

JULY 2021

# Housing Research & Education Project Highlights



**BC HOUSING**

**RESEARCH CENTRE**



BC Housing's Research Centre works in collaboration with housing sector partners to foster excellence in residential construction and find innovative solutions for affordable housing in British Columbia. Sharing leading-edge research, advances in building science, and new technologies encourages best practice. The Research Centre identifies and bridges research gaps to address homelessness, housing affordability, social housing challenges and the needs of distinct populations. Mobilizing knowledge and research expertise helps improve the quality of housing and leads to innovation and adoption of new construction techniques, Building Code changes, and enhanced education and training programs.

Visit the Research Centre Library on the BC Housing website to access a wealth of resources that support a strong housing sector. You can search online for current technical and socio-economic research, best practice guides, research reports, case studies, bulletins and videos on a wide range of topics that advance housing knowledge, lessons learned and innovative solutions.

Learn more about the Research Centre at [www.bchousing.org](http://www.bchousing.org)

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 Reflects sustainable housing solutions and a commitment to environmental and social responsibility.



## Socio-Economic Research

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Socio-economic research provides important information on trends, demographics, best practices and supply-and-demand indicators to help government and housing providers make informed decisions. Key areas of focus include:

- › **Addressing homelessness** – Our research on homelessness examines accessible, appropriate and affordable housing options for every person who needs a safe place to live. This includes research on best practices in addressing homelessness, as well as community acceptance, and evaluations of programs and services.
- › **Distinct populations** – BC Housing conducts research on housing issues facing distinct populations, including seniors, families, youth, Indigenous individuals and families, and people with disabilities. We also look at the key housing indicators in our province – such as household composition, median age, age and condition of housing stock, income and other factors.
- › **Housing sector transformation** – Non-profit housing providers face many challenges. These include dealing with aging buildings, limited new programs and operating funds. BC Housing partners with other agencies to conduct research that leads the transformation of the social housing sector. Through our research, we're profiling innovative ways to build the sector's capacity and to deliver and manage housing.
- › **Housing affordability** – The provincial government is committed to making life more affordable for British Columbians. A historic level of new provincial investments has been dedicated to initiating and expanding housing programs that will create more affordable homes for people who live and work in our communities. At the same time, BC Housing is researching ways to improve access to housing for all British Columbians. This includes working to increase density and improve the availability of affordable rental housing around transit stations.

### Technical Research

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Technical research leads to innovations that improve how residential buildings are designed and constructed and offers insights into sustainable housing solutions and best practice. Key areas of focus include:

- › **Industry research** – Our building science research enhances the quality of residential construction through innovative design tools and construction practices. Pilot studies and building detail guides developed in collaboration with industry partners provide solutions for better performance and durability of residential construction in B.C.
- › **Emerging design and technology** – The continuous evolution in housing design and construction provides opportunities for the Research Centre to participate in projects that integrate new technologies and methods of construction. The focus is on delivering affordable, resilient and community integrated buildings. Working with partners, BC Housing facilitates pilot studies, advances best practices, fosters the development and adoption of technological innovation, and builds capacity to meet the changing needs of industry and B.C. communities.
- › **Industry education** – BC Housing works with external partners to share information on best building practices, leading-edge research and building code changes for the construction and design of homes in B.C. Our Research Centre Library and Learning Centre offer a range of online resources and help disseminate knowledge on emerging technologies, high performance housing, seismic and fire safety requirements, and other topics of importance to the industry.
- › **Homeowner education** – Consumer resources cover a variety of topics and highlight the importance of maintenance and renewal planning to protect a building’s assets, the owners investment and create a comfortable living environment. Building systems that are routinely inspected and maintained perform better and have a longer service life.



## Making a Positive Impact, Sharing Knowledge and Inspiring Housing Solutions



75+  
Projects

- › Leads over 75 research and education projects creating an ever-growing impactful body of knowledge.



100+  
Partners

- › Works in collaboration with 100+ housing sector partners, leveraging funding and expertise for maximum positive impact.



- › Undertakes research that brings value to the sector by developing a body of evidence that can be used to transform business practices, change behavior, and create more inclusive and resilient communities.



\$ \$ \$ / \$ \$

- › Supports research that provides a social return on investment, recognizing that every dollar invested in supportive housing creates three to five dollars in social and economic value.



- › Supports local, national and international events, exchanging knowledge and leading-edge ideas to advance the housing sector in BC and beyond.

\$3.29  
Million



100  
Research &  
Education Projects

- › Fosters innovation in the housing sector through the Building Excellence Research & Education Grants program with \$3.29 million in grants awarded to date, supporting 100 new research and education projects.



- › Provides scholarships and bursaries to support up and coming industry professionals and trades.



- › Develops best practice guides for industry that are also used as curriculum by institutions in educating our next generation of design and construction practitioners.



- › Provides forward-looking market intelligence and housing data to help residential construction professionals, housing sector partners and homeowners make informed decisions.



- › Leads multi-year, multi-stakeholder knowledge and capacity building projects.



- › Provides intelligence on socio-economic and demographic data, using state-of-the-art dashboard capabilities, to help Government and sector partners make informed decisions, identify emerging trends and housing solutions.

BC Housing's Research Centre is focused on technical and socio-economic research to advance best practice and create a strong housing sector in British Columbia. We work in collaboration with other levels of government, consumer and industry organizations, research organizations, education institutions and non-profit associations to carry out research projects and initiatives with impactful results.



### ▶ Addressing Homelessness

Coordinates a homeless count, providing valuable data and an overall snapshot of homelessness in B.C., to monitor trends and create better services, supports and programs.

Provides toolkits with strategies and links to resources to assist stakeholders working with neighbours, local governments, and others to gain community acceptance for non-market housing.

Undertakes research to explore modular construction of supportive housing as an innovative approach to rapidly address homelessness across British Columbia.

### ▶ Housing Sector Transformation



Provides case studies highlighting how BC Housing has worked with non-profit providers to redevelop their sites, sharing lessons learned to support the sector in building capacity, becoming more self-sufficient, and increasing housing options.

### ▶ Industry Education



Delivers Building Smart seminars and webinars, BC Housing's signature education program for knowledge mobilization, to help advance the adoption of innovative building practices. Provides pre-packaged educational videos on a wide range of topics for self-paced Learning on Demand.



**38,800+** in person attendees



**11,000+** webinar attendees



**475+** customized education seminars



**400+** Learning on Demand attendees

### ▶ Homeowner Education



Shares research and knowledge to provide safe, durable, energy efficient and affordable homes for B.C. families and residents.

Fosters best practices in residential construction, giving homebuyers even greater confidence in their new home purchases.

Works in collaboration with housing sector partners to deliver consumer-focused educational seminars to educate homebuyers and homeowners on the importance of maintenance and a range of residential construction topics of interest.



### ▶ Distinct Populations



Studies the impacts of **30+ modular housing sites** on residents and communities, including the positive impact on homelessness, housing stability, quality of life and health of residents.

Conducts research to better understand the housing needs of regional communities, support subsidized housing, and provide more affordable housing in rural and urban areas of the province, including Northern British Columbia.

Provides data to inform program planning as well as cross-governmental research on Women's Transition Housing and Supports Program which provides women and children with a temporary place to stay, support services, and assistance.

### ▶ Housing Affordability



Undertakes research to build knowledge and capacity for affordable housing in small B.C. communities, identifying regions that require greater capacity and support as well as municipalities that have successfully implemented affordable housing initiatives.



### ▶ Industry Research



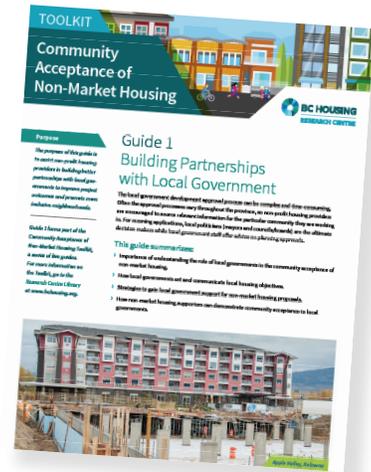
Works with partners to develop unique platforms, such as the Canadian Thermal Bridging Construction Details Database with more than **500 construction details and thermal calculations** for all types of buildings, energy standards, and climates across Canada to enhance building design and construction.

Undertakes research to measure the efficiency of building envelope retrofits on existing multi-unit social housing buildings in British Columbia to improve current retrofit practices and air quality for residents.

### ▶ Emerging Design and Technology



Leads the Mobilizing Building Adaptation and Resilience project in collaboration with more than **30 organizations, including industry and local, provincial and national agencies** to accelerate the uptake of resilient building design in Canada and contribute to climate and disaster resilience in local communities.



## Community Acceptance of Non-Market Housing Toolkit

### Description

This comprehensive toolkit provides non-profit housing providers, local governments and other stakeholders with key resources for working with communities to gain acceptance of non-market housing developments. It includes tips for communicating with community stakeholders, as well as strategies to address common neighbour concerns, demonstrate support to local governments, and mobilize supporters.

Approaches to gaining community acceptance and communication channels continue to evolve and transform. Based on shared knowledge and research, the toolkit explores how to best utilize social media and website content, as well as lessons learned from non-market housing developments across British Columbia. As part of the Community Acceptance series, the toolkit addresses when and how to engage the community and how to work toward community support for your development. It also includes useful resources for messaging, toolkit design and sample Frequently Asked Questions.

### Impact

The Community Acceptance of Non-Market Housing Toolkit will mobilize stakeholders to use a variety of tools to gain community acceptance of new affordable and supportive housing.

**Status:** Reports available online at [www.bchousing.org](http://www.bchousing.org)

**Awards:** 2020 Award for Planning Excellence, Planning Publications and Media – Canadian Institute of Planners

**Audience:** Non-profit housing providers, municipalities, planners, developers, and other stakeholders

## COVID-19 Response Emergency Shelters – Pandemic Data: Impacts and Outcomes Series

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### Description

Since the start of the COVID-19 pandemic, BC Housing has been working with regional health authorities, municipal partners and non-profit shelter and housing providers to develop community-based response plans. This includes identifying locations where vulnerable individuals, such as those who are experiencing or are at risk of homelessness, would be able to recover and self-isolate. These sites are vital to prevent the spread of COVID-19. They allow shelter providers to maintain safe distances between people in existing shelters, free-up acute care beds in hospitals, and prevent crowding.

Shelter providers operating COVID-response emergency shelters enter data about each stay at their sites into the Homeless Individuals and Families Information System (HIFIS). BC Housing uses this database to collect information about shelter usage for BC Housing-funded shelters. The reports in this series summarize the data provided to BC Housing during the pandemic period by shelter providers operating COVID-response emergency shelters. This series will provide semi-annual updates during the pandemic.

### Impact

This data helps inform current and future pandemic decision-making as well as emergency planning. The project shows the impact of the pandemic on the emergency shelter sector and how the shelters affect people experiencing homelessness.



#### NEW PROJECT

**Status:** Project underway

**Audience:** Non-profit housing providers, municipalities, provincial government, public, and other stakeholders

**Status:**

Project underway

**Partners:**

Ministry of Social Development and Poverty Reduction, Provincial Indigenous Homelessness Committee for BC, Lu'Ma Native Housing Society, Prince George Native Friendship Centre, Prince George Nechako Aboriginal Employment and Training Association, Aboriginal Coalition to End Homelessness – Vancouver Island

**Audience:**

All levels of government, policy makers, general public, business community, architects, builders, medical providers, service providers, school boards, First Nations communities, Indigenous people, Indigenous housing professionals, foundations, researchers, and students

## Documenting Indigenous Peoples' Experiences of Homelessness

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### Description

The purpose of this project is to better understand homelessness in ways that are not possible through a point-in-time homeless count. The Province of B.C. hopes to provide a broader perspective that reflects the Indigenous definition and experience of homelessness by producing a series of short, impactful videos.

These videos will complement the point-in-time homeless counts in B.C. and tell the story of homelessness from an Indigenous perspective. Objectives include 'looking behind the count' to gain a better understanding of the pathways into homelessness that are specific to Indigenous people. This includes the systemic and historical factors that contribute to homelessness. The videos will foster understanding about what homelessness means for Indigenous people and highlight successful strategies to address and prevent it.

