buildings and houses that are in close proximity to one another or to the property line. For instance, limiting distances (i.e., spatial separations) may need to be increased depending on fire department response times, percentages of unprotected openings in the exposing building face, or construction type. Both exposed soffits and building faces may also require additional protection. The changes may have an impact on all facets of construction, including how close buildings and/or homes are constructed to each other, the nature of exterior construction materials used, and lot sizes in subdivisions.

Working together, Alberta and the CCBFC have moved quickly to address this matter of wide concern. The new requirements for the 2010 Codes, as well as guidance provided on options for meeting them, will make it easier for other Canadian jurisdictions to deal with the issue of conflagration.

For more information, please contact Philip Rizcallah at 613-993-4064 or philip.rizcallah@nrc-cnrc.gc.ca.

Code requirements for large farm buildings to be updated

At its September meeting, the Canadian Commission on Building and Fire Codes (CCBFC) agreed to move on a major priority: updating Code requirements for farm buildings. This decision was based on safety concerns as well as technical deficiencies in the current edition of the National Farm Building Code of Canada, given that it references the 1995 rather than the 2005 National Building Code of Canada.

The CCBFC has agreed, with advice from the Provincial/Territorial Policy Advisory Committee on Codes, to first work on updating the requirements for large farm buildings with a view to incorporating these updates into the 2015 National Building and National Fire Codes of Canada. The new requirements will be objective-based to match the format of these documents. For small farm buildings, further consultation is required to ascertain how they should be handled in the national model codes.

For more information or to provide input, please contact Philip Rizcallah at 613-993-4064 or philip.rizcallah@nrc-cnrc.gc.ca.

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Construction codes

Commission needs new members

Volunteers are being sought to serve on the Canadian Commission on Building and Fire Codes (CCBFC), a senior committee responsible for the development of Canada's National Model Construction Codes. The terms for its current members will expire in August 2010. A pool of candidates is needed to represent all regions of Canada and all sectors of the construction industry that use, or benefit from, the Codes. Although there is no remuneration, NRC does reimburse expenses incurred in

attending meetings. Appointments are for a five-year term.

The CCBFC is responsible for developing and approving the content of the National Model Construction Codes. In consultation with the provinces and territories, it is also responsible for setting code development policy direction and overseeing the development process to ensure it is open, transparent and consensus-based. The CCBFC oversees the work of nine standing committees whose members apply

their experience in various technical areas to develop and improve the Codes, thereby helping to protect the health and safety of Canadians. It is estimated that the workload associated with CCBFC responsibilities represents five to ten days in a given year for most members.

CCBFC members are expected to be broadly knowledgeable on Code-related matters and able to exercise broad objective judgments. They are selected for their individual expertise and experience with the Codes – not as delegates from a particular interest group. Information about the Commission's work, and that of its standing committees, is available at www.nationalcodes.ca.

If you are interested in becoming a member and participating in important national code development work, please send an expression of interest, before February 26, 2010, to the Secretary of the CCBFC using the online form at www.nationalcodes.ca.

New CCBFC Chair selected for next code development cycle

In anticipation of the new code development cycle that starts in fall 2010, Chris Fillingham was appointed Vice-Chair of the CCBFC effective September 1st, 2009. He will take over the reins one year later, replacing the current Chair, Bruce Clemmensen, who will retire as Chair on August 31st, 2010.

Mr. Fillingham has a 30-year association with Toronto's Stantec Architecture Limited. He has been involved with the Codes since 1977, first as a Standing Committee member and then as a CCBFC member. He possesses extensive experience in managing and directing multi-disciplinary consultant teams for complex, institutional projects. He is a past President of the Ontario Association of Architects as well as the Royal Architectural Institute of Canada, and is Chairman of the Board for Pro-Demnity Insurance Company.

