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Top News

Team Expansion: Three new PIs join the CWCRN team

Project Updates: Recent developments in CWCRN research

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Upcoming Events: 2nd NextGen Conference in Ottawa (May 27–28, 2025) and Timber Connections Workshop on May 29, 2025 – Details inside

A Note from the NSERC Project Coordinator

Dear Wood Construction Community,

As we step into the third year of the NSERC-Alliance Grant "Next-Generation Wood Construction," I am excited to share updates on our progress. As some projects launched in 2022 conclude, we celebrate their successful outcomes and contributions to advancing mass timber construction.

With new funding from Natural Resources Canada, we've added six new projects and welcomed three new professors to our interdisciplinary team, which now includes 34 faculty members from 14 Canadian universities, along with 20 government and industry partners who form the Canadian Wood Construction Research Network (CWCRN).

Together, we remain focused on addressing key challenges in structural safety, fire safety, energy efficiency, durability, and sustainability, while advancing design standards, promoting sustainable technologies, and highlighting the socio-economic and environmental benefits of wood buildings.

Thank you for your continued support, and please stay connected through [our website](#) and [our LinkedIn page](#) as we shape the future of wood construction together.

Warm regards,

Dr. Ying Hei Chui



Welcoming New Experts to the Team



Dr. Hossein Daneshvar – University of Alberta

Dr. Daneshvar's research focuses on hybrid mass timber systems, enhancing carbon storage in structural elements and improving lateral load-resisting systems in tall timber structures.

Dr. Felix Wiesner – University of British Columbia

Dr. Wiesner is an expert in fire safety engineering, specializing in the fire performance of timber buildings and large-scale compartment fire tests to evaluate fire dynamics and structural resilience.



Dr. Vinny Gupta – University of Waterloo

Dr. Gupta brings extensive experience in fire dynamics and lithium-ion battery safety. His research includes flame spread prediction and fire propagation mechanisms, with several prestigious grants and awards to his credit.

We are excited to have them on board and look forward to their contributions to our interdisciplinary efforts!

HQP Spotlight- Houman Ganjali

Position:

Ph.D. Candidate, School of Engineering, University of Northern British Columbia (UNBC), Prince George, BC

Academic Background and Motivation:

Houman holds a master's degree in Structural Engineering from the Science and Research Branch, University of Tehran, where he specialized in the structural performance of steel and concrete buildings. Driven by a desire to promote sustainable building practices, he came to Canada to pursue research in timber structures, joining Dr. Thomas Tannert's team at the Wood Innovation Research Lab, UNBC.

Current Research Focus:

Houman's research centers on advancing design standards for point-supported CLT (cross-laminated timber) floors, a growing system in Canadian construction. Under Dr. Tannert's guidance and with support from Fast+Epp, Houman is conducting a comprehensive series of experimental tests on CLT's punching shear resistance at the material, connection, and component levels. The goal is to develop standardized provisions for CLT punching shear resistance, addressing the current gap in North American standards.

Research Highlights and Impact:

Houman has completed over 1,025 tests, contributing to a new analytical model for CLT punching shear resistance, which will be presented to the CSA O86 technical committee for potential adoption. His work has been recognized at seven international conferences, reflecting its significance to the timber construction industry.

Future Directions:

Houman envisions continuing his research journey, with plans to explore CLT long-term behavior, advanced modeling approaches, reinforcement strategies, and methods for **preventing disproportionate collapse**.

Awards and Recognition:

- UNBC Doctoral Tuition Award (2021-2026)
- 1st Place, Best Graduate Student Poster, UNBC Faculty of Science and Engineering Poster Competition (2024)



Project Updates

Project T1-1-C: Performance of MT flat-plate systems under out-of-plane loading

*Houman Ganjali and Dr. Thomas Tannert
University of Northern British Columbia*

Research Overview:

The crosswise layup in Cross-laminated Timber (CLT) provides two-way resistance, which makes CLT a suitable choice for point-supported applications. In such applications, CLT punching shear resistance is one of the key properties and is directly related to the rolling shear strength of the lamellas. In this project, the factors relevant to CLT punching shear resistance are studied at material, connection, and component level.