### Impact

This project seeks to raise awareness and understanding of the unique experience of homelessness among Indigenous people in B.C.

## Exploring Impacts of Non-Market Housing on Surrounding Property Values – Full Report

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### Description

When new non-market housing is announced, neighbours often ask about the impacts on surrounding property values. BC Housing engaged Insight Specialty Consulting to undertake research to understand the market impacts of the introduction of non-market housing into a neighbourhood.

The Exploring Impacts of Non-Market Housing on Surrounding Property Values – Full Report explores median assessed residential property values and median sale prices for the most common residential type surrounding the case study sites. Median assessed values for nearby commercial properties are also examined. In addition, other factors such as land use changes, availability of services, and local and broader economic changes are considered.

### Impact

This research can be used by those engaged in the development of non-market housing to answer concerns from neighbours about the possibility of impacts on property values.



**Status:** Available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** Non-profit housing providers, municipalities, neighbours of non-market housing, planners, developers, and other community stakeholders



## Modular Housing Outcomes – Understanding Impacts for Residents and Local Communities

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### Description

In 2017, the Government of British Columbia announced the Rapid Response to Homelessness Program as an immediate response to address homelessness across B.C. The Province committed \$291 million over two years to build 2,000 modular supportive housing units for people who are experiencing homelessness or at risk of homelessness.

The modular housing evaluation examines the impacts of modular housing on residents and local communities. The specific outcomes reviewed include: impacts on homelessness, housing stability, quality of life, health of residents, community acceptance and use of emergency health care services. Resident outcomes for the first 17 modular supportive housing developments are available online.

### Impact

This study supports building community acceptance of supportive housing by demonstrating positive impacts and lessons learned from developing modular housing.

**Status:** Available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** City of Vancouver, non-profit housing providers, health authorities

**Audience:** Non-profit housing providers, community associations, policy makers, and other housing stakeholders

## Preventing and Reducing Homelessness: An Integrated Data Project

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### Description

This project will link data from the Ministry of Social Development and Poverty Reduction, the Ministry of Municipal Affairs and Housing and BC Housing to identify the cohort of people who have experienced homelessness or are at risk of becoming homeless in B.C. This includes demographic information, pathways into homelessness, and the cross-government interventions that helped them exit homelessness.

Establishing this integrated data set supports government's actions on homelessness and poverty reduction strategy, TogetherBC.

### Impact

Insights from this project will help government evaluate the effectiveness of its policy and program decisions and improve services for British Columbians.

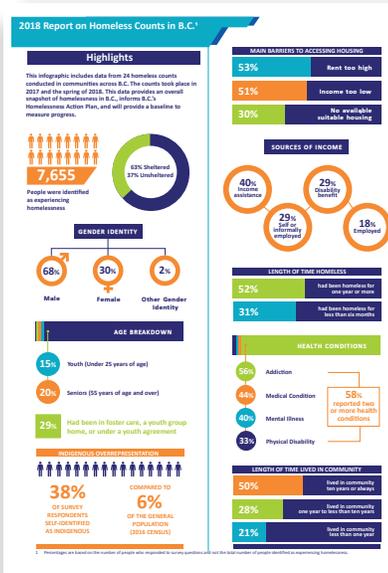


### NEW PROJECT

**Status:** Project underway

**Partners:** Ministry Social Development and Poverty Reduction, Ministry of Citizens' Services, Attorney General and Ministry Responsible for Housing

**Audience:** Policy makers, provincial and federal governments, local governments, researchers



## Province of BC Homeless Counts 2018 and 2020-21

### Description

The 2018 Report summarizes findings from 24 homeless counts conducted in communities across British Columbia. The findings also include shelter data from communities that did not conduct a homeless count. The result is an overall snapshot of homelessness in B.C. The data presented provides a baseline to measure progress.

In spring of 2018, the Province of British Columbia funded homeless counts in 12 B.C. communities. The Homelessness Services Association of BC, Urban Matters and the BC Non-Profit Housing Association coordinated these counts and combined the results with available data from 12 additional counts and shelters to prepare this report.

A total of 28 homeless counts were planned for spring 2020. These counts were scheduled to take place in 16 provincially-funded communities and 12 other communities that received funding from the federal government and other sources. Pilots of extended counts over four or five days in two provincially-funded communities were also planned to assess how results from this approach may differ from the 24-hour Point-in-Time methodology.

Thirteen counts were completed in March 2020. However, due to the COVID-19 pandemic, the remaining counts were postponed until 2021. In total, the following counts were completed in 2020-21:

- 16 Provincially-funded counts (including two extended counts)
- 6 Federally-funded counts
- 3 Independently-funded counts

### Impact

Homeless Counts inform our understanding of the demographics and service needs of people who experience homelessness.

**Status:** 2020 community profiles and 2018 report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Homelessness Services Association of BC, Urban Matters and BC Non-Profit Housing Association

**Audience:** Non-profit housing providers, community agencies, and government policy makers

## Research Summary: Community Benefits of Supportive Housing

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### Description

This document includes key information, facts and statistics to help neighbours and local organizations understand the benefits of supportive housing. The Community Benefits of Supportive Housing Research Summary also provides an overview of pathways into homelessness and summarizes key findings from research that demonstrate the positive impact of supportive housing for communities.

Issues that are addressed include the impacts of supportive housing on property values, the costs of supportive housing relative to the costs of homelessness, and resident outcomes.

### Impact

This research demonstrates the benefits of supportive housing for communities to address concerns and increase understanding and acceptance for this type of housing.



**Status:** Summary available online at [www.bchousing.org](http://www.bchousing.org)

**Awards:** 2020 Gold Roof Award for Knowledge to Action – Canada Mortgage and Housing Corporation

**Audience:** Non-profit housing providers, municipalities, neighbours of supportive housing, and other stakeholders



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** Non-profit housing providers, municipalities, developers, and other industry stakeholders

## Social Return on Investment (SROI) of Supportive and Affordable Housing in BC

### Description

BC Housing commissioned three studies to examine the social and economic value created by affordable and supportive housing in British Columbia. These studies follow the internationally standardized Social Return on Investment (SROI) methodology.

SROI analysis combines quantitative, qualitative, and participatory research techniques to demonstrate the value of outcomes from different stakeholder perspectives. The result is a ratio that compares the total amount invested in a social initiative to the financial value of social and economic outcomes that are achieved, showing — in monetary terms — the financial benefit of social investments.

The following housing developments were examined as case studies:

- **Affordable housing developments:** Dahli Place and Pembroke Mews in Victoria, Qualicum Park Village in Qualicum Beach and Ellendale in Surrey.
- **Dedicated-site supportive housing:** The Budzey Building in Vancouver, Cardington Apartments in Kelowna, The Kettle on Burrard in Vancouver, Queens Manor in Victoria and Wesley Street in Nanaimo.
- **Scattered-site supportive:** Canadian Mental Health Association (CMHA) Kelowna, CMHA Mid-Island Branch in Nanaimo, Lookout Housing and Health Society in Surrey, MPA Society in Vancouver and Pacifica Housing in Victoria.

### Impact

The Social Return on Investment series of reports show that a range of significant social and economic value is created through investment in affordable and supportive housing.

# Annual Program Statistics and Outcomes for Women’s Transition Housing and Supports Program

## Description

BC Housing’s Women’s Transition Housing and Supports Program (WTHSP) funds more than 110 transition houses, safe homes, and second stage housing for women — with or without children — who are at risk of violence, or who have experienced violence. These programs provide women and children with a temporary place to stay, support services, referrals and assistance in planning next steps.

Each quarter, transition houses, safe homes, and second stage housing sites funded through WTHSP submit forms to BC Housing, recording administrative and outcome data regarding the programs.

This series shows annual data aggregated for each of the three WTHSP program types and trend data where available.

## Impact

This data informs program planning as well as cross-government research, and demonstrates accountability for funding of the Women’s Transition Housing and Supports Program (WTHSP). The annual reports also provide information to WTHSP providers and other stakeholders about the demographics and outcomes of those accessing WTHSP programs to support planning processes.



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** Non-profit housing providers, other levels of government, and other community stakeholders



## Housing Options for Vulnerable Youth and Young Adults in BC

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### Description

This research examines five housing models for vulnerable youth and young adults: the Foyer Model, Host Homes, Convertible Leases, Low Barrier Scattered Site and Low Barrier Congregate Site housing. The report analyzes essential design and program characteristics of each housing model against two sets of key considerations: suitability for the needs of subpopulations of youth, and factors to consider for implementation, including costs, stakeholder acceptance, and the extent to which the options are applicable in urban or rural communities across B.C.

Based on a literature review and qualitative interviews with housing experts, this study examines the suitability of the housing models for six subpopulations of youth who are overrepresented in the youth homeless population. This includes youth who are LGBTQ2S+, Indigenous, aging out of care, living with high acuity mental health issues, actively using substance and in recovery.

### Impact

The Housing Options for Vulnerable Youth and Young Adults report supports all levels of government and the non-profit sector in identifying best practices when considering housing options for youth. It supports policy and program development and can be used in presentations to councils to build community acceptance of housing for youth.

**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Simon Fraser University, School of Public Policy

**Audience:** Non-profit housing providers, municipalities, developers, and other stakeholders

## Indigenous Housing Series: Building Knowledge Case Studies

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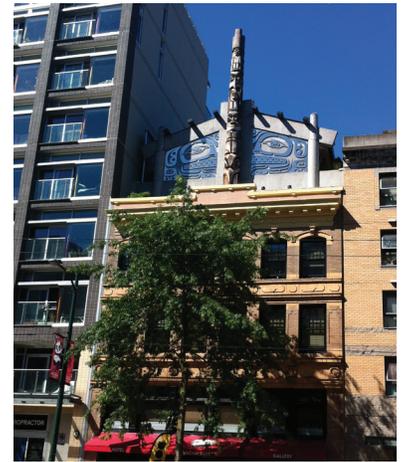
### Description

This case study series highlights housing providers and programs that serve Indigenous women, youth, and families who are in need of housing support and facing child welfare intervention. The case studies provide information on program components and support, and considerations for design and maintenance of space. They also examine key practices, program highlights, challenges and successes. The information included in the series may assist other housing providers to create or expand wrap around support services to help families stay together.

The case studies focus on the following housing providers and programs: Ki-Low-Na Friendship Society, Ksan House, Aboriginal Mother Centre Society, Lu'ma Native Housing Society, Tamitik Status of Women, Vancouver Native Housing Society, and the Urban Native Youth Association.

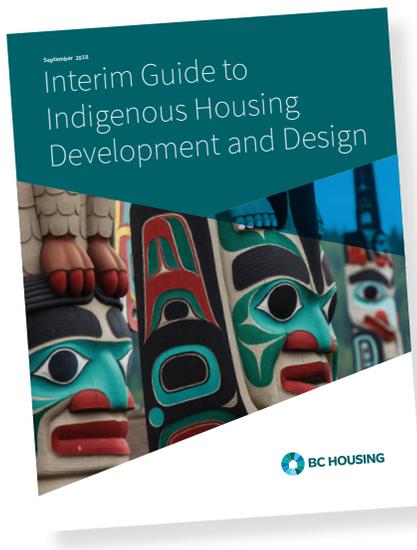
### Impact

The Indigenous Housing Series informs practices of other housing providers looking to create or expand wrap around support services to help families stay together.



**Status:** Reports available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** First Nations housing professionals, non-profit housing providers, developers, and other stakeholders



## Interim Guide to Indigenous Housing Development and Design

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### Description

Designing and building homes that better meet the needs of First Nation communities is a growing area of interest and research, with new work being undertaken across British Columbia and Canada. The resource guide was developed based on existing secondary research and interviews with First Nations Housing Managers from around B.C., and focuses on community planning for housing design. This includes technical, demographic and cultural considerations.

This guide is a good starting point for First Nations and their partners, and highlights resources to help ensure that new housing best meets the needs of the community.

### Impact

The Interim Guide to Indigenous Housing Development and Design provides a high level starting point for First Nations and their partners to help plan and build housing that meets community needs.

**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** First Nations housing professionals, non-profit housing providers, developers, and other stakeholders

## Student Research: Impacts of COVID-19 on Equity-Seeking Populations

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### Description

The purpose of this project is to document impacts of recent pandemics on equity-seeking populations and lessons learned. This research also highlights initiatives undertaken by all levels of government, including First Nations communities, in response to COVID-19. In particular, the research documents initiatives to assist at-risk populations, including people experiencing homelessness.

