NEWBuildS NEWS BULLETIN #4: SPRING 2012

NEWBuildS Activities:

The 2nd Annual NEWBuildS Annual Workshop, May 2nd & 3rd, 2012

- Dr. Y. H. Chui, Scientific Director & Ms. Lynn Embury-Williams, Chair of BoD, hosted the 2nd NEWBuildS Annual Workshop at Radisson Hotel Vancouver Airport, Richmond, BC. It was attended by about 80 participants from partner universities, FPInnovations, and government agencies and 40 industry representatives including architects, engineers, building designers, structural engineers, builders and wood products manufacturers.
- Keynote Address of "SYSTEMIC CHANGE" is by Michael Green of Michael Green Architecture Inc. He is the architect and author of "Case for Tall Wood Buildings" which featured a case study for wood buildings with heights up to 20 storyes in BC.
- Representatives from FPInnovations presented its related Research Program and the Construction Value Pathways.
- This was a 2-day event and consisted of 6 Sessions with 26 presentations from researchers from 12 Canadian universities. Session topics included Structural Performance of CLT Building Systems, Structural & Serviceability Performance of Wood and Hybrid Building Systems, Fire performance, Sustainability and Durability. Projects address a range of key building system related issues such as structural performance, fire resistance, vibration serviceability, durability and energy efficiency.
- There was a special Session on NSERC CRD Program projects with topics of Forest Products Stochastic Modeling Group and Exterior and Interior Components for Green Buildings
- The 26 presentations are available at http://newbuildscanada.ca/members/researchers/ "May 2 & 3, 2012 – 2nd NEWBuildS Annual Workshop & Presentations, Vancouver, B.C.
- NEWBuildS hosted a Reception for network researchers to facilitate networking between fellow researchers and to introduce the new Theme II Leader, Professor S. Stiemer.

NEWBuildS Student Training Workshop – May 4th, 2012

- The Training Workshop was hosted by Departments of Civil Engineering & Statistics, University of British Columbia at FPInnovations office, Vancouver. The presenters were Prof. Ricardo Foschi, Prof. Ruben Zamar and Prof. Jim Zidek with 5 sessions. Prof. Zidek was the organizer of this Workshop.
- NEWBuildS was honored that Prof. Ricardo Foschi, a renowned expert on Reliability Analysis, who presented "Motivation: Coping with Uncertainty"; brief introduction on why statistics and probability were important for applied scientists
- Prof. Zamar's presentation was on fractional factorial designs while Prof. Zidek's presentation was on modeling stochastic systems. Prof Foschi wrapped up the Training Workshop with a convincing presentation on reliability-based design. The presentations are available at the NEWBuildS web site.
- There were about 30 attendees at this Workshop with a discussion between HQPs and presenters at the end of the formal session. A tour of the FPInnovations labs was given after the event.

CWC/NRC/FPInnovations/NEWBuildS Mid-rise Building Project Student Workshop – February 3rd, 2012

- As reported in Fall 2011 Newsletter, CWC initiated a project, known as 'Wood and Wood-hybrid Mid-rise Buildings' with the intent to develop technical information that will lead to a review of the storey limits for combustible construction in the National Building Code of Canada. This is a project jointly undertaken by Construction Portfolio of NRC and FPInnovations. CWC, FPInnovations and NRC expressed a desire to collaborate with NEWBuildS researchers and to ensure there is synergy between NEWBuildS program and the Mid-rise project.
- This Workshop took place on February 3rd, 2012. Twelve graduate students were invited to present their research to the Mid-rise project team with a focus on 3 main topics; structural, fire and durability.

NEWBuildS Outreach Committee formed

- NEWBuildS has established an Outreach Committee , a sub-committee of BoD and its function is to
  - Develop a strategy to implement Network and other relevant research results;
  - Advise on possible applications of research results and dissemination of research results;
  - Advise BoD on Intellectual Property, arising from Network research.
- Committee members are Ms. Griffin/CWC (Chair), Mr. Harmsworth/GHL, Mr. Newfield/RJC, Dr. Atif/NRC, Mr. Karacabeyli & 4 FPInnovations Theme Leaders, Dr. Chui/UNB and NLM.