Progress Update:

A total of 164 punching shear tests on panels sized 1.7×1.8 m, 1.5×1.8 m, and 1.5×1.5 m, see the exemplary photo below, were conducted at the Fast+Epp Concept lab in Vancouver and the UNBC Wood Innovation Research Lab in Prince George. The impacts of column location; CLT provider, lamella species and grade; and support geometry were evaluated.

The results showed that the support location and size affect the shear stress distribution. Therefore, adjustments factors have been introduced to account for the increased rolling shear strength. Further, adopting an appropriate shear stress distribution model is crucial for punching shear design of CLT. A comparison between the results from the shear analogy and transformed composite section methods was presented at the 2024 INTER meeting, together with a modified design proposal for CLT point-supports [1].



Next steps:

Full-scale point supported floors will be tested to investigate the structural performance of point supported floors and validate the proposed design approach. In parallel, CLT rolling shear creep is being evaluated in the last experimental phase of the project.

[1] Ganjali H, Tannert T, Shabnewaz Md, Dickof C, Popovski M (2024) Punching-Shear Resistance of Point-Supported CLT Panels. *International Network on Timber Engineering Research (INTER)*, Paper 57-12-1, August 25-29, Padua, Italy

Project Updates

Project T1-3-B: Performance-Based Design of Wood-Based Systems

Christopher Leong and Dr. Cristiano Loss
University of British Columbia

Research Overview:

Sub-project T1-3-B aims to develop performance-based seismic design procedures for wood-based systems, focusing on CLT and CLT-steel composite shear walls. The goal is to create industry guidelines for future editions of the National Building Code of Canada, supporting sustainable, seismically resilient wood buildings.

Progress Update:

Data Collection & Analysis:

- Preliminary linear response spectrum analysis (RSA) for 6-, 12- and 18-storey all mass timber buildings were conducted for archetype buildings in Vancouver and Montreal
- Python-based building archetype program is being developed to design and model archetype mass timber buildings up to 18-storeys with balloon-type CLT shear walls in OpenSeesPy. Parameters such as number of bays, bay size, interstorey height, and loads will be variable
- Finite-element analysis (FEA) of CLT-steel composite wall was conducted, and a python-based program is being developed to model more configurations

Key Findings (if applicable):

FEA shows a 31% stiffness increase for CLT-steel composite walls over standard CLT shear walls.

Next steps:

Extend the program for ground motion selection, non-linear analysis, and post-processing.

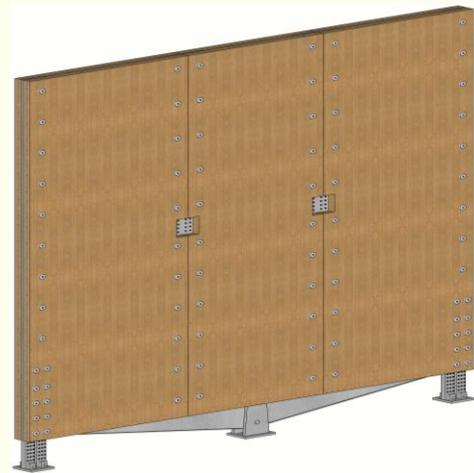


Fig. 2: render of CLT-steel composite wall prototype under development

Fig. 1: Presentation at Fast+Epp office¹



Additional Notes (if any):

Preliminary results presented at the Council on Tall Buildings and Urban Habitat (CTBUH) Tall Wood Buildings event in Vancouver, and to be shared at the 2025 International Association of Bridge and Structural Engineering (IABSE) Symposium in Tokyo.

Project Updates

Projects T2-1-A and T2-1-C: Fire Performance Evaluation of CLT Panels

Kathryn Chin, Ethan Phillion and Dr. John Gales
York University

Research Overview:

Last year, our team achieved significant milestones, including a publication in the IABSE journal of Structural Engineering International on small-scale modeling of solid wood materials in fire, and a conference proceeding introducing intermediate-scale fire testing of solid wood samples in collaboration with University of Waterloo. We calibrated models using glulam members and identified research gaps. Building on these successes, we have initiated small and intermediate-scale fire tests on Cross Laminated Timber (CLT) panels to evaluate their thermal and structural fire performance. Data generated from these tests is crucial for enhancing our modeling efforts using LS DYNA and other finite element software.