This project was undertaken by three students at UBC's School of Community and Regional Planning. The research includes:

- a literature review to document impacts and lessons learned from recent pandemics, including COVID-19, SARS, MERS, and H1N1, particularly in terms of impacts related to health and housing
- a literature review to document initiatives undertaken by the federal, provincial/territorial governments, First Nations communities, and local governments in Canada in response to COVID-19, particularly initiatives targeted to assist equity-seeking populations
- a literature review and case studies to learn more about the impacts of COVID-19 on people experiencing homelessness as well as initiatives undertaken in Canada and other countries to specifically address their needs

### Impact

This research project will enhance understanding about how pandemics can affect equity-seeking populations and will inform policy and program planning to increase resilience.



**Status:** Project underway

**Partners:** UBC's School of Community and Regional Planning

**Audience:** City planners, community agencies, general public, housing providers, local governments, non-profit housing providers, non-profit sector, other levels of government, provincial and federal government, researchers, and students



## Women’s Transition Housing and Supports Programs – Pandemic Data: Impacts and Outcomes Series

### Description

Through the Women’s Transition Housing and Supports Programs (WTHSP), BC Housing supports more than 110 transition houses, safe homes and second stage housing programs for women with or without children who are at risk of violence, or who have experienced violence. The programs provide women and children with a temporary safe place to stay, support services, referrals and assistance in planning next steps.

In April 2020, BC Housing began setting up expansion sites across British Columbia as a result of the COVID-19 Pandemic. This ensured continuing support for women and children fleeing violence who require their own room to self-isolate, quarantine or due to vulnerable health. These spaces also helped create physical distancing at existing WTHSP sites. The expansion sites are mostly located in hotels and motels around the province, secured by BC Housing or a WTHSP provider.

The report summarizes the administrative data provided by WTHSP expansion and existing providers to BC Housing during the pandemic period. It includes information about stays at WTHSP expansion and existing sites, who is accessing the programs, program statistics and outcomes.

### Impact

This data helps inform current and future decision-making and emergency planning. The information shows the effect of the COVID-19 on the WTHSP sector and how the sector has continued to support women and children experiencing violence during the pandemic.

#### NEW PROJECT

**Status:** Project underway

**Audience:** Non-profit housing providers, municipalities, provincial government, public, and other stakeholders

## Accessory Dwelling Units: Case Studies and Best Practices from BC Communities

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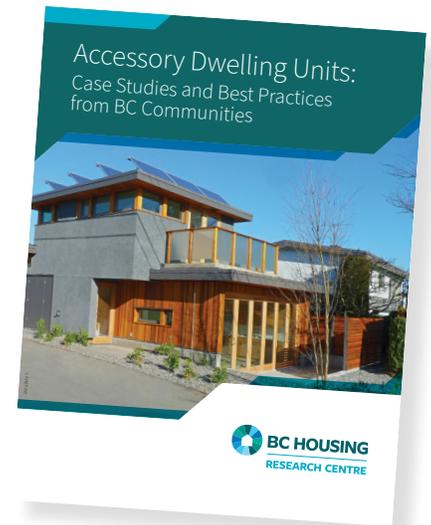
### Description

Many B.C. municipalities now have policies and zoning in place to allow for secondary suites and accessory dwelling units (ADUs). Despite the introduction of the policies, there has been a slow uptake in adding secondary suites and ADUs. This research project looks to understand the current situation in B.C.'s small and medium-sized communities including the main barriers to the construction of ADUs and lessons learned.

The research findings will be used to develop a set of best practice guidelines that will encourage and support a greater uptake of ADU housing units throughout B.C.

### Impact

Providing best practice guidelines to encourage greater use of accessory dwelling units in B.C.'s small- and medium-sized communities will help ease the lack of rental housing and improve housing diversity in the province.



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** WCS Engagement + Planning

**Audience:** Builders, planners, and non-profit housing sector



## Building Knowledge and Capacity for Affordable Housing in Small Communities – Final Reports (Campbell River and Invermere)

### Description

Affordable housing continues to be a growing concern for communities large and small throughout British Columbia. Most small communities have policies in their Official Community Plans supporting the development of affordable housing, yet implementation of these policies remains a challenge. In the larger urban centres, tools such as density bonuses, inclusionary zoning, amenity cost contributions and development cost charges can be used to support the creation of affordable housing units. However, in smaller communities, these tools may not be as effective or even possible, due to lower density nature and/or rural culture, or the lower demand for development.

This research looks at the current situation of affordable housing for small communities in eight regions within B.C. The study identifies areas that require greater capacity and support, as well as municipalities that have successfully implemented affordable housing initiatives.

### Impact

This project focuses on building the knowledge and capacity of small communities to develop more affordable housing, and targets workforce (lower to middle income) housing needs.

**Status:** Available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Whistler Centre for Sustainability, Columbia Basin Trust, Canada Mortgage and Housing Corporation, Real Estate Foundation of BC, other partners

**Audience:** Builders, planners, governments, and the non-profit sector

## Building Knowledge and Capacity for Affordable Housing in Small Communities – Webinar Series

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### Description

The Building Knowledge and Capacity for Affordable Housing in Small Communities – Webinar Series highlights key findings from a study on the state of housing in non-metropolitan areas within British Columbia.

The study provides information on market housing gaps and opportunities for appropriate housing, home values, need for repairs, home availability, and energy efficiency. These findings, and options for addressing market demand, will be discussed through a series of regional webinars as part of BC Housing's Building Knowledge series.

### Impact

This Building Knowledge webinar series will enhance awareness and understanding of market housing gaps and opportunities for non-metropolitan areas within British Columbia.



#### NEW PROJECT

**Status:** Project underway

**Partners:** Community Development Institute at the University of Northern British Columbia

**Audience:** Architects, builders, building industry, contractors, design professionals, local governments, non-profit housing providers, residential construction industry



## Community Housing for Resilient Communities

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### Description

This project showcases innovation in the community housing sectors of British Columbia and Quebec in the context of urban land development. Specifically, it profiles several community sector innovators that are incrementally increasing local control of urban land development to enhance the sense of belonging for their residents.

Ten case studies have been developed to present this information in a format that is compelling and accessible for a broad audience. These case studies were shared with industry professionals and made available to the public at the 2019 Canadian Housing and Renewal Association National Congress on Housing and Homelessness in Victoria, B.C. Videos on the case studies are available as part of this project.

### Impact

The Community Housing for Resilient Communities will facilitate discussion and inspire other community leaders to implement these approaches. This project offers planners, architects, and other city builders an engaging lessons-learned format within the current context of urban land development.

**Status:** Report and videos available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Vancity, Real Estate Foundation of BC

**Audience:** Building industry, researchers, housing providers, and other levels of government

## Evaluation of Supporting Tenants, Enabling Pathways (STEP) Pilot

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### Description

The Supporting Tenants, Enabling Pathways (STEP) pilot project seeks to ensure supportive housing units in Vancouver are occupied by people most in need. STEP provides those who are ready to live independently with assistance to help them move from supportive housing to another affordable housing option. Individuals experiencing homelessness who require supports are then able to move into the vacated supportive housing units. This evaluation will enable BC Housing and project partners to determine whether the STEP pilot is meeting its goals and objectives.

### Impact

The project will review the STEP client outcomes, assess the coordinated approach to creating flow in the housing continuum, and identify best practices, lessons learned and recommendations for program modifications.



**Status:** Project underway

**Partners:** City of Vancouver, Vancouver Coastal Health, Streethome Foundation

**Audience:** City planners, community agencies, health authorities, policy makers, non-profit housing sector, and researchers



#### NEW PROJECT

**Status:** Project underway

**Audience:** Federal and provincial governments, local governments, and policy makers

## Shelter Aid for Elderly Renters Program and the Rental Assistance Program Review

### Description

The Shelter Aid for Elderly Renters (SAFER) Program and the Rental Assistance Program are cornerstones of BC Housing's supports for low-income seniors and low-income families with children. Learning about the impact of these programs on recipients will identify opportunities to enhance the delivery of services to the target populations. Information gathered as part of the review will also enable BC Housing to assess the effectiveness of these programs in meeting their intended goals and objectives.

The review will explore:

- The success of the rental assistance programs in achieving their intended outcome; making renting in the private market more affordable for low-income seniors and working low-income families with children
- The impact of these rental assistance programs on the lives of the recipients
- Barriers that reduce access to these programs among target populations
- Using a Gender-Based Analysis (GBA+) lens, the additional barriers that impact how diverse and vulnerable people access these programs
- Opportunities to enhance the future delivery of these programs
- Other alternative service models to consider

### Impact

Insights from this review will help evaluate the effectiveness of the Shelter Aid for Elderly Renters and Rental Assistance Program policy and program decisions and improve services for British Columbians. The results will inform the future delivery of BC Housing's programs and key findings will be shared with other jurisdictions that offer similar programs.

## Transit-Oriented Affordable Housing Study

### Description

This study explores the opportunities and constraints for building new affordable rental housing in transit-oriented locations across the Metro Vancouver region. Phase 1 of the study examines the opportunities and challenges. Phase 2 evaluates the effectiveness, limitations, and applicability of specific tools to support the delivery of new transit-oriented affordable rental housing in the region.

Phase 2 includes two research components: developing a business framework for a transit-oriented affordable housing revolving loan fund; and reviewing policy tools and approaches available to municipalities to encourage the development of affordable transit-oriented rental housing and address the constraint of high land costs in the region.

The study builds on two Metro Vancouver initiatives – the Regional Affordable Housing Strategy and the Housing and Transportation Cost Burden Study – which describe the region’s rental housing needs and the high burden many renter households face when housing and transportation costs are considered together.

### Impact

This study aims to increase transit-oriented affordable rental housing in Metro Vancouver.



**Status:** Phases 1 and 2 completed and posted online at [www.metrovancouver.org](http://www.metrovancouver.org)

**Partners:** Metro Vancouver, BC Non-Profit Housing Association, TransLink, Vancity, Ministry of Municipal Affairs and Housing, Canada Mortgage and Housing Corporation, Urban Development Institute

**Audience:** Consumers, developers, planners, government, builders and transit authorities, and non-profit housing providers



## What Works: Securing Affordable and Special Needs Housing through Housing Agreements

### Description

Local governments often rely on Housing Agreements to address a community's housing policy objectives – such as increasing the supply of affordable housing, facilitating the supply of special needs housing, or preserving or protecting housing over the long term. The What Works: Securing Affordable and Special Needs Housing through Housing Agreements project highlights best practices for entering into, administering and enforcing Housing Agreements.

The resource guide includes:

- Emerging and proven best practices for entering into, administering, monitoring and enforcing Housing Agreements. This includes best practices from the Metro Vancouver region and other jurisdictions in British Columbia
- Sample terms and conditions, as well as agreement templates, for municipal staff to consider when drafting Housing Agreements for various types of housing, such as: affordable homeownership, secured rental housing, rental units in a strata/mixed tenure housing, non-market housing, and special needs housing
- Effective monitoring and enforcement strategies for Metro Vancouver municipalities administering Housing Agreements. This includes identifying strategic partners, roles, and responsibilities (for example, BC Housing and Metro Vancouver Housing Corporation)

**Status:** Resource guide available at [www.metrovancouver.org](http://www.metrovancouver.org)

**Partners:** Metro Vancouver

**Awards:** 2020 Silver Award for Excellence in Planning Practice, City & Urban Areas – Planning Institute of British Columbia

**Audience:** Municipal planners, housing policy personnel, the development industry, and non-profit housing providers

### Impact

The resource guide is intended to help local governments employ Housing Agreements to facilitate non-market housing development and secure long-term affordable or special needs housing.

## Business Transformation in the Community Non-Profit Housing Sector

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### Description

The Business Transformation II study is the first in Canada to examine skillsets and core competencies that the non-profit housing sector needs to transform and future-proof their businesses. The findings of this study are based on 213 survey responses and interviews with representatives from 21 housing organizations across Canada.

In response to changing operating environments, housing organizations are adjusting their management and business approaches. An insider perspective shows how these housing organizations are responding to new opportunities and responsibilities. This includes undertaking business transformations and increasingly employing methods that have traditionally been associated with private sector organizations.