New product evaluations from NRC-CCMC

Company	Product Name	CCMC #	Description
Imasco Minerals Inc.	Imasco Corefactor – Basic Drainage Adhesive 4 / Imasco Corefactor – Cavity Drainage Adhesive 2	13334-R	Exterior Insulation and Finish Systems (EIFS) Class PB
HW Foam Fab	HW Foam Type 1	13393-L	Extruded Expanded Polystyrene Insulation Board
IECS	Cellulose Insulation	13396-L	Cellulose Fibre Insulation (CFI) for Buildings
Igloo Cellulose Inc.	Igloo Stabilized Wall System	13407-L	Cellulose Fibre Insulation (CFI) for Buildings
Southern Cross Technologies, Inc.	GreenEBoard™	13417-R	Magnesium Oxychloride Cement Boards
Novik inc.	Revêtement extérieur	13420-R	Polypropylene Siding
Guardian Building Products	EZ Attic Insulation	13440-L	Loose-Fill Mineral-Fibre Insulation
HW Foam Fab	HW Foam Type II	13457-L	Extruded Expanded Polystyrene Insulation Board
BASF Canada Inc.	Walltite ECO™ – Air Barrier System	13467-R	Air Barrier Systems for Exterior Walls of Low-Rise Buildings
Raven Industries, Inc.	Fortress Pro	13468-R	Sheathing, Membrane, Breather-Type

For further information on the performance, usage and limitations of these products, as well as for other reports and listings by NRC-CCMC, see the Web Registry of Product Evaluations located at www.nrc-cnrc.gc.ca/eng/services/irc/ccmc/registry-product-evaluations.html.

Wind uplift design for commercial roofing systems evaluated by NRC-CCMC

Commercial roof claddings on large structures need to be engineered to meet wind uplift requirements. Their design involves three major steps: load calculation, resistance evaluation and design correlation.

Recently, the NRC Institute for Research in Construction, through the SIGDERS consortium (Special Interest Group for the Dynamic Evaluation of Roofing Systems), and in collaboration with the Roofing Contractors Association of British Columbia and RCI Foundation, made wind load calculations easier for engineers.

Load calculations are performed in accordance with provincial building code wind standards. In most cases, these requirements are based on the National Building Code (NBC) of Canada. However, since each building and each location is unique, so is each roof configuration. Consequently, the NBC provides specifications to account for these variations. Recently, the NRC Institute for Research in Construction, through the SIGDERS consortium (Special Interest Group for the Dynamic Evaluation of Roofing Systems), and in collaboration with the Roofing Contractors Association of British Columbia and RCI Foundation, made wind load calculations easier for engineers. They now offer a simple, web-based calculator (see *Construction Innovation* December 2008). Based



Commercial roof cladding failure as a result of high winds

on the 2005 NBC, this Wind-Roof Calculator (Wind-RCI) is available free at: www.nrc-cnrc.gc.ca/eng/projects/irc/calculator.html.

To determine if a commercial roofing system will meet the NBC wind load requirements, the NRC Canadian Construction Materials Centre (NRC-CCMC) is often asked to conduct an evaluation. For roofing materials that fall under a referenced standard, they prepare an evaluation listing based on the evaluation of results of tests specified in the referenced standard. For roofing systems that do not fall under a standard referenced in the NBC [e.g., thermoplastic polyolefin (TPO)], they conduct a code analysis and develop a technical guide with test requirements that the client needs to meet. These requirements include a test of dynamic wind load as per the requirements of CSA A123.21-04 (Standard Test

Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems). NRC-CCMC then evaluates test results and if the roofing system performance meets the requirements, it publishes an evaluation report. Test results are specified in this report, along with the system tested and the wind load resistance level attained.

Design correlation is the task of a qualified professional who certifies that wind load resistance of the tested system is higher than the calculated wind uplift load. In using the report, verification must be made that the wind load resistance meets NBC requirements. The report is unique to that particular roof assembly and its tested configuration (such as fastener type, spacing and membrane thickness) cannot be applied to roof configurations that differ from the tested system.

Indoor environment

International experts gather in Ottawa for knowledge exchange on acoustics and noise control

Over 1000 international experts on acoustics and noise control engineering visited Ottawa in August to participate in INTER-NOISE 2009, the 38th International Congress and Exposition on Noise Control Engineering. Sponsored by the International Institute of Noise Control Engineering, the congress was organized by a team led by NRC Institute for Research in Construction (NRC-IRC) researchers on behalf of the Canadian Acoustical Association and the Institute of Noise Control Engineering of the United States. The congress theme, *Innovations in Practical Noise Control*, stressed the importance of innovative thinking to achieve practical, cost-effective results.