Progress Update:

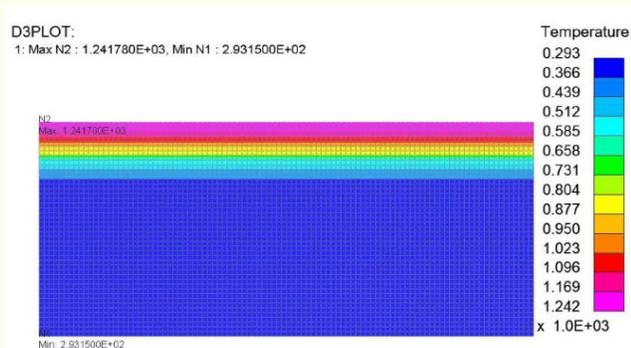
Data Collection & Analysis:

- We are currently conducting comprehensive fire tests on CLT panels to assess various thermal and structural behaviors. Initial findings indicate promising results in fire resistance.

Fig. 1: CLT samples



Fig. 2: LS DYNA Modelling



Next Steps:

Concurrently, we are developing calibration tests on instrumentation with the support of graduate student Anne Davidson. Additionally, a study on Laminated Veneer Lumber (LVL) in fire is underway, with intermediate-scale testing expected to conclude this spring. We plan to proceed with model development and validation for these materials based on collected data.

Additional Notes (if any):

- Following Dr. Gales' workshop on "Important Factors in Growing Canadian Wood Engineering Education," a paper titled "The current state of gender-based diversity within the field of Canadian professional structural timber engineering" has been accepted in the Canadian Journal of Civil Engineering. This paper offers valuable insights for grant proposals focusing on Equity, Diversity, and Inclusion (EDI) considerations in future timber research.
- Team members visited Arup London to explore Code-Red large-scale timber compartments, gaining insights into international priorities for new wood construction design and implementation. They also delivered methodology presentations and early-stage Laminated Veneer Lumber in fire modeling at the CONFAB conference in the UK.
- For more updates, please visit yorkufire.com and follow [Dr. Gales' LinkedIn profile](#).

Project Updates

Project T3-2-D: Energy-efficient ventilation design for healthy indoor environment in wood buildings

*Dr. Shujie Yan and Eslam Fathelbab and Dr. Liangzhu (Leon) Wang
Concordia University*

Research Overview:

Engineering mitigation effectively removes contaminants from indoor environments. Since the COVID-19 pandemic, efforts to improve indoor engineering controls have significantly increased. However, the energy performance of various strategies has received rare attention. This study evaluates different ventilation strategies for their impact on contaminant removal and energy savings by dynamically coupling CONTAM and EnergyPlus simulations. The building models were developed for the Future Building Laboratory (FBL), a wood-structured facility designed to advance intelligent building operations. This study also focuses on developing calibration methodologies for CONTAM models based on the Ensemble Kalman Filter and Genetic Algorithms to improve the accuracy of ventilation and contamination mitigation strategies in indoor environments. This research calibrates CONTAM models using experimental data gathered from the FBL.

Progress Update:

- ***Data Collection & Analysis:***

For the data collection and analysis, measurements were taken from six rooms within the FBL, forming the basis for the CONTAM simulation model. A sampling method was employed to optimize the simulation process and reduce the number of simulations required. Following this, a parametric simulation was conducted, accompanied by a sensitivity analysis to evaluate the impact of individual parameters on the model outcomes. Two calibration approaches were then implemented: the Ensemble Kalman Filter and the Genetic Algorithm, both used to refine the model and achieve more accurate calibration. Meanwhile, the CONTAM-EnergyPlus co-simulation program was established for the FBL building, utilizing the procedures introduced by the National Institute of Standards and Technology (NIST). Six test chambers inside the first floor were modeled in the program.