The first study, Business Transformation I: Promising Practices for Social and Affordable Housing in Canada, explored emerging business practices and new approaches to the development, operation, and sustainability of social housing in Canada. Case studies based on a survey and a series of interviews were examined to document and understand the extent to which social housing organizations, including both funders/regulators and providers, are innovating.

### Impact

These studies support the non-profit sector in building capacity to achieve long-term viability, sustainability and self-sufficiency.



**Status:** Studies available online at [www.housingpartnership.ca](http://www.housingpartnership.ca) and [www.bchousing.org](http://www.bchousing.org)

**Partners:** Housing Partnership Canada

**Audience:** Non-profit housing providers and government organizations



## Comparative Analysis of Mixed Model Developments in Meeting Canadian Housing Objectives

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### Description

This research demonstrates how mixed model developments can be achieved and sustained. This study also promotes a broader understanding of the key success factors for providing affordable housing within these mixed model developments.

The research analyzes nine mixed model projects across Canada, with a blend of locations and market sizes. Three of the projects represent mixed tenure, three represent mixed income and three represent conversions of public housing to either mixed income or mixed tenure.

The analysis examined different definitions of mixed models, the opportunities and challenges of these models, their corporate and legal structures, and financial and partnership arrangements. The study also focused on the physical structures and building types used, including information on affordability, number of units and target demographic. The analysis explored the financial and market considerations in selecting the various models.

### Impact

This study provides key lessons learned and outline considerations when setting up affordable housing using a mixed delivery model, and how governments can better support these developments moving forward.

**Status:** Project underway

**Partners:** Housing Partnership Canada, City of Calgary, Housing Services Corporation, York Housing

**Audience:** Non-profit housing sector

## Homeowner Seminars

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### Description

BC Housing collaborates with housing sector partners to deliver educational seminars for homeowners and homebuyers on a range of topics. This includes seminars and forums presented by the Condominium Home Owners Association of BC (CHOA), the Canadian Condominium Institute, and the Homebuilders Association Vancouver throughout the year. Sessions are delivered by knowledgeable industry experts and provide practical information and resources to help consumers make informed decisions about residential construction, homebuying and maintenance.

CHOA offers educational seminars province-wide to assist strata councils, individual owners and the general public. These sessions cover a variety of subjects and highlight the importance of maintenance and renewal planning to protect a building’s assets, the owner’s investment and how to create a comfortable living environment. Building systems that are routinely inspected and maintained perform better and have a longer service life. Residential topics of interest for consumers include: maintenance for balconies, decks and roofs, replacing windows and building envelope systems, installing and maintaining heat recovery ventilators and solar panels.

### Impact

Conducted in collaboration with housing sector partners, these consumer-focused seminars educate homebuyers and homeowners about the importance of maintenance and cover a range of residential construction topics of interest.



**Status:** Educational seminars delivered annually on a range of topics

**Partners:** Condominium Home Owners Association of BC, Canadian Condominium Institute, Homebuilders Association Vancouver

**Audience:** Consumers, builders, developers, and warranty insurance providers



## Maintenance Matters: Building Maintenance Bulletins

### Description

Maintenance Matters is a series of bulletins and videos on building maintenance issues for multi-unit residential buildings. The bulletins address a range of questions and issues including why maintenance work is necessary, when and how often maintenance work should be done, and who should undertake the work. Some of the publications released include: The Impact of Delayed Maintenance and Renewals on Buildings, Replacing Podium Water-proofing, Managing Internal Water Systems, Repairing and Replacing Window Wall Systems, and Make-up Air Units.

The Maintenance Matters bulletins provide key information to support stratas, co-operative boards and other types of multi-unit residential building owners in maintaining properties. The series includes a selection of 21 bulletins and 13 companion videos on a range of topics.

### Impact

Maintenance Matters bulletins and videos provide important information to co-operative boards, stratas and various other types of multi-unit residential building owners in order to support the maintenance of properties.



**Status:** Bulletins available online at [www.bchousing.org](http://www.bchousing.org)  
Videos available on BC Housing's YouTube channel

New bulletins underway

**Partners:** Condominium Home Owners Association of BC

**Audience:** Residents of multi-unit buildings, strata owners, strata councils, builders, developers, property managers, housing co-ops, and the industry in general

## British Columbia LEEP for Renovations

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### Description

LEEP for Renovations builds upon the BC Local Energy Efficiency Partnerships (LEEP) program to focus on energy efficient renovations for existing housing. Conducted in collaboration with Natural Resources Canada, this project seeks to examine the technical gaps and market barriers to deep energy retrofits that can deliver energy reductions, while providing comfortable, healthy, durable, resilient improvements to the home.

### Impact

LEEP for Renovations will identify innovations that can reduce renovation time and substantially improve the energy and overall performance of existing housing.



**Status:** Project underway

**Partners:** Natural Resources Canada, local governments, industry associations

**Audience:** Architects, builders, building officials, building trades, city planners, contractors, design professionals, developers, industry stakeholders, provincial and federal government, researchers, and the residential construction industry



**Status:** Project underway

**Partners:** Natural Resources Canada

**Audience:** Local and federal governments, policy developers, building officials

## Cost and Benefits of Constructing to Post-Earthquake Operational Standards

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### Description

This study estimates cost implications of select BC Housing buildings to be designed to post-earthquake operational standards as opposed to their current design for life safety/collapse prevention in keeping with BC Building codes.

The project examines eight BC Housing buildings as archetypes and reviews their design standards and structural approaches. The key focus of this study is estimating the additional costs required to construct these buildings to ensure that they are designed to be operational post-earthquake. The report findings will help industry prepare for future buildings to be built to a post-earthquake operational standard. This means that after a major earthquake, there will be fewer building demolitions, less people displaced, and communities returning to normal life more efficiently and faster.

### Impact

Cost and Benefits of Constructing to Post-Earthquake Operational Standards will lay the ground work for future buildings to be built to a post-earthquake operational standard.

## Documenting the Construction of an Innovative High Performance Wood-Frame Building

### Description

This research documents the construction of a non-profit housing project in Victoria from start to finish. The project aims to better understand the benefits of Lean construction and the Last Planner® system. It will report on the outcomes and opportunities for further research in advancing high performance buildings using modern methods of construction. Lean principles are starting to be supported by the Integrated Project Delivery (IPD) model (in practice within the healthcare sector and increasingly for commercial and educational projects), but have yet to be deployed in the residential context. This project will identify, analyze and present relevant IPD case study projects for their applicability to affordable, multi-family housing projects in British Columbia.

### Impact

This project will enhance understanding of the benefits of Lean construction and the Last Planner® system, and identify opportunities for further research to advance high performance buildings using modern construction methods.



**Status:** Project to be completed in 2021

**Partners:** Forestry Innovation Investment

**Audience:** Government, city planners, builders, developers, contractors, design professionals, and the industry in general



## Local Energy Efficiency Partnerships (LEEP)

### Description

The Local Energy Efficiency Partnership (LEEP) process was first developed by the Office of Energy Research and Development at Natural Resources Canada (NRCAN). This business-to-business initiative has since been adopted in several Canadian provinces, including British Columbia.

BC Housing, BC Hydro, FortisBC, the City of Vancouver, and the City of New Westminster worked together to get LEEP started in the province. Local home builders' associations also play a key role in delivering the initiative. As part of the project, NRCAN and builders assess and screen technologies and conduct field trials. The results continue to be adapted into BC Housing Builder Insight bulletins and educational events such as the Builder Technology Forums conducted in Vancouver, Kelowna, Prince George, Victoria, Nanaimo and Surrey.

The LEEP video series, showcasing lessons learned and successes of Net Zero level construction in the Lower Mainland, the Okanagan and around Prince George, is available online. These videos show how the LEEP initiative is helping to drive innovation in the industry and accelerate the construction of affordable energy-efficient homes.

### Impact

Local Energy Efficiency Partnerships assess and screen technologies, conduct field trials, create educational materials to guide energy efficient construction in our province, and build readiness for transition to higher steps in the BC Energy Step Code.

**Status:** A multi-year project with videos available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** BC Hydro, FortisBC, City of Vancouver, City of New Westminster, Natural Resources Canada

**Audience:** Builders, suppliers, utilities, and local government

## Metrics and Parameters for Shared Social Spaces

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### Description

Positive social trust and connection are essential for human health and happiness. Research suggests that the design of social spaces in multi-unit housing can influence these outcomes. However, housing providers require clear metrics to guide discussions with designers and policy makers about the quality and quantity of spaces for social wellbeing in housing design.

### Impact

Creating metrics and parameters for shared social spaces will facilitate building designs and reviews that will advance social trust and connection in multi-family housing projects.



**Status:** Project underway

**Audience:** Architects, building industry, city planners, design professional, developers, housing co-ops, housing designers, housing providers, non-profit housing providers, policy makers, researchers, and the residential construction industry

**Status:**

Project underway

**Partners:**

Natural Resources Canada, Institute for Catastrophic Loss Reduction, BC Hydro, City of Vancouver, Lower Mainland health organizations, Province of British Columbia, Royal Architectural Institute of Canada, Urban Development Institute, Canadian Home Builders' Association and other partners

**Audience:**

Residential construction industry, professional associations, and other stakeholders

## Mobilizing Building Adaptation and Resilience

### Description

Mobilizing Building Adaptation and Resilience (MBAR) is a multi-year, multi-stakeholder knowledge and capacity building project led by BC Housing. It involves participation and collaboration from over 30 organizations, including industry and national/provincial/local agencies. MBAR leverages pilot projects to create and curate a body of knowledge (and tools) to inform development, design and management decisions around new construction and renovation of buildings. The project includes development and delivery of an industry train-the-trainer program incorporating experience and knowledge gained from pilot projects.

By facilitating and piloting sustainable and resilient design and renovation of buildings, MBAR aims to:

- Stabilize communities in a natural disaster (e.g. earthquake)
- Help building owners and occupants better protect their investments
- Adapt to anticipated climate change stresses (e.g. higher precipitation, warmer summers, fire-related air pollution) and
- Prepare for and adapt to climate change shocks (e.g. severe flooding/fire/windstorms)

### Impact

MBAR will accelerate the uptake of resilient building design in Canada, contributing to climate and disaster resilience as well as socio-economic vitality in local communities. This multi-stakeholder initiative also aims to reduce the risk of loss of livability or building use, building damage, and much costlier future repairs and retrofits.

## Modular Housing and the Affordable Housing Sector

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### Description

In recent years, the modular construction industry has played an increased role in the development of affordable housing through the B.C. Rapid Response to Homelessness initiative. As modular housing companies become further involved in successive affordable housing projects, the product design these companies offer continues to evolve.

This project will explore available research, engage with key stakeholders, and review project costing data to document emerging trends, innovations and challenges encountered by affordable housing providers, developers and modular construction companies. The research also explores the benefits, risks and implications of scaling up and using modular construction methods to build affordable housing in other communities across Canada.

### Impact

This project will create a decision-making and planning tool that housing providers can use to determine if a modular construction approach is a suitable option for their next development project. The tool will also include a project readiness checklist which outlines some of the key considerations that should be taken into account early in the development process.



**Status:** Project underway

**Partners:** Canada Mortgage and Housing Corporation

**Audience:** Non-profit housing providers, municipalities, developers, and other stakeholders



**Status:** Project underway

**Audience:** Architects, design professionals, developers, local governments, non-profit housing providers, residential construction industry professionals, provincial and federal government, researchers, residents, and strata owners of multi-unit residential buildings

## Predictive Digital Modelling of Social Interaction for Multi-Family Building Design

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### Description

This research study focuses on the technical specifications for a building design tool to promote the frequency of social interaction in building design options to enhance human proximity and social connectivity.

Social isolation is an increasing concern in Metro Vancouver where the decrease in traditional network bonds has resulted in declining social health. Social connectivity mitigates the multiple challenges of poverty, addiction and mental illness that affect many housing occupants. Building design can positively benefit social connectivity by fostering the frequency of interaction through design layout, understanding the flow of people, acoustic considerations and the benefits of comfortable surroundings.

### Impact

This research study provides technical specifications for a software tool to be developed, enabling future building design to enhance the frequency of social contact, mitigating social isolation and overall declining social health in areas of Metro Vancouver.