Update: NEWBuildS Theme Leaders

NEWBuildS announced the appointment of new Theme Leaders as follows;

- University Theme II Leader: **Professor Siegfried F. Stiemer, UBC**
  Dr. Stiemer is a senior professor at Department of Civil Engineering, UBC and a well known researcher in steel structures, but has also worked on wood structural systems.
- FPInnovations Theme III Leader: **Mr. Christian Dagenais, MSc**
  Mr. Dagenais was previously employed with CECOBOIS with over 10 years of design and research experience in fire and structural behaviour of wood structural systems.

NEWBuildS Project Enhancement Fund Competition

Project Enhancement Fund awards are intended to support activities to enhance the quality of NEWBuildS research project with a maximum amount of $6,000 for each request. NEWBuildS approved 5 awards for the 2012 competition. The proposals were reviewed by an Evaluation Panel and the recommendation was approval by SSC and BoD. A report is required on completion of activities funded by this special fund.

Interaction with external stakeholders by Management Team:

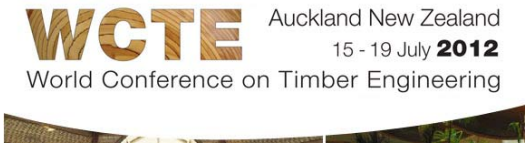
- **Forest Innovation By Research and Education (FIBRE) (http://reseauxfibrenetworks.ca/)** was officially launched in Oct 2011. It is consisted of 7 forestry related networks and 1 Network of Centre Excellence (NCE) with strong support from NRCan and FPInnovations.
- FIBRE is consisted of over 120 universities professors from 27 universities. There will be over 300 students trained. FPInnovations will have 110 staff scientists involved with the network.
- FIBRE's application to NSERC under Strategic Network Enhancement Initiative (SNEI) was approved in April 2012. The goal of this award is to build on the Network's existing training program and support enriched training opportunities, to enhance the knowledge/technology transfer activities with existing partners and reach out to new partners; and to further the goal of NSERC's international strategy.
- There will be 2 industrial workshops in Edmonton and Quebec City in 2012 and a Joint FIBRE Conference – Scheduled for May 14-16, 2013 in Montreal with international speakers.

Graduated Researchers with NEWBuildS Funding:

Dr. Yue Chen	Ph.D. Timber Engineering and Applied Mechanics; Department of wood science	University of British Columbia	PROJECT T1–6–C1: Structural performance of box based cross laminated timber system used in floor applications
Mr. Michael Kruszelnicki	Master of Engineering; Department of Civil Engineering	Carleton University	PROJECT T3–2–C9: Rationalization of Life Safety - Code Requirements for Mid-Rise Buildings
Mr. Robert Lepage	Master of Applied Science; Department of Civil and Environmental Engineering	University of Waterloo	PROJECT T4–5–C10: Moisture Response of Wall Assemblies of Cross-Laminated Timber Construction in Cold Canadian Climates

Future Network and related events:

- NEWBuildS Theme Meetings – TBD
- World Conference on Timber Engineering (WCTE) 2012 will be held in Auckland, New Zealand on July 15 -19, 2012.
  NEWBuildS HQPs will present papers at WCTE 2012
  http://www.conference.co.nz/wcte2012



Featured Project:

PROJECT: T3–2–C9: Rationalization of Life Safety - Code Requirements for Mid-Rise Buildings"

Lead Investigator: **Dr. George Hadjisophocleous, Carleton University**
Dr. Ehab Zalok, Carleton University

HQP: **Mr. Michael Kruszelnicki, M.Eng**

FPInnovations Co-Investigator(s): **Dr. Steve Craft** (2010-2011)

This thesis project was part of NEWBuildS project T3-2-C9 and examined the rationale for the various requirements of the National Building Code of Canada that are applicable to combustible construction. Specifically, the requirements of Subsection 3.2.2 were reviewed in order to establish if a rationale for the various limitations could be ascertained.