The congress technical program featured distinguished plenary and keynote lectures on topics including: health effects of noise disturbance, road and traffic noise, modeling of sound transmission, wind turbine noise, and building acoustics. Of particular note was a plenary lecture by Dr. J. David Quirt (NRC, Canada) summarizing the current state of the art for controlling sound transmission between spaces in buildings. The lecture revealed gaps that must be addressed if tangible improvements to practice and regulations are to be made. Another distinguished lecture, by Dr. Jin Yong Jeon (Hanyang University, Korea), highlighted the importance of understanding impact sound sources and ratings (for noises such as footsteps from the floor above) for building occupant satisfaction.

More than 625 invited and contributed technical papers were presented over three days. The single



Concurrent with INTER-NOISE 2009 was the Second Forum of the International Council of the Academies of Engineering and Technological Sciences (CAETS) on Worldwide Noise Sources. The Forum focused on sources of noise, in particular the technologies available for the reduction of product noise.

largest topic receiving attention was sound in buildings, including: sound transmission, speech privacy, classroom acoustics, noise sources and ratings, acoustics of green buildings, and acoustical characterization of building materials. One of the largest sessions dealt with lightweight constructions (such as wood-framed). This highlighted the need to define better and more satisfactory construction

details, particularly for the control of low frequency noise from foot falls. The technical program also included significant contributions on transportation noise (including aircraft), community and environmental noise (including health effects of noise exposure), acoustical measurements and characterization of materials.

Over 50 companies and agencies took part in the exposition where they presented their measurement equipment and software, testing and consulting services, and products

and facilities. NRC-IRC also participated, distributing a CD-ROM containing publications and free software along with general and technical information related to its activities.

Concurrent with INTER-NOISE 2009 was the Second Forum of the International Council of the Academies of Engineering and Technological Sciences (CAETS) on Worldwide Noise Sources. The forum focused on sources of noise, in particular the technologies available for the reduction of product noise. CAETS is planning on using the outcome of this forum for support in developing recommendations for low-noise products and their worldwide promotion.

Further information on the INTER-NOISE 2009 Congress and related activities is available at www.internoise2009.com or by contacting Dr. Trevor Nightingale at trevor.nightingale@nrc-cnrc.gc.ca or Dr. Bradford Gover at brad.gover@nrc-cnrc.gc.ca.

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

Energy Efficiency in Buildings – New Tools and Technologies

Building Science Insight is a national seminar series presented annually by the National Research Council of Canada Institute for Research in Construction (NRC-IRC) to provide construction professionals with practical information. Each seminar focuses on technical advances in building science on a specific topic and includes the results of NRC-IRC research. This year's seminar will address the efficient use of energy in buildings through five presentations on recent research and one on issues related to energy codes.

The following topics will be addressed:

Overview of the National and Provincial Energy Codes for Buildings

This presentation will provide an overview of the development of the Model National Energy Code for Buildings 1997 and its evolution to the updated provisions planned for the National Energy Code for Buildings 2011. It will also discuss the current and future status of energy regulations for buildings in the provinces and territories and their association with the National Energy Code for Buildings 2011.

Dimmable Lighting: Energy Savings and Occupant Satisfaction

Dimming ballasts with appropriate controls can reduce lighting energy consumption as much as 50%. Personal dimming controls can produce additional energy savings of about 10%, while also improving occupant satisfaction and productivity. NRC-IRC researchers will review their research findings in this field and predict future trends.

Energy Rating of Insulated Wall Assemblies

The Wall Energy Rating (WER) is a tool for energy rating of wall assemblies, comparable to the window Energy Rating found in CSA Standard A-440.2, which may eventually be referenced in similar national and international standards. This presentation will provide background on the development of the Wall Energy Rating, and present the results of a recent NRC-IRC research project that determined the WER of walls constructed with various thermal insulation materials according to common construction practices.