- ***Publication (Ongoing Manuscripts):***

Evaluating per-person ventilation rates in Canadian primary schools

Indoor ventilation conditions were interpreted from a stochastic CO₂ grey-box model using Bayesian inference. Classroom field measurements and students' absenteeism data were used to verify the model's capability on ventilation rate predictions. The verified model was further applied to evaluate the whole-year Canadian classroom ventilation conditions.

Multizone aerosol transport evaluation in DOE prototype buildings

In this study, the CONTAM-quanta approach was applied to major prototype buildings developed by the U.S. Department of Energy (DOE), and the corresponding modeling database was established. The modeled buildings cover the most common types of commercial constructions, which include offices (Small/Medium/Large), hotels (Small/Large), retail (Stand-Alone retail/ Strip mall), schools (Primary/Secondary), and apartments (Mid-rise/High-rise). The modeling results were summarised, and Bayesian inference was applied to infer the equivalent clean air delivery rate required for different types of buildings.

Another manuscript presents a methodology for calibrating multizone airflow models, specifically CONTAM, using experimental data collected from six rooms within the FBL. The study incorporates a

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sampling strategy to minimize the number of simulations required, followed by parametric simulations and sensitivity analysis to assess the influence of key parameters. The calibration process employs two distinct approaches, the Ensemble Kalman Filter and the Genetic Algorithm, to achieve more accurate and reliable models for predicting indoor ventilation and contaminant distribution.

Next Steps:

- Compare the results of the CONTAM-EnergyPlus co-simulation program with field measurements.
- Verify the prediction capabilities on occupancy by interpreting the CO₂ Grey-Box model using Bayesian inference.
- Evaluation of different mitigation strategies using the calibrated simulation models.
- Finalize the ongoing manuscripts

Additional Notes (if any):

Dr. Shujie Yan will join as a Postdoc Fellow at the Thrive Research Centre at Queensland Univ. of Technology, Australia, led by Distinguished Professor Lidia Morawska. The aim of the centre is to design and engineer building systems whose elements work together to reduce airborne infection transmission by improving indoor air quality while maintaining comfort and efficiency.

Dr. Leon Wang became an IBPSA Fellow (International Building Performance Simulation Association) and an ASHRAE Fellow (American Society of Heating, Refrigerating & Air-Conditioning Engineers).

Project Updates

Project T4-2-A: Development of a novel acoustic design methodology for wood construction by integrating LCA

Mohamad Bader Eddin, Sylvain Ménard
University of Québec at Chicoutimi, Canada

Research Overview:

The aim of this research is to develop an acoustic design methodology utilizing artificial neural networks (ANN) approach by integrating life cycle analysis (LCA) and thermal insulation analysis. Lab-based sound insulation measurements are employed to develop the ANN model, which relates to CLT and ribbed CLT-based assemblies.

Progress Update:

• *Data Collection & Analysis:*

In this research, 112 lab-based sound insulation measurements are used to develop an artificial neural networks model. 48 pertain to airborne sound insulation and 64 to impact insulation measurements. The tests were conducted on 45 CLT ribbed and CLT-based floor assemblies (see Figure 1) across one-third octave bands (50–5000 Hz). OpenLCA software is utilized to conduct a life cycle assessment on the studied assemblies, examining six impact categories: climate change (long term), freshwater acidification and eutrophication, ionizing radiation, ozone layer depletion, and particulate matter formation. Total thermal resistance, heat storage capacity, and heat loss are calculated for each floor assembly to determine their thermal insulation performance using the Ubakus online calculator. The acoustic model demonstrates satisfactory results with 1 dB differences in the prediction of airborne and impact sound indices (R_w and $L_{n,w}$). LCA categories and thermal insulation performance are plotted against the acoustic performance of floors. Within each acoustic performance tier, LCA results can be optimized for a floor assembly by selecting appropriate materials. However, a strong positive correlation is found between total thermal resistance and heat loss against acoustic performance. Designers should be cognizant of the trade-offs between acoustic, thermal insulation, and environmental performance when choosing assemblies with favourable environmental impacts relative to acoustic and thermal insulation ratios.