A thorough review of Subsection 3.2.2 yielded findings that showed that combustible construction is subject to much more stringent requirements than those that are applicable to non-combustible construction. Specifically, these restrictions include height limitations, area limitations, requirements for sprinkler protection, requirements for fire resistant rated assemblies, and requirements for specific occupancy classifications and the exclusion of certain occupancy classifications.

The importance of Fire Resistance Ratings

One key finding related to that of fire resistance ratings. The 1980 and 1985 National Building Codes commentaries and associated document acknowledged that fire resistance ratings were of significant importance in considering the structural capabilities of a structure and recognized that massive members would maintain their structural stability in a fire compared to a member of inferior dimensions (regardless of their combustible properties of these members).

Additionally, the Function Statements of the 2005 National Building Code of Canada provide further support for the importance of fire resistance ratings. When comparing these Function Statements against the various requirements, it was clearly shown that although combustibility is a factor affecting fire spread, combustibility is not considered as a factor affecting structural integrity. This conclusion flies in the face of the existing limitations of our current codes in that a large number of structural limitations are imposed on combustible construction despite the findings that it is truly an issue of fire resistance capabilities and not a measure of "combustibility". This is an important finding as it shows that specifying a requirement for non-combustible construction may be exceeding the actual intent of the code itself.

External Influences

Historically, it can be seen that the codes were (and still are) subject to a number of external influences that provide some degree of exertion upon the requirements found therein. The findings showed that a number of the building code requirements were initially set in an arbitrary (albeit educated) manner. It was shown that a number of building code limitations, including building height limitations, were based on the comfort level of those establishing the codes at that time as well as on the capabilities of firefighting efforts at the time..

Mathematical Relationships

The indirect analysis demonstrated the mathematical support for the height and area relationship as an equation which is consistent across nearly every occupancy of NBCC 3.2:

Max Area = $(A_B/N) * C * FRR * Sup$

Where:

A_B is the baseline area value permitted for that type of Occupancy
N = Number of storeys
C is a non-combustibility factor
FRR is the fire resistance rating in hours
Sup is a suppression factor where
Sup=1 if no sprinklers and access to 1 street
Sup=1.25 if no sprinklers and access to 2 street
Sup=1.5 if no sprinklers and access to 3 street
Sup=3 if the building is sprinklered

Figure 1 - Equation relating height and area

Although this provides a sense of cohesiveness for the applicable requirements, it was highlighted that this fails to provide a rationale for why those requirements are what they are. However, one key conclusion from this exercise showed that if we are willing to accept the current limitations as-is, then we should be willing to accept changes to the building code that, based on the demonstrated mathematical relationship, would allow for combustible structures to exceed the current dimensional limitations currently imposed by the building code.

Recommendations:

A number of recommendations were presented showing how changes to the current limitations for combustible construction can be made while respecting the rationale for those requirements. These recommendations included:

- Modification to the building codes to establish requirements based on the factor of fire resistance rating rather than on the factor of combustibility.
- Modification to the building codes to classify buildings as being constructed of protected assemblies vs. non-protected assemblies.
- Modification to the building codes to classify construction types of structural members as light-gauge vs. heavy-gauge construction to reflect the calculated performance of various materials based on their dimensions.
- Follow the height and area relationship equation to establish an alternative solution which would allow for justifying the use of combustible construction in buildings higher than those currently permitted.
- Establishing performance based criteria based on various forms of quantitative and computer-based risk models.
- Establishing a holistic approach to fire protection where the design methodology more closely resembles the structural design approach of Part 4 of the NBCC rather than the prescriptive approach of Part 3.

This project showed that despite the current code limitations that are imposed upon combustible construction, it is possible to provide a logical approach to dealing with combustible construction while respecting the overall rationale intended by the National Building Code of Canada and that there is room to develop the codes into an even more open and science-based approach than ever before.