Making Buildings Responsive to Peak Energy Demand

Meeting peak electrical demand is costly, but failure to do so leads to blackouts. Building operators can help by dimming lights and changing thermostat set points and ventilation rates during peak periods. This presentation looks at the extent to which energy demand can be reduced without significantly affecting the indoor environment.

High-Performance Thermal Insulation in Building Envelopes

Although still virtually unknown in Canada, vacuum insulation panels (VIPs) have thermal resistance values up to 10 times those of conventional insulation materials. This presentation will outline NRC-IRC studies on the performance and construction of VIPs, explain how they work, and demonstrate the challenges and advantages of using them in building construction.

Energy-Efficient Roofs

Properly designed roofs can play a significant role in efforts to achieve energy efficiency and sustainability in construction. This presentation will review and clarify misunderstandings surrounding sustainable, green, reflective and high-performance roofs; present some recent research on the performance of these roofs; address environmental, durability and life-cycle issues; discuss design and construction; and encourage the use of new technologies.

This one-day seminar will be held in the following locations:

- Fredericton, Jan. 12, 2010*
- Ottawa, Jan. 15, 2010*

French Seminars

- Quebec, Feb. 9, 2010
- Montreal, Feb. 11, 2010*

* With simultaneous translation

Completed Seminars

- Vancouver Oct. 6, 2009
- Whitehorse, Oct. 8, 2009
- Winnipeg, Oct. 20, 2009
- Edmonton, Oct. 22, 2009
- Iqaluit, Nov. 10, 2009
- Regina, Nov. 16, 2009
- Calgary, Nov. 18, 2009
- Yellowknife, Nov. 20, 2009
- St. John's, Dec. 1, 2009
- Halifax, Dec. 3, 2009
- Toronto, Dec. 9, 2009

The registration for the seminar is \$349 plus tax, \$75 for students. Discounts are available for 10 or more people from the same organization. Please visit the website at bsi.gc.ca for more details and registration information.

Speakers: The roster of speakers includes NRC-IRC building science specialists Hakim Elmahdy, Guy Newsham, Phalguni Mukhopadhyaya, Benjamin Birt, Aziz Laouadi, Mike Swinton, Ralph Paroli and Morad Atif as well as technical advisors from the Canadian Codes Centre including Cathleen Taraschuk, Mihailo Mihailovic, Elisabeth Girgis and Heather Knudsen. Provincial representatives responsible for energy regulations will also be invited to address energy code issues.

Past Seminars now on the Web

NRC-IRC is pleased to announce that Webcasts of our three most recent BSI seminars, BSI 2008/09 on **Single and Multi-Family Houses**, BSI 2007/08 on **Fire Safety Research for Better Building Design**, and BSI 2006/07 on **Sustainable Infrastructure** are now available. These consist of complete audio and visual records of each presentation, allowing anyone anywhere, at any time, to stay current with developments in construction research in these areas.

Versions of these seminars are now available at www.nrc-cnrc.gc.ca/eng/ibp/irc/bsi/seminar-publications.html.

The price of each online seminar is \$125.



Urban infrastructure

NRC-CSIR supports future Infrastructure Data Repository

The NRC Centre for Sustainable Infrastructure Research (NRC-CSIR) in Regina is launching an initiative to develop an integrated management tool and protocol in support of the building of a national data repository for municipal infrastructure assets.

Municipal infrastructure decision-making requires the integration of data from multiple, distributed, and mostly disparate data sources. Efficient representation, integration, management, and sharing of these complex data sets can only be practically achieved through the use of comprehensive and integrated databases. As challenges for managing municipal infrastructure assets are mounting, the need to develop tools to support efficient data management and decision-making is widely recognized.

Researchers at NRC-CSIR are developing a test-bed for a web-enabled, national, Infrastructure Data Repository (IDR) that will focus primarily on municipal water, sewer and transportation networks. This initiative aims to improve the availability, quality and sharing of infrastructure data within and across organizational boundaries, spanning different levels of government.

The IDR will employ a set of integrated geospatial data models that have been under development and validation for three years in collaboration with the City of Regina. Developed using Geography Markup Language (GML), these models will define a comprehensive set of attributes for the standardization of municipal infrastructure representation, exchange, and reporting.