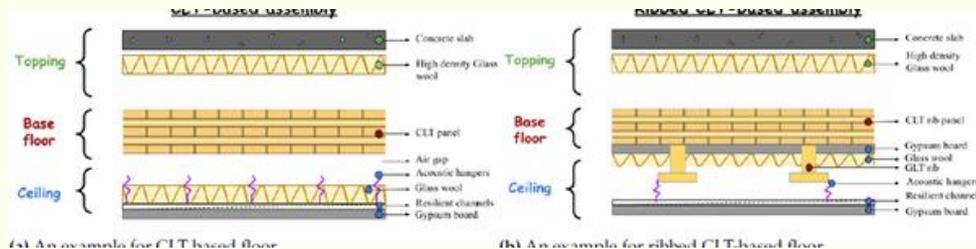


Figure 1: Unscaled schematic illustrating the organization of the acoustic data for each assembly

Next steps:

An optimization study considering acoustic, thermal insulation and LCA would provide valuable insights for designers and aid in decision-making during the design phase.

Project Updates

Project T3-1-B: Hygrothermal Modeling of Mass Timber Structures under Rain Leakage Loads

*Himanshu Sharma and Dr. Hua Ge
Concordia University*

Research Overview:

Mass timber buildings have gained attention in recent years due to their energy efficiency and ability to manage overheating risks comparably to concrete structures. However, mass timber buildings are more prone to moisture-related issues, which makes hygrothermal modeling essential for evaluating and mitigating potential moisture damages. This project focuses on modeling the hygrothermal performance of Cross-Laminated Timber (CLT) wall assemblies under rainwater leakage conditions to assess the mold growth risk. Using Delphin 6.1, 1D and 2D hygrothermal simulations are carried out to evaluate the impact of rainwater infiltration on various CLT wall and floor connections across different Canadian climates, providing insights into moisture resilience and durability for mass timber structures under both current and future climates.

Progress Update:

Delphin was used to create 1-D and 2-D hygrothermal models for a CLT wall. This wall is one of the CLT wall assemblies tested by FP Innovations in Vancouver [1]. Hygrothermal parameters including temperature, relative humidity, and moisture content, were measured from April 2021 to November 2022. In this experiment, water was intentionally injected into the wall assembly (July 2021, December 2021, and August 2022) to simulate rain leakage. The measured data were used to validate Delphin models. Fig. 1 shows the test wall configuration and sensor locations.

In this work, a north-facing CLT wall assembly was first modeled in Delphin to simulate the heat and moisture transfer at mid-level height without water injection, followed by simulations modeling the bottom area of the wall, where wetting pads were placed on both the exterior and interior sides of the CLT to simulate rain leakage. The validation process involved adjusting CLT material properties in the simulation to align with observed experimental results. It was found that key parameters influencing moisture content at both the exterior and interior surfaces of the CLT were the moisture storage function and liquid diffusivity. Initial simulation results showed that the liquid diffusivity is the most significant influencing factor on the moisture content simulated during the water injection periods.

Key Findings:

- The Delphin model can predict the hygrothermal performance of CLT walls with accuracy within 1% in moisture content (MC) for both 1-D and 2-D simulations over the period without water injection.
- Over the period with water injection, Delphin models predicted the moisture content with a mean absolute error (MAE) of 3.2% in 1D and a MAE of 3.5% in 2D models.
- Delphin model was tested with different liquid diffusivity coefficients (shown in equation (1): 3.8, 2.6, and 2.2) to investigate their impact on moisture content predictions. Fig. 2 shows the comparison between 1D simulation results and the measurements in MC at the exterior side of CLT.

$$D_{ws} = 3.8 \cdot \left(\frac{A}{W_f}\right)^2 1000 \left(\frac{W}{W_f} - 1\right) \quad (1)$$