## Tiny Houses – An Alternative to Conventional Housing

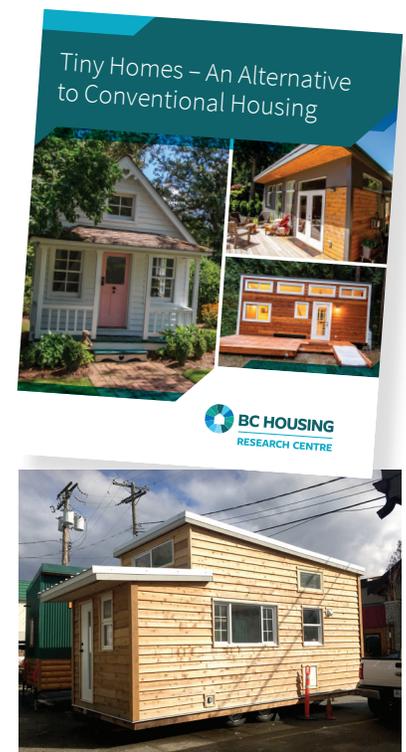
### Description

Affordable housing continues to be a concern across British Columbia and there is an urgent need to increase housing options for homebuyers. In North America, some jurisdictions are exploring the construction of tiny houses as an option to increase the available housing stock. Tiny houses are not currently permitted in the Lower Mainland and are not regulated through the BC Building Code or Vancouver Building Bylaw.

This project identifies lessons learned in other jurisdictions and explores barriers and opportunities for implementation in British Columbia. The research showcases experiences in other jurisdictions through local and international case studies. The study includes interviews with experts related to the tiny house industry and analyzes opportunities to regulate and support the construction of single tiny houses and villages.

### Impact

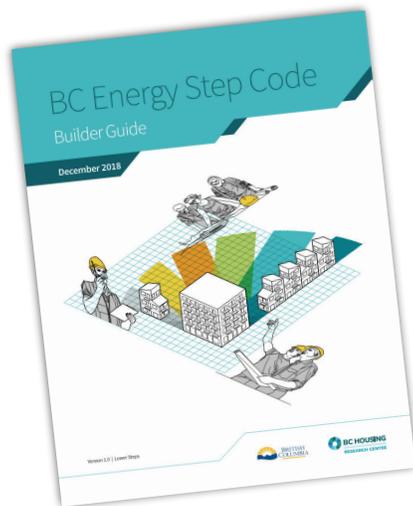
The final report includes findings and recommendations for addressing planning regulations, warranty provisions and cultural aspects for implementing tiny houses into new or established B.C. neighbourhoods.



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Light House Sustainable Building Centre and BC Tiny House Collective

**Audience:** Consumers, warranty providers, developers, planners, builders, and non-profit housing providers



## BC Energy Step Code Builder Guide

### Description

This guide consolidates information on how builders may achieve the performance targets set in the BC Energy Step Code. This guide is intended to be an industry resource with respect to designing and building to the BC Energy Step Code, without compromising other aspects of building performance including moisture management, overheating, and durability. The BC Energy Step Code is currently applicable to Part 9 residential buildings in all B.C. climate zones and Part 3 residential buildings in Climate Zone 4. This guide is limited to wood-frame construction and thus omits guidance for non-combustible Part 3 buildings.

This first edition of the Builder Guide includes guidance for the Lower Steps of the Step Code, while later editions will include updates for the Upper Steps (4 and 5 for Part 9 buildings, 3 and 4 for Part 3 buildings).

### Impact

The BC Energy Step Code Builder Guide will communicate key strategies and approaches to meeting the Energy Step Code in low to mid-rise residential buildings, especially wood-frame buildings in British Columbia.

Requirements For Part 3 Residential Buildings Located In Climate Zone 4 (see page 37)  
(Based on BCBC Table 10.2.3.3.A)

	Equipment & Systems TELII (kWh/(m <sup>2</sup> -year))	Building Enclosure TEDI (kWh/(m <sup>2</sup> -year))
STEP 1	Conform to Part 8 of the NECB	
STEP 2	130	45
STEP 3	120	30
STEP 4*	100	15

**Status:**

Available online at [www.bchousing.org](http://www.bchousing.org) for Lower Steps of the BC Energy Step Code

Updated version planned for 2022

**Partners:**

BC Hydro, FortisBC, City of Vancouver, City of New Westminster, Ministry of Energy, Mines & Petroleum Resources, other Energy Step Code Council members

**Audience:**

Builders, developers, designers, construction professionals, local governments, energy utilities, and other industry stakeholders

## BC Energy Step Code Design Guide – Supplement S3 on Overheating and Air Quality

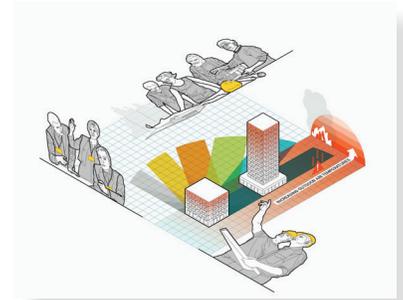
### Description

This supplement to the BC Energy Step Code Design Guide recommends strategies to reduce the impacts of a warmer climate on mid- and high-rise (Part 3) wood-frame and non-combustible residential buildings across British Columbia.

Current building codes and standards are based on past climatic conditions and do not necessarily recognize the impacts of climate change on the health, comfort, and safety of building residents. This supplement considers future conditions as an increasingly important part of building design to address overheating and indoor air quality in residential construction. Creating more resilient buildings will allow residents to cope with higher temperatures, more frequent and severe heat waves, and air quality challenges caused by extreme wildfires and other air pollutants.

### Impact

This guide recommends key strategies and approaches to help ensure that multi-unit residential buildings constructed today are designed for occupant comfort and safety throughout the lifetime of the building.



**Status:** Available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** BC Hydro, City of Vancouver, City of New Westminster, Province of British Columbia

**Audience:** Development, design and construction industry, local governments, energy utilities, and other industry stakeholders



## Best Practice Guide for Air Sealing and Insulation Retrofits for Single Family Homes

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### Description

Air sealing and insulation retrofits of homes are reliable methods to reduce energy consumption, improve durability, lower utility bills for the homeowner, as well as the gas and electric load. This updated, second edition guide consolidates best practices for air sealing and insulation retrofits, such as building enclosure weatherization for B.C. homes. It includes procedures for common air sealing and insulation for attics and roofs, above-grade walls, basements, crawl spaces, floors and the interfaces between these assemblies.

A valuable reference tool for construction industry professionals, the information may also interest homeowners performing home retrofits without a contractor, although this guide is not written for the do-it-yourself audience.

### Impact

The Best Practice Guide for Air Sealing and Insulation Retrofits for Single Family Homes is specific to British Columbia's unique climate, construction practices, and building code requirements. It is intended to be a reference tool for construction industry professionals and can help contractors learn how to perform weatherization work.

**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** BC Ministry of Energy, Mines & Petroleum Resources, BC Hydro, FortisBC

**Audience:** Builders, contractors, developers, researchers, architects, and the industry in general

## Best Practices for Window and Door Replacement in Wood-Frame Buildings (2020 Update)

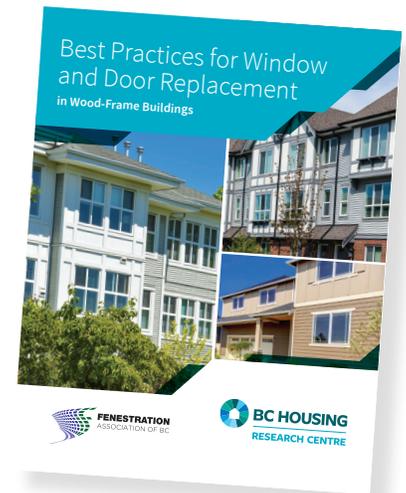
### Description

Windows and doors are critical components that contribute significantly to the overall performance of building enclosures. This guide applies current building science and best practices to the replacement of windows and doors in wood-frame buildings. It provides key information for building designers and the residential construction industry on new regulations for reduced energy use and greenhouse gas emissions, along with net-zero energy ready and low-carbon building requirements.

The guide includes new information on industry standards, modern window and door technology and other factors relating to window and door replacement in existing buildings. While it addresses the unique challenges presented by BC's coastal climate, it is also of value for other geographical locations.

### Impact

This informative guide will be a significant reference for the design and residential construction industry to provide quality window and door replacement in existing buildings.



#### NEW PROJECT

**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Fenestration Association of BC

**Audience:** Building industry, design professionals, manufacturers, warranty providers



**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** Builders, contractors, developers, designers, and building officials

## Builder Guide to Site and Foundation Drainage – Best Practices for Part 9 Houses

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### Description

This guide outlines current industry best practices for Part 9 buildings with respect to site drainage, foundation drainage, and below-grade building envelope assemblies. It provides direction for builders, homeowners, and building officials, and emphasizes basic building code requirements and best practices.

The guide also addresses conditions which may be faced on more challenging sites (due to local geology, climate, or topography), discusses soil gas control, and provides guidance on maintenance and drainage remediation for existing buildings. Increasing the level of awareness in the industry about the importance of site and foundation drainage is a key goal. The aim is to ultimately reduce the risk of post-construction water ingress into below-grade spaces which is an increasing issue for warranty providers, insurers, and homeowners.

### Impact

This guide educates homeowners and builders on the key strategies and approaches to reducing post-construction water ingress into below-grade spaces for Part 9 buildings in British Columbia.

## Builder Insight Technical Bulletins

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### Description

Builder Insight is a series of bulletins and companion videos designed to provide practical information on new technologies, research results, building practices and emerging technical issues in residential construction.

Licensed Residential Builders and other industry professionals have access to a wide range of topics from building envelope to heat recovery ventilation, the BC Building Code and energy performance requirements. These publications provide up-to-date research highlights and include online references to additional resources and tools useful in the design and construction of single and multi-unit buildings.

New editions are developed based on industry requirements. The recent Builder Insight No. 19 – Modelling the Future Climate in Passively Cooled Buildings and the companion video provide an overview of how designers can improve building resilience by considering the risk of overheating and meeting the BC Energy Step Code. It includes a methodology for analyzing and reporting the potential for passively cooled buildings to overheat under future climate scenarios. This document is intended for readers with an understanding of energy modelling and supports a consistent standard for use across the building industry.

### Impact

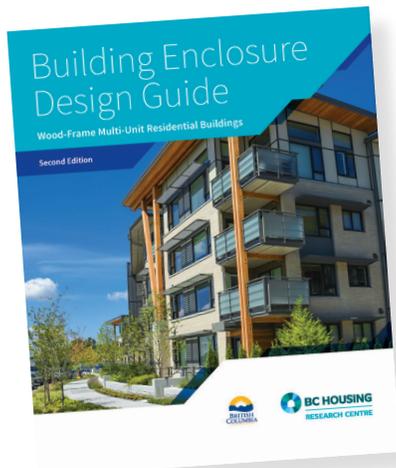
These bulletins provide information on emerging technical issues, new technologies, and best practices for builders, contractors, designers and other industry professionals, with the overall goal of improving the quality of residential construction in British Columbia.



**Status:** Bulletins and videos available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Building and Safety Standards Branch, warranty insurance providers, other stakeholders

**Audience:** Builders, contractors, developers, and the residential construction industry



## Building Enclosure Design Guide – Wood-Frame Multi-Unit Residential Buildings (Second Edition)

### Description

This guide explores current building science advances and best practices related to the design and construction of building enclosures of multi-unit, wood-frame residential buildings. It provides practical information and useful guidelines to help ensure efficient and durable building enclosures in new construction.

This revised second edition of the guide includes updates and lessons learned over the past nine years. Since the release of the first edition in 2011, there have been significant updates to the BC Building Code and City of Vancouver Building Bylaw which impacted the content of this guide. This includes changes to referenced energy standards as well as fenestration standards and various other industry standards.



**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

Order online at [www.crownpub.bc.ca](http://www.crownpub.bc.ca)

**Partners:** Building and Safety Standards Branch, Engineers and Geo-Scientists BC, Architectural Institute of British Columbia, Applied Science Technologists & Technicians of BC, warranty insurance providers, and other partners

**Audience:** Builders, contractors, architects, house designers, engineers, trades, suppliers, students, apprentices, and others involved in residential construction

### Impact

This guide outlines current best practices for the design and construction of wood-frame multi-unit buildings with the focus on heat, air and moisture transfer. It addresses the unique challenges presented by B.C.'s coastal climate, which has inspired advances in building envelope technology that have been adopted around the world.