In its initial phase, the IDR will integrate asset inventory and condition data from a number of municipalities. The condition data will be extracted from municipal databases, mapped and entered into the IDR and verified to ensure data integrity, consistency and security.

In a later phase, tools to support asset valuation, the standardization of performance evaluation and benchmarking, the determination of funding needs and priorities, and optimized renewal and decision-making processes will be developed. This work will be carried out in the context of improving existing commercial asset management software applications and of building on the knowledge previously developed in NRC's Core Public Infrastructure (CPI) initiative.

It is fully anticipated that the IDR and related tools will help Canadian municipalities promote sustainable infrastructure practices by encouraging the use of consistent data collection and reporting protocols.

Municipal infrastructure stakeholders and commercial asset management software application providers interested in participating in this project can contact Dr. Mahmoud Halfawy at 306-780-5396 or mahmoud.halfawy@nrc-cnrc.gc.ca.

A model framework for assessing Canada's core public infrastructure

Continued from cover

evaluation approach, in which the performance of CPI is assessed with regard to the three pillars of sustainability: society, environment and economy. It can be used as a support tool for decision-making at the detailed project level, tactical level and senior strategic level, and permits the assessment of progress towards achieving sustainable communities.

To address the identified knowledge deficit and to complement the framework, a research and development program has been proposed to improve the performance assessment and management of CPI. In the first stage of this proposed R&D program, the National Research Council, Infrastructure Canada, Statistics Canada, with the support of AECOM and a National Advisory Committee, have developed a national survey to create an inventory and to assess the condition of Canada's CPI systems.

A pilot survey will soon be tested on a sample of municipalities, provinces/territories, and federal entities. The results of the survey project will improve our knowledge and understanding of Canada's CPI at national, provincial and regional/metropolitan levels, as well as assist asset owners and managers in their planning and investment decisions.

More information on the model framework can be found at: www.nrc-cnrc.gc.ca/eng/projects/irc/public-infrastructure.html and www.nrc-cnrc.gc.ca/obj/irc/doc/pubs/nrcc51410.pdf.

For specific questions or interest in participating in the R&D program, contact Dr. Zoubir Lounis at 613-993-5412 or e-mail zoubir.lounis@nrc-cnrc.gc.ca.

Sustainable urban infrastructure research in Canada

Sustainable infrastructure is defined as “the design, construction, planning and maintenance of infrastructure that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Through dynamic and rapidly growing technology cluster initiatives with universities and industry, the National Research Council advances world-class R&D in collaboration within Canadian communities.

Since 2004, the National Research Council Centre for Sustainable Infrastructure Research (NRC-CSIR) in Regina has been bringing municipalities and firms in Saskatchewan together with researchers to develop innovative technologies and decision support tools to address the need for sustainable municipal infrastructure (see *Construction Innovation* December 2006). NRC has long-established partnerships with the University of Regina, the City of Regina, Western Economic Diversification Canada and the Province of Saskatchewan to develop the technology cluster and has collaborations and project partnerships with a wide range of other stakeholders and organizations.

Several Saskatchewan municipalities have been identified as Living Laboratories – communities where new technology and products can be tested, validated and demonstrated. The City of Regina is one such living laboratory, and now other cities and small towns

throughout the province have joined in to form a municipal innovation network. Other communities in Canada and around the world will benefit by adopting the innovations that have been developed or tested and verified in these living labs.

The primary focus of NRC-CSIR has been on the development and management of sustainable water and wastewater infrastructure. There are several projects in different stages of advancement that will help Canadian municipalities sustainably repair and build infrastructure. These include: a wireless sensor network (see *Construction Innovation* December 2008) to provide real-time sewer flow monitoring and water main leak sensing; finding solutions that will help extend the life of asbestos cement water mains; sustainable storm water management tools in a changing climate; on-line water quality monitoring; and a pilot drinking water distribution system for testing pipe material, water quality interactions and other technologies to make water supplies safe and secure.