D_{ws} = Liquid Diffusivity for suction, m^2/s , A_w = Absorption Coefficient, $kg/m^2 \cdot s^{0.5}$,
 W_f = Free water saturation, kg/m^3 , W = Unsaturated water content, kg/m^3

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- A coefficient of 3.8 overpredicted moisture content over the water injection periods;
- A coefficient of 2.2 underpredicted moisture content over the water injection periods;
- The coefficient of 2.6 has the best match with measured data, achieving a MAE of about 3% in moisture content over the water injection periods for both interior and exterior CLT.
- Temperature and relative humidity obtained from simulations have good agreements with field measurements, with a MAE of 0.7°C for temperature and 4.5% in RH at mid-level height where no water is injected.

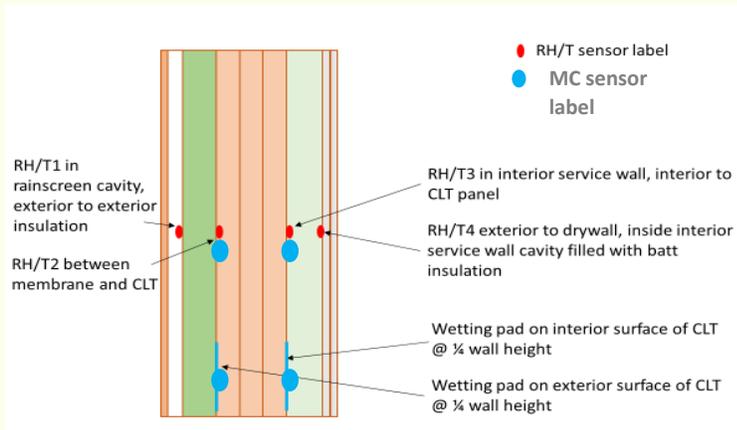
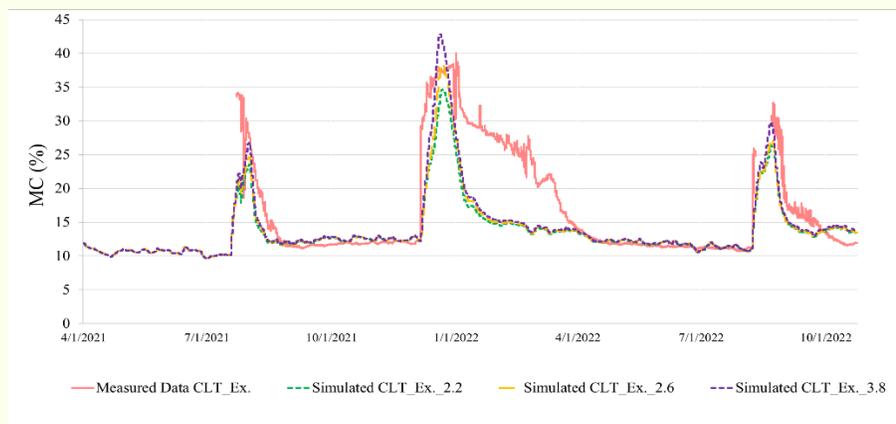


Figure 1 Sensor locations for RH, T and MC in wall assembly [1]

Note: MC sensors were installed at 6mm into the CLT wall from both exterior and interior side.

Figure 2 Comparison between simulated and measured moisture content at the exterior surface of the CLT considering different liquid diffusivity coefficients.



Next Steps:

Following validation, the model will be used to investigate the hygrothermal performance of typical 2D junctions such as wall-floor connections and other critical junctions at grade and parapet levels under rain penetration loads across various Canadian climates under both current and projected future climates. This research aims to enhance the resilience and durability of mass timber structures by providing valuable insights on properly carrying out hygrothermal modeling and supporting the development of effective moisture control strategies to mitigate moisture-related risks under rapidly changing climatic conditions.

References:

1. J. Y. Wang, *Testing r22+ mass timber walls for hygrothermal performance in the Vancouver climate - final performance report, 2023. FP Innovations.*

Outreach Activities

Past Events

HQP Seminar Series

For the latter half of this year, the **Highly Qualified Personnel (HQP) Seminar Series** continued to provide a platform for insightful discussions, featuring expert speakers on diverse topics in sustainable construction, energy efficiency, and research funding.