## Building Envelope Guide for Houses – Part 9 Residential Construction (Second Edition)

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### Description

This updated guide builds on the previous Building Envelope Guide that was produced in 2007. It provides practical information regarding the design and construction of the building envelope for new homes constructed in accordance with Part 9 of the 2018 BC Building Code. The updates include basement water-proofing, damp proofing, soil gas provisions and insulation combinations that address water ingress, energy performance, condensation and soil gas concerns (including radon, methane and water vapour).

In addition to basement systems, the guide specifically addresses electrical meter boxes, exterior electrical penetrations, and the integration of these devices into the building enclosure without compromising water penetration control, airtightness, energy efficiency and electrical safety.

### Impact

The guide describes minimum requirements for the building envelope for houses, including requirements for rainscreen in coastal areas, as well as building practices for the design and construction of wall assemblies that go beyond the minimum requirements of the Code for best practices.



#### Status:

Guide available online at  
[www.bchousing.org](http://www.bchousing.org)

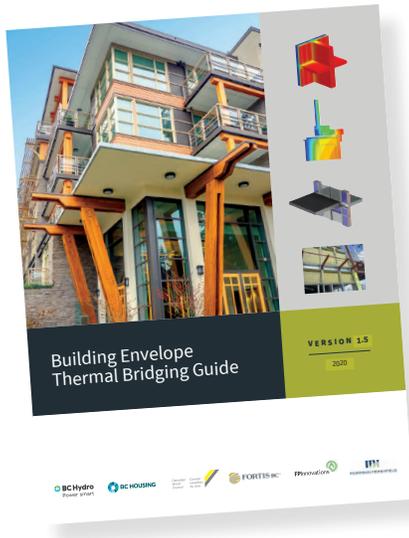
Order online at  
[www.crownpub.bc.ca](http://www.crownpub.bc.ca)

#### Partners:

Applied Science Technologists & Technicians of BC, Architectural Institute of British Columbia, Building and Safety Standards Branch, Building Officials' Association of B.C., Canadian Home Builders' Association, Concrete BC, Canadian Wood Council, Homebuilders Association Vancouver and Roofing Contractors Association of BC

#### Audience:

Builders, contractors, architects, house designers, building officials, engineers, trades, suppliers, students, apprentices, and others involved in residential construction



## Building Envelope Thermal Bridging Guide

### Description

This guide has been updated for the purpose of developing residential construction wall assemblies for wood-frame, concrete and steel-frame buildings.

Version 1.5 adds 33 new details and 165 new scenarios that includes generic details and assemblies. The updated version includes new assemblies such as steel-framed, precast-concrete, wood-framed, and roofing systems. Additional insulation scenarios have been added to walls and roofs to include solutions for all of Canada's climate zones and net-zero buildings.

The catalogue provides applications and insights demonstrated through four new video tutorials.

### Impact

By looking at current obstacles and showing opportunities to improve building envelope thermal performance, this guide aims to help the construction sector realize more energy efficient buildings.

**Status:** Guide available at [www.bchydro.com](http://www.bchydro.com) and [www.bchousing.org](http://www.bchousing.org)

**Partners:** BC Hydro, FortisBC, City of Vancouver, City of New Westminster, Canadian Wood Council, FPInnovations, and other partners

**Audience:** Researchers, design professionals, builders, developers, and the industry in general

## Building Smart Seminars, Workshops & Webinars

### Description

BC Housing works with industry partners to deliver Building Smart seminars, workshops and webinars province-wide. This popular seminar series provides builders with best building practices, up-to-date research, and Building Code information related to the construction and design of homes in B.C.

Building Smart is BC Housing’s signature program for knowledge mobilization in British Columbia. Sessions explore building science, new technologies, high performance housing, building enclosure design and construction, energy efficiency and sustainability, seismic safety requirements and topics of importance to the residential construction industry. More than 46,000 industry professionals have participated since the inception of the program.

Following the launch of Learning on Demand, a new online e-learning platform, industry professionals can access a series of pre-recorded Building Smart videos for self-paced learning and earn Continuing Professional Development (CPD) credits.

### Impact

The Building Smart seminar series and new Learning on Demand platform promote building best practice by sharing information about up-to-date research, advances in building science, new technologies, and Building Code requirements for the construction and design of safe, durable, high performance homes in B.C.



**Status:**

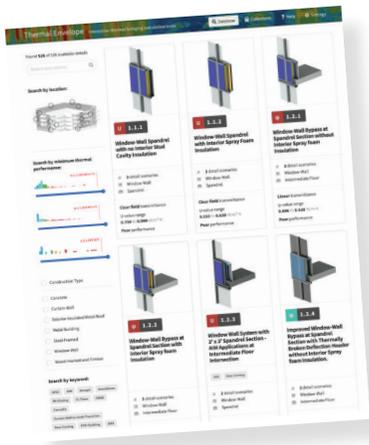
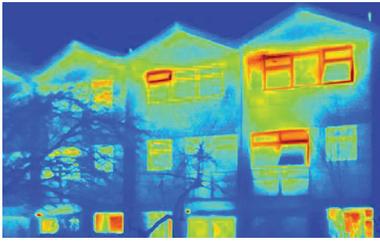
Register for ongoing seminars and Learning on Demand at: [learningondemand.bchousing.org](http://learningondemand.bchousing.org)

**Partners:**

Building and Safety Standards Branch, Canadian Home Builders’ Association of BC, Homebuilders Association Vancouver, Building Officials’ Association of BC, Architectural Institute of British Columbia, Engineers and Geoscientists BC, Applied Science Technologists & Technicians of BC, warranty insurance providers, other partners

**Audience:**

Builders, contractors, developers, architects, engineers, design professionals, building officials, building trades, home inspectors, and suppliers



## Canadian Thermal Bridging Construction Details Database

### Description

The project will develop an online database including more than 500 construction details and thermal calculations applicable to all types of buildings, energy standards, and climates across Canada. This unique platform has application for residential, commercial and institutional buildings.

The online tools use new calculation methods that allow industry stakeholders to more accurately calculate and mitigate thermal bridging, reduce energy use in buildings, and improve occupant comfort.

Industry professionals will be able to fully quantify thermal bridging and adopt innovative technologies to mitigate its impact on energy consumption. The new design tools will assist with more stringent code compliance, heating and ventilation load calculations, and input into building energy models.

#### Status:

Project underway

#### Partners:

Canada Mortgage and Housing Corporation, BC Hydro, Transition énergétique Québec, Manitoba Hydro, Canadian Wood Council, FPInnovations, Passive House Canada, Canadian Institute of Steel Construction, Canadian Steel Construction Council, Canadian Sheet Steel Building Institute, Exterior Insulation Finish Systems Council of Canada, Insulated Concrete Forms Manufacturers Association, City of Vancouver, City of Edmonton, City of Toronto

#### Audience:

Builders, architects, engineers, energy utilities, and other industry professionals

### Impact

This innovative project will transform the popular Building Envelope Thermal Bridging guide into a platform that enables industry-wide collaboration and sharing of information across disciplines. It will accelerate the development and adoption of Net-Zero Ready standards and enhance building design and construction. By providing essential resources for practitioners to better assess the thermal performance of the building envelope, this project will support the industry in selecting options that reduce greenhouse gas emissions in buildings.

## Design Guidelines for Condominium Balconies in British Columbia

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### Description

Condominiums are the predominant form of housing in Canada and the majority of new condos have balconies. A well designed balcony can enhance the quality of life for occupants, connecting them to the outdoors, providing fresh air, and appropriate levels of daylight.

Condo designers currently do not have climate-specific guidelines to compare design options for building forms or individual suites. As a result, these balcony spaces are often underutilized, and shade both the living spaces inside, and the units below.

The proposed research will quantify the various daylight, energy, and design impacts of various condo balcony options for cities in ASHRAE Climate Zones 5, 6, and 7. Creating a detailed 3D model of two case studies of condo balconies, the research will explore balcony locations and types on facades, model specific parameters of building form and site, as well as several interior suites. The study will also include climate-based daylight simulations to evaluate performance of these buildings and specific floor plans.

### Impact

The result will be a comprehensive simulation-based study, with findings illustrated in a user-friendly report with design guidelines for industry professionals. The research will encourage the design of high performance condominiums with a focus on balcony design to provide a quality outdoor amenity for people, while balancing energy and daylight performance.



**Status:** Project underway

**Partners:** Ryerson University, Toronto University

**Audience:** Architects, builders, city planners, design professionals, energy utilities, engineers, consumers, homeowners, housing designers, and warranty providers



## NEW PROJECT

### Status:

Project underway

### Partners:

Province of British Columbia, BC Hydro, City Vancouver, Condominium Home Owners Association, ZEBx, BC Non-Profit Housing Association, and Aboriginal Housing Management Association

### Audience:

Strata owners, strata councils, consumers, building owners, builders, and contractors

## Heat Pumps in Multi-Unit Residential Buildings

### Description

Multi-unit residential buildings can gain heat for several reasons, including older windows, poor window placement, a lack of shading, poor ventilation, and inefficient appliances and hot water systems. Active mechanical cooling is a solution to futureproof buildings due to overheating concerns. Installing a dedicated cooling system like a heat pump is a big commitment and can have implications. Adopting strategies that have the potential to reduce the amount of cooling needed before installing a cooling system can help lower energy use, utility costs and CO2 emissions.

This project will provide professional insights on changes strata councils and owners can make to help keep their homes as cool as possible using mechanical and non-mechanical cooling strategies. The research will review the process, provide guidelines for contractor selection, and outline selection design and installation considerations for heat pumps.

### Impact

This research provides guidelines on changes strata councils and owners can make to help keep their homes comfortable using mechanical and non-mechanical cooling strategies. It also communicates design intent of various existing wall and roof assemblies, as well as best practices to avoid damage to the building envelope when heat pumps are installed.

## High Performance Builder Training

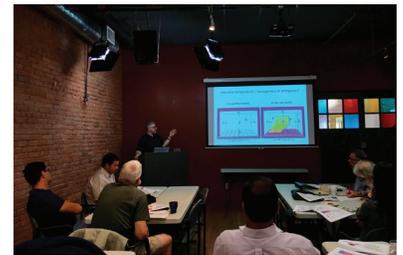
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### Description

The High Performance Builder Training program opens the door for building professionals across the province to access information and training in the five tiers of the Energy Step Code. This includes the pathway from the current BC Building Code requirements to net zero energy ready requirements for Part 9 residential buildings. The training program also contributes to CleanBC energy and Greenhouse Gas (GHG) reduction commitments. By producing and sharing training videos and case studies, this program is making high performance building education more accessible to B.C. building professionals.

### Impact

This project positively impacts the energy and GHG reduction commitments as articulated in CleanBC and the Province's *Clean Energy Act* by improving access to the information and training required by B.C.'s construction professionals to design and construct high performance, energy efficient buildings.



**Status:** Project underway

**Partners:** BC Hydro, FortisBC, the Province of BC

**Audience:** Builders, architects, engineers, and the residential construction industry



## Illustrated Guide – Achieving Airtight Buildings

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### Description

This guide consolidates information on achieving airtightness in buildings, with a specific focus on larger or more complex building types. Various jurisdictions are working to implement airtightness performance and testing requirements. This guide is intended to be an industry resource with respect to designing, building, and testing airtight buildings, while not compromising other aspects of building enclosure performance, including moisture management, thermal performance, and durability.

The information included in this guide applies mainly to mid- and high-rise (Part 3) wood-frame and noncombustible residential buildings within British Columbia. However, it is also applicable for larger or more complex low-rise (Part 9) wood-frame residential buildings and buildings with other occupancies.

### Impact

The Illustrated Guide – Achieving Airtight Buildings will help developers, builders and designers understand their respective responsibilities in building airtight buildings, ensuring that more buildings will be airtight, which is a key strategy to achieve energy efficiency and durability in buildings.