As part of an on-going, multi-disciplinary project led by NRC on integrated management of municipal infrastructure assets, a new collaborative opportunity has been identified – developing communication protocols and a test-bed for a web-enabled Canada-wide, Infrastructure Data Repository (see page 8 in this issue).

The centre has worked with the community to create non-profit cluster organizations and alliances including Communities of Tomorrow, a Water Innovation Alliance, a Transportation Alliance and a group of western Canadian cities and firms addressing needs and possible solutions in sustainable urban drainage systems. These organizations and pre-competitive technology groups bring researchers, firms and others together to identify niche areas for collaborative projects.

For more information on NRC-CSIR, contact Dr. David Hubble (306) 780-3332 or david.hubble@nrc-cnrc.gc.ca or visit www.nrc-cnrc.gc.ca/eng/clusters/regina.html.

Free Construction Technology Updates now exclusively online

Construction Technology Updates are a regular series of publications reporting the results of NRC-IRC research in clear, easy-to-understand language. These publications explain a specific issue, provide background information to put the issue into context, present the results of research, and discuss their applications and implications.

The 72 titles published to date cover a wide spectrum of topics in all types of construction. Code considerations are addressed where applicable.

Readers are advised that the series is now available exclusively on the NRC-IRC website at: www.nrc-cnrc.gc.ca/eng/ibp/irc/ctus/ctus-index.html.





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National Fire Code 2005	\$140		\$130		\$250**		\$1,000		\$1,500
National Plumbing Code 2005	\$120		\$110		\$180**		\$720		\$1,080
Practical 2005 NBC User's Guides: Structural Commentaries (Part 4)	n/a***		\$94		\$94		\$380		\$560
User's Guide – NBC 2005, Application and Intent Statements	n/a***		n/a***		\$150		\$600		\$900
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new Quebec Construction Code, Chapter I – Building, and National Building Code 2005 (amended)	\$240		n/a***		\$240		\$960		\$1,440
new Quebec Construction Code, Chapter III – Plumbing, and National Plumbing Code 2005 (amended)	\$144		n/a***		\$144		\$576		\$864
National Farm Building Code 1995	n/a***		\$34		\$51		\$204		\$306
new Alberta Building Code 2006 on CD	n/a***		n/a***		\$240		\$960		\$1,440
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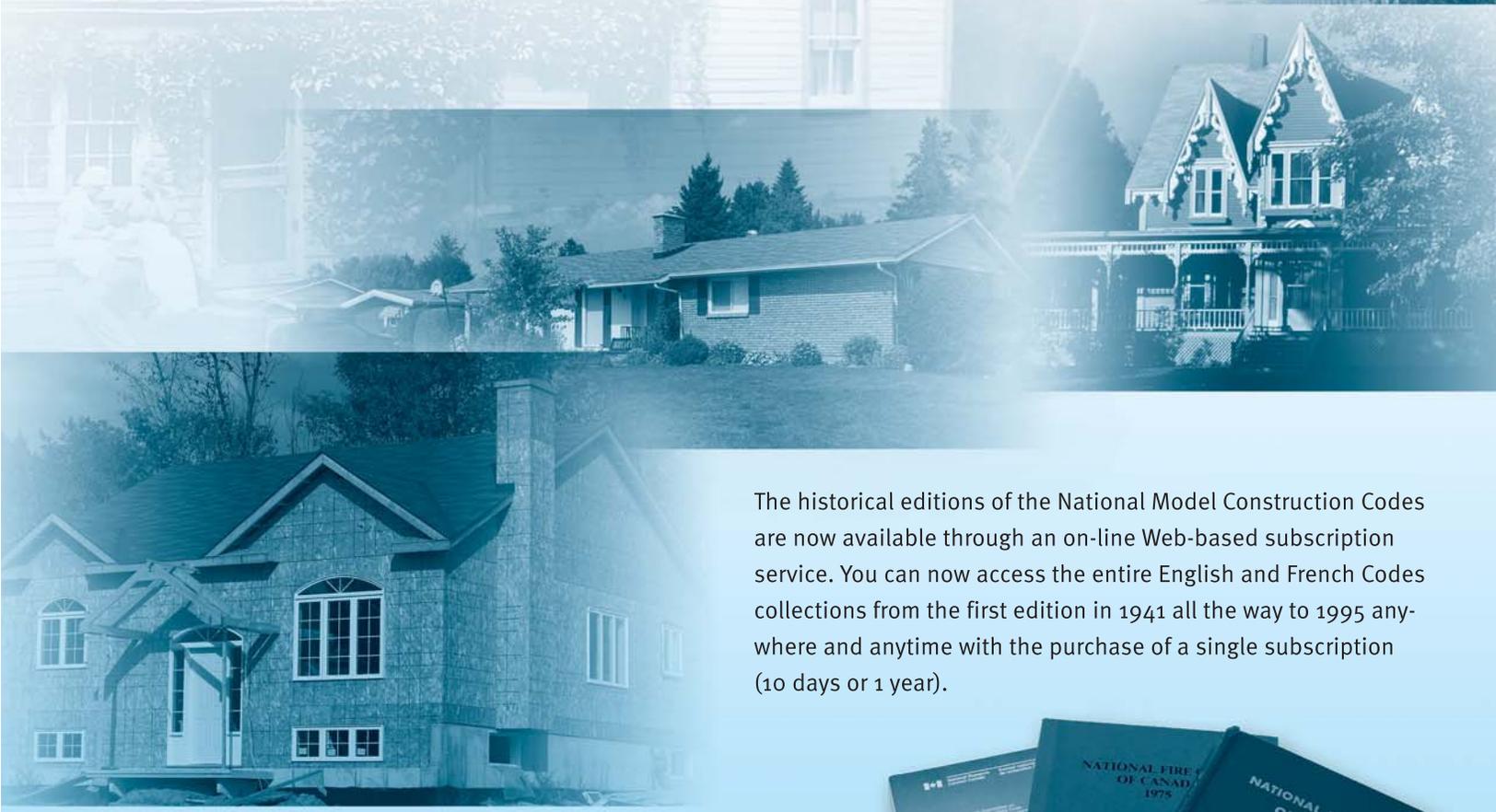
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Upcoming events