HQP Seminar X: *Energy Audit of Exterior Building Envelopes Using Infrared Thermography*

Speaker: Dr. Phalguni Mukhopadhyaya, University of Victoria

[View Presentation](#)

HQP Seminar XI: *Building Relationships with Indigenous Organizations and Governments*

Speaker: Sarah Frey, Na-Cho Nyäk Dun Development Corporation

[View Presentation](#)

HQP Seminar XII: *Future Stocks and Flows of Wood in Canadian Construction*

Speaker: Bidhan Bhuson Roy, University of British Columbia

[View Presentation](#)

HQP Seminar XIII: *Addressing Grand Challenges in Life Cycle Assessment Through AI*

Speaker: Dr. Qingshi Tu, University of British Columbia

[View Presentation](#)

HQP Seminar XIV: *Design of Connections for Mass Timber Structures*

Speaker: Dr. Alexander Salenikovich, Laval University

[View Presentation](#)

HQP Seminar XV: *Building a Fundable Narrative: Essential Insights for Grant Success*

Speaker: Ms. Jelena Sapkovskaja, Alberta Innovates

[View Presentation](#)

Thank you for your engagement and we look forward to your continued support in future events!

Upcoming Events

Continuing HQP Seminars & Theme-Specific Workshops

Along with continuing the HQP Seminar Series, we are excited to announce that **theme-specific workshops** will be held again early next year as part of the **NextGen Wood Workshop Series 2025**. These workshops will feature technical presentations by HQPs, which will be reviewed by expert panels, industry collaborators, and Principal Investigators (PIs).

- **Theme 1 Workshop:** Wednesday, February 12th, 2025, 10:00 a.m.–2:00 p.m. MT
- **Theme 2 Workshop:** Tuesday, February 18th, 2025, 10:00 a.m.–2:00 p.m. MT
- **Theme 3 Workshop:** Tuesday, February 25th, 2025, 10:00 a.m.–2:00 p.m. MT
- **Theme 4 Workshop:** Tuesday, March 11th, 2025, 10:00 a.m.–2:00 p.m. MT

These virtual, half-day workshops are designed to showcase HQPs' research progress and foster valuable feedback and discussions. Detailed agendas and Zoom links will be shared closer to the dates. For updates on the HQP Seminar Series, workshops, and other events, please follow us on [LinkedIn](#) or visit [our website](#).

Annual Conference and Workshop 2025

Following the well-received first conference in Edmonton, the **2nd NextGen Wood Conference** will be held in Ottawa on **May 26–27, 2025**. The conference will include presentations and discussions on ongoing work in Alliance Grant projects, with attendees including PIs, collaborators, and HQPs.

Special Workshop on Timber Connections

Date: May 28, 2025

This workshop will address recent developments in timber connections, a key aspect of wood construction.

Useful links:

Hotel Booking Link: [Hilton Garden Inn](#)

Conference Registration Link: [NextGen Wood Conference 2025](#)

Google Calendar Link: [Add to Calendar](#)



Richmond Olympic Oval, Richmond, BC (Source: Wikipedia)

Thank you for reading!

As we reflect on the ongoing progress of the **Canadian Wood Construction Research Network (CWCRN)**, we are inspired by the commitment and collaboration of our partners, researchers, and students. Together, we are advancing innovation in sustainable wood construction, driving impactful research, and fostering meaningful connections within the industry and academia.

We encourage you to stay engaged with CWCRN through our events, workshops, and seminars. Your contributions and active participation are integral to our shared success.

For updates, resources, and event details, stay connected:

- LinkedIn: [Follow us on LinkedIn](#)
- Website: [Visit our Website](#)
- Email: Contact us at cwcrn@ualberta.ca or reach out directly to our Program Manager at tshamsi@ualberta.ca.

Thank you for being a part of this journey. Let's continue building a stronger, more sustainable future with wood.

Warm regards,

The CWCRN Team