**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** City of Vancouver, BC Hydro

**Audience:** Builders, architects, engineers, professionals in the building development, design and construction industry

## Illustrated Guide – R22+ Effective Walls in Residential Construction in BC (Second Edition)

### Description

This guide consolidates information on above and below grade wall assemblies for low- and mid-rise buildings that are capable of achieving R-22 or greater effective thermal performance. It is intended to be an industry resource to meeting this thermal performance level, while not compromising other aspects of building enclosure performance, including moisture management, air leakage, and durability.

This second edition has a shift in focus from the original guide because of a change to the requirements by the City of Vancouver. It now includes information that applies to low-rise detached and semi-detached homes, row-houses/townhomes, and multi-unit residential buildings up to six storeys within British Columbia. The main focus is on wood-frame, concrete, and steel-frame walls that use traditional construction methods, with some guidance for other less common wall types. Fire risk considerations for low- and mid-rise buildings are also addressed.

### Impact

This guide was developed to assist builders and designers to construct walls that achieve R-22 or higher thermal performance.



**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

Order online at [www.crownpub.bc.ca](http://www.crownpub.bc.ca)

**Partners:** City of Vancouver, Building and Safety Standards Branch, City of New Westminster, FPInnovations, Canadian Wood Council, and other partners

**Audience:** Residential builders, architects, engineers, contractors, and the construction industry in general



## Illustrated Guide – R30+ Effective Vaulted and Flat Roofs in Residential Construction in British Columbia

### Description

This guide consolidates information on vaulted water shedding roofs and flat waterproof membrane roofs on low- and mid-rise wood-frame buildings which are capable meeting R-30 or greater effective thermal performance. The level of thermal performance is becoming part of energy performance improvements required by the BC Energy Step Code and the Vancouver Building Bylaw. The guide is intended to be an industry, utility, and government resource to meeting this thermal performance level, while not compromising other aspects of building enclosure performance, including moisture management, air leakage and durability.

This guide focuses on vaulted and flat (i.e. non-attic) roof assemblies which can achieve an effective thermal resistance of R-30 (RSI-5.3) or better while meeting the other performance requirements for roof assemblies. These insulated roof assemblies help to reduce the transmission of heat energy through the building enclosure. This reduces the heating and cooling loads of the building, and the overall building energy consumption.

### Impact

This illustrated guide will be a reliable industry resource to educate designers and builders on the pros and cons of different design strategies for roof assemblies which achieve an effective R-30 value or higher.

**Status:** Guide available online at [www.bchousing.org](http://www.bchousing.org)

Order online at [www.crownpub.bc.ca](http://www.crownpub.bc.ca)

**Partners:** Roofing Contractors Association of BC, City of Vancouver, City of New Westminster, City of North Vancouver, Canadian Wood Council, Architectural Institute of British Columbia, Canadian Home Builders' Association of BC

**Audience:** Builders, architects, engineers, and the residential construction industry

## Illustrated Guide – Seismic Bracing Requirements BC Building Code Part 9

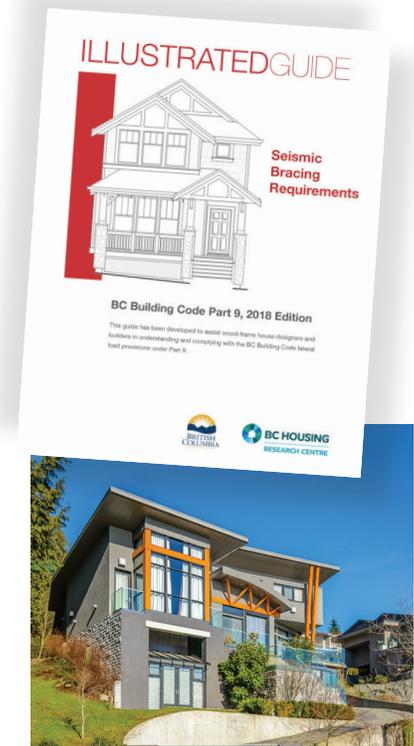
### Description

The Illustrated Guide for Seismic Design of Houses was updated to comply with changes to the BC Building Code (BCBC) for Part 9 Buildings. The guide outlines the new prescriptive lateral bracing requirements for buildings located in seismic zones as defined in the BCBC.

Using a step-by-step process and 3-D illustrated graphics, the guide explains design requirements, suggesting a sequence of applications using examples of houses representative of those built in seismic zones in British Columbia.

### Impact

This guide provides industry professionals and the building industry with practical solutions to comply with the December 2018 BC Building Code seismic requirements for Part 9 buildings.



#### Status:

Guide available online at  
[www.bchousing.org](http://www.bchousing.org)

Order online at  
[www.crownpub.bc.ca](http://www.crownpub.bc.ca)

#### Partners:

Building and Safety Standards Branch, Canadian Home Builders' Association of BC, Building Officials' Association of BC, City of Vancouver, City of Burnaby, FPInnovations, Canadian Wood Council, Architectural Institute of British Columbia, Engineers and Geoscientists BC, and Applied Science Technologists & Technicians of BC

#### Audience:

Builders, building officials, developers, architects, manufacturers, and other industry professionals



**Status:** Project underway

**Partners:** Building Safety and Standards Branch

**Audience:** Building industry, industry stakeholders, and the residential construction industry

## Illustrated Guide for Fire and Life Safety Requirements in Part 3 and 9 of the BC Building Code

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### Description

This guide addresses the fundamental concepts upon which the fire and life safety requirements of the British Columbia Building Code have been developed. Importantly, the guide also responds to industry concerns in applying these requirements.

The fire and life safety risk of a building is directly linked to the use of the building and is measured in terms of potential fire development and occupant egress, awareness and ability to evacuate respectively.

The document covers high-level concepts, including key definitions, occupancy classification, fire compartmentation and spatial separation with a focus on the application of those concepts in a residential context. The resulting guidance information and illustrations will help B.C.'s residential construction industry apply the requirements to residential design and construction.

### Impact

This guide provides the foundational information necessary to facilitate the appropriate application of the fire and life safety requirements, and the basis upon which more practical guidelines can be developed for B.C.'s residential construction industry.

## Integrated Design Process Education Project

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### Description

The Integrated Design Process (IDP) is a collaborative design approach that is intended to optimize performance, cost, occupant comfort and resilience of a residential building, while meeting all other owner objectives. IDP involves engaging the builder, the project owner, and their team of designers, mechanical contractor and energy advisor at the conceptual design stage in order to identify key goals and the best way to achieve them. In so doing, IDP helps avoid unforeseen challenges during construction and ensures that all expectations can be met. It can also help builders find the most cost-effective approaches to higher energy performance.

This project supports the adoption of IDP as a standard practice in the residential construction industry by working with leading industry professionals to develop educational content, tools, guidelines and industry capacity for IDP.

### Impact

By promoting the use of IDP as a standard practice in the residential construction industry, this project will improve the quality and efficiency of home construction in B.C.



**Status:** Project underway

**Partners:** BC Hydro, FortisBC, Canadian Association of Consulting Energy Advisors

**Audience:** Builders, building industry, energy advisors, building officials, and design professionals



**Status:** Project underway

**Partners:** Natural Resources Canada, Forest Innovation Investment, Canadian Wood Council, National Research Council Canada, FPInnovations

**Audience:** Architects, engineers, technologists, contractors, and industry professionals

## Technical Guide for the Design and Construction of Tall Wood Buildings in Canada

### Description

To support the Tall Wood Building initiative in Canada, FPInnovations published the 2014 Edition of the Technical Guide for the Design and Construction of Tall Wood Buildings in Canada (TWBG). More than 80 professionals were involved in developing this widely-recognized guide, which helped introduce the terms Mass Timber Construction and Hybrid Tall Wood Buildings. Since then, a number of tall wood buildings have been constructed, and the six-storey height limitation for a mass timber system will likely be raised to 12-storey in the 2020 Edition of the National Building Code in Canada (NBCC). The Government of B.C. also invited municipalities to adopt provisions in the 2020 NBCC for 12-storey mass timber buildings before these provisions are formally adopted in the BC Building Code.

The 2021 Edition of the TWBG will build on the fact that a 12-storey mass timber gravity system will likely be an acceptable solution in the revised National Building Code in Canada. Drawing information from buildings constructed to date, the guide will continue to support alternative solutions to go beyond 12-storeys, such as the Brock Commons building at the University of British Columbia in Vancouver.

### Impact

The updated Technical Guide for the Design and Construction of Tall Wood Buildings in Canada, combined with the Government of B.C.'s decision to allow municipalities to adopt the NBCC 2020 provisions, will create an environment in B.C. that supports the development of design and construction expertise in mass timber construction. This will also help to develop the B.C. supply chain for mass timber products.

## Testing R22+ Wall Assemblies

### Description

Building energy regulations are changing rapidly across Canada to meet government mandates to reduce energy consumption and greenhouse gas emissions. In British Columbia, the Energy Step Code was enacted in April 2017 for both Part 9 and Part 3 buildings to transition new housing stock to Net Zero energy ready by 2032.

This project tested wall assemblies most commonly used in B.C. to see how they meet the B.C. energy requirements and whether they can remain durable in a coastal climate. Six types of wood-frame walls with different thermal insulation strategies, all meeting the R22 effective (RSI 3.85) requirement were included. Hygrothermal performance measurements gathered over a 19 month period provided valuable data for designing durable and energy efficient wall assemblies.

### Impact

The goal of this project is to provide recommendations on durable and energy efficient wood-frame wall assemblies that can be readily used by builders.



**Status:** Project completed  
Available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Forestry Innovation  
Investment and other  
industry partners

**Audience:** Designers, builders,  
manufacturers, architects,  
and the residential  
construction industry



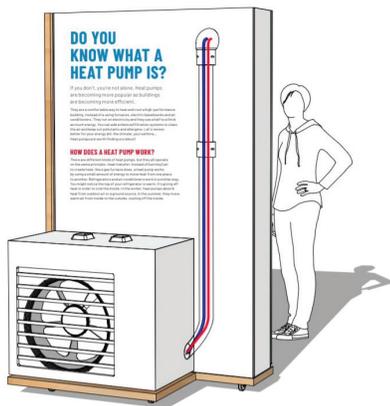
## Zero Energy Buildings and Heat Pumps Science Exhibit

### Description

British Columbia is a leader in the development of Net Zero Energy Ready buildings and the adoption of the Energy Step Code. While industry experts are very familiar with these concepts, BCIT, in partnership with BC Housing and other organizations, has developed an interactive science exhibit to educate a wider consumer and industry audience. The exhibit illustrates that high-performance building is a better way to build, and it's simple, comfortable and resilient.

The exhibit is based on two themes – envelope and ventilation and low carbon mechanical systems. Unveiled at Science World during the EcoCity World Summit in Vancouver, the exhibit showcases the science behind heat pumps along with interactive displays on radiation, heat recovery ventilators and more.

After a few months at Science World, the exhibit will visit key locations, including industry conferences such as Buildex, and various municipalities across B.C. from Victoria to Prince George and the Okanagan.



**Status:** Project underway

**Partners:** BC Hydro, City of Vancouver and CleanBC

**Audience:** Consumers, homeowners, design professionals, municipalities, and the residential construction industry

### Impact

Developing and showcasing this interactive exhibit will help B.C. consumer and industry audiences better understand the importance of high-performance Net Zero Energy Ready buildings. It is expected that over 300,000 visitors throughout the province will see this educational Building Science display.

## BC Energy Step Code Market Response Monitoring Project

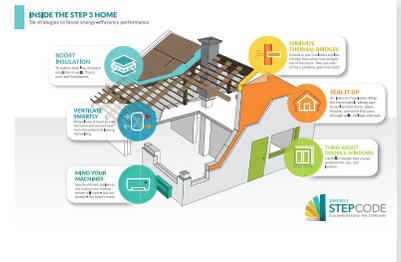
### Description

BC Housing and its partners are developing an ongoing monitoring and reporting process that tracks key indicators related to the implementation of the BC Energy Step Code.

This project aims to explore how the BC Energy Step Code is transforming the way the industry builds homes, as well as the potential impact on residential construction costs. The research also looks at how construction costs for homes built under the BC Energy Step Code are evolving over time across the different steps, housing archetypes (Part 3 and Part 9), and regions.

### Impact

This project will help governments and industry stakeholders identify and respond to any emerging challenges or barriers in building under the BC Energy Step Code.



**Status:** Project underway

**Partners:** BC Hydro, FortisBC, BC Ministry of Energy, Mines & Petroleum Resources, BC Energy Step Code Council members

**Audience:** Local governments, residential construction industry, professional associations, energy utilities, and other industry stakeholders



**Status:** Project underway

**Partners:** Greater Victoria Housing Society, Forestry Innovation Investment, Natural Sciences and Engineering Research Council of Canada

**Audience:** Architects, builders, design professionals, energy utilities, and professionals in the residential construction industry

## Building Performance Monitoring and Assessment of an Innovative Six-Storey Building in Victoria

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### Description

This research study aims to measure the performance of an innovative six-storey wood-frame building to validate design assumptions. The building proposed by the Greater Victoria Housing Society is designed to meet the high energy efficiency standards in Step 4 of the BC Energy Step Code for Part 3 buildings.

The building will be instrumented to allow for long-term monitoring of energy use, indoor air quality, building enclosure performance, acoustic behaviour and wood movement of the structure to better understand the in-service performance. The measured performance will be compared with design targets.

### Impact

Findings from this study will help to improve the design and operation of future five and six-storey wood-frame buildings pursuing Passive House or Upper Steps of the BC Energy Step Code.

## Comparison of Effectiveness of Ventilation Systems to Deliver Acceptable Indoor Air Quality in Individual Suites

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### Description

The purpose of this study is to evaluate the reliability of the commonly used ventilation systems in distributing fresh air to suite rooms, controlling cross-contamination between suites, and overcoming 'stack effect' to avoid pollutants migrating between floors. Complaints from occupants are increasing in multi-unit residential buildings (MURBS) due to cross contamination between suites and floors of laundry and kitchen odors from exhaust vents. This project will test a selection of units for airtightness and attic ventilation. It will assess their current condition and propose cost effective improvements to prevent pollutants from migrating between floors, and to minimize the re-entry of exhaust contaminants into nearby suites.

### Impact

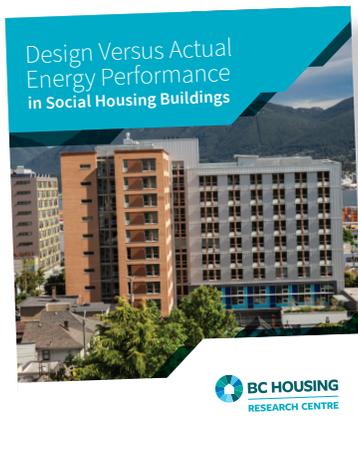
This project will compare a selection of ventilation systems used in B.C. and in Europe, based on their effectiveness for maintaining acceptable indoor air quality in the building suites, and recommend cost effective improvements.



**Status:** Project underway

**Partners:** British Columbia Institute of Technology

**Audience:** Builders, architects, engineers, and professionals in the residential construction industry



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** University of Victoria

**Audience:** Builders, developers, contractors, researchers, engineers, and the industry in general

## Design Versus Actual Energy Performance in Social Housing Buildings

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### Description

Green buildings that follow a third-party sustainability certification, are becoming more mainstream in Canada. BC Housing, along with some municipalities across the province, have mandated a certain level of sustainability for construction of multi-unit residential buildings. A requirement of most third-party rating systems is an energy model that indicates the expected energy usage of the building, post-construction and post-occupancy. This project was conducted in three phases. Phase one compared green buildings programs. Phase two collected performance data in 20 BC Housing buildings, and the final phase examined individual buildings.

### Impact

The purpose of this project is to identify major issues with building performance versus expected/modeled performance, and to find solutions for these problems moving forward.

## Exploring the State of Building Sector in Non-Metropolitan Areas of British Columbia

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### Description

There is concern that some communities in non-metropolitan B.C. may not have the resources necessary for taking on new residential construction projects and repairing and maintaining existing housing. With local contractors, skilled tradespeople and suppliers in short supply, residential construction projects could potentially be delayed or not initiated, leading to the possible deterioration of the housing stock in the community.

This study will look at the overall availability of residential construction resources in smaller B.C. communities by researching a range of newly constructed BC Housing projects and existing subsidized housing projects.

### Impact

This study will research the impact of residential construction resource shortages on the building sector in small B.C. communities in relation to new construction costs and the repair and maintenance of the existing housing stock.



#### NEW PROJECT

**Status:** Project underway

**Partners:** Community Development Institute of the University of Northern British Columbia

**Audience:** Builders, local governments, non-profit housing providers, and other industry professionals



## Exterior Air Barrier Research for Highly Insulated Deep Wall Assemblies in Cold Climates

### Description

The purpose of this study is to investigate the amount of moisture that is transported within a deep wall assembly through the process of natural convective air movement when an exterior air barrier is used.

Measurements will be collected to validate the hygrothermal model to provide long-term behavior under various climate scenarios. The influence of cavity insulation material properties will also be investigated.

### Impact

This research supports informed considerations when designing buildings to ensure long-term high performance and durability, as well as the health and safety of the occupants. The study will also help to identify buildable solutions for Step 5 Energy Code compliance in cold climates.

#### NEW PROJECT

**Status:** Project underway

**Partners:** University of Northern British Columbia

**Audience:** Building industry, design professionals, researchers, residential construction industry

## Field Evaluation of Roof Sheathing Surface Treatments – Asphalt Shingle Sloped Roofing Research Study (Phase 2)

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### Description

Low-slope vented roof assemblies are widely used in wood-frame construction throughout Canada. However, vented wood-frame assemblies have posed consistent durability and moisture challenges in the Pacific Northwest climate. This study identifies the main wetting mechanisms, potential for mould growth, and what the typical air leakage is in low-slope roofs as compared to conventional roofs. To assess best practice, the project includes a literature review, survey of roof renewals, field monitoring and testing, energy simulations and industry guidelines.

### Impact

This study quantifies the risk and identifies safe insulation and ventilation strategies for low-sloped roofs.



**Status:** Project available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** Roofing Contractors Association of BC, Canadian Wood Council

**Audience:** Builders, developers, contractors, engineers, architects, and the industry in general



## Impacts of Oxygen Deprivation and Noxious Gas Circulation During Fire Development in Energy Efficient Homes

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### Description

Fires in single family homes contribute to the highest incidence of fire fatalities in British Columbia and Canada. There is limited information on the evolution and circulation of toxic fire gases that result from burning homes. These gases may be exasperated by airtightness in energy efficient homes. This research will systematically investigate temperatures, oxygen deprivation, carbon monoxide, other gas species distributions and hot gas movement in a two-storey structure during a fire. Research results will improve understanding of the differences in fire dynamics associated with ventilation limited fires when compared with ventilated fires. The project will also evaluate the impact of ventilation limited conditions on evacuation and fire service.

### Impact

This research project will improve understanding of differences in fire dynamics associated with ventilation limited fires when compared with ventilated fires.

**Status:** Project underway

**Partners:** Natural Sciences and Engineering Research Council, University of Waterloo

**Audience:** Local governments, policy makers, architects, builders, designers, developers, and the residential construction industry

## Improving Efficiency in Hydronic Radiant Heating Systems

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### Description

The purpose of the study is to assess and verify savings related to hydronic heating systems in multi-unit residential buildings (MURBs). The research involves the use of the EndoTherm additive in a number of BC Housing directly managed buildings and measuring the expected energy savings after a few months of installation. This pilot project aligns with BC Housing's mandate to reduce greenhouse gas emissions in its portfolio. Comparing the weather normalized pre-addition of the hydronic system additive EndoTherm to post-addition heating energy in the design and construction of residential buildings may prove to have large impacts on building efficiencies and provide additional residential construction options.

Results of this pilot study, examining 12 existing multi-unit residential buildings in B.C.'s Lower Mainland, are outlined in the Builder Insight technical bulletin on this topic: Improving Efficiency in Hydronic Radiant Heating Systems.

### Impact

This project will influence members of the construction industry to consider options for increasing energy efficiency and assess and verify savings related to hydronic systems.



**Status:** Available online at [www.bchousing.org](http://www.bchousing.org)

**Audience:** Builders, building officials, developers, architects, manufacturers, and other industry professionals



## Indoor Air Quality in BC Social Housing Buildings

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### Description

This report aims to quantify indoor air quality in existing multi-unit social housing buildings in British Columbia. It identifies the current state of indoor conditions in a selection of buildings and the impact of building enclosure and ventilation system retrofit measures. Research objectives will be met through airtightness testing and long-term monitoring of environmental conditions within suites pre- and post-retrofit of building enclosure and mechanical systems.

Findings from this report will be quantified using relative humidity, dewpoint temperature, and carbon dioxide concentrations to measure the efficiency of building envelope retrofits to address indoor air quality concerns.

### Impact

This research project will help identify the impact of retrofit measures on the indoor air quality and determine if current retrofit practices need to be improved.

**Status:** Project underway

**Partners:** Canada Mortgage and Housing Corporation

**Audience:** Builders, designers, non-profit housing associations, and others in the residential construction industry

## Innovative Procurement in Social Housing Construction – Documenting the First IPD Project in British Columbia

### Description

While collaboration is not new to the construction industry, it is only recently that a cohesive method of project delivery has been formalized through Integrated Project Delivery (IPD).

IPD is an innovative building project procurement strategy that requires early involvement of key participants. Multiple individuals take an interest in the project’s success, share risks and rewards, co-develop project outcomes and share cost savings. In this model, the success of the stakeholders is determined by the success of the project. The process consists of the following five factors: early involvement of key participants, shared risk and reward based on project outcomes, joint project control, reduced liability exposure, and jointly developed and validated targets.

BC Housing, Vancouver Coastal Health, and the City of Vancouver are working together to deliver the first project in British Columbia through the IPD model. The project studies the impact of the IPD model to deliver the project on time and within budget.

### Impact

The research will develop and advance knowledge and best practices on delivering a project with multiple stakeholders and high-performance building targets using an IPD model.



**Status:** Project underway

**Partners:** Vancouver Coastal Health, City of Vancouver

**Audience:** Builders, developers, contractors, design professionals, and the industry in general



## Monitoring Indoor Air Quality in a Six-Storey Passive Building in Fort St. John

### Description

Indoor air quality is an important design consideration and becomes particularly important for highly energy efficient buildings; but is heavily influenced by climate and occupant behaviour. This monitoring study aims to collect data on building envelope performance and indoor air quality from a highly energy efficient, six-storey wood-frame residential building located in climate zone 7A in northern British Columbia. The building design meets Passive House standard to minimize space heating needs in the winter.

### Impact

This study provides information that will assist the building sector in developing durable, comfortable, and energy efficient buildings for cold climates.

**Status:** Project underway

**Partners:** FPInnovations

**Audience:** Researchers, builders, contractors, architects, students, designers, energy advisors, and others involved in residential construction

## Sound Transmission of Wood-Frame Wall Assemblies

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### Description

There is interest in obtaining acoustical data on the transmission loss of wood-frame wall types and facades recommended by building envelope engineers in British Columbia. To date, the industry does not have data on typical envelopes, specifically current split insulation and rainscreen assemblies, and transmission loss models have not been validated. Research to obtain acoustical data on the sound transmission loss of wood-frame wall types and facades is recommended by building envelope engineers in British Columbia.

### Impact

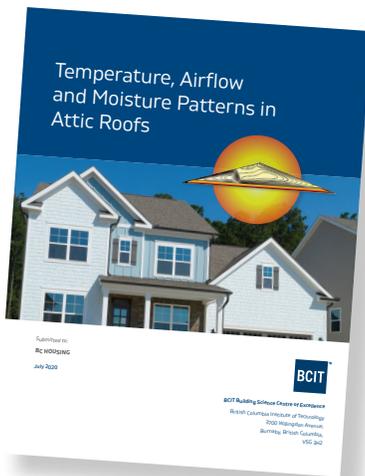
This project will investigate transmission loss of wood-frame wall type assemblies, provide transmission loss data for assessment of building facades and facade elements, and examine the acoustical performance of whole building envelopes.



**Status:** Project underway

**Partners:** British Columbia Institute of Technology, Natural Resources Canada

**Audience:** Builders, contractors, and other industry professionals



**Status:** Report available online at [www.bchousing.org](http://www.bchousing.org)

**Partners:** British Columbia Institute of Technology (BCIT