2010 JANUARY

12

Linkages 2010, a Municipal Infrastructure Innovation and Business Forum, Saskatoon, Saskatchewan. <http://www.seima.sk.ca/>

APRIL

21-22

Buildex Vancouver, the BC Construction Show / HomeBuilder & Renovator Expo, Vancouver, B.C. You are invited to visit booth for more information about our research expertise. <http://www.buildexvancouver.com/>

MAY

5-7

First International Conference on Nanotechnology in Cement and Concrete, Irvine, California, USA. http://www.trb.org/news/blurb_detail.asp?id=9750

10-13

CIB World Building Congress, Salford, U.K. <http://www.cib2010.org/>

19-20

eSim 2010, Winnipeg, Manitoba www.esim.ca

JUNE

1-2

European Facility Management Conference, Madrid, Spain. <http://www.eurofm.org/news.php?id=94>

7-9

6th International Conference on Concrete under Severe Conditions, Environment & Loading, Mérida, Yucatán, Mexico. June 7-9, 2010. <http://www.consec10.com/index.php>

16-18

International Conference on Performance-Based Codes and Fire Safety Design Methods, Lund University, Sweden. <http://www.sfpe.org/Education/8thInternationalConferenceonPerformanceBasedCodesandFireSafetyDesignMethods.aspx>

28-30

Second International Conference on Sustainable Construction Materials and Technologies, Ancona, Italy. <http://www.uwm.edu/Dept/CBU/ancona.html>

JULY

5-7

Interflam 2010, 12th International Conference on Fire Science & Engineering, Nottingham, England. <http://www.intercomm.dial.pipex.com/html/events/interflam10cfp.htm>

25-29

9th United States National and 10th Canadian Conference on Earthquake Engineering: Reaching Beyond Borders, Toronto, ON. <http://2010eqconf.org>

SEPTEMBER

13-15

1st Central European Symposium on Building Physics, Cracow, Poland. <http://www.cesbp2010.p.lodz.pl/>

22-24

2nd Historic Mortars Conference, Prague, Czech Republic. <http://www.itam.cas.cz/HMC2010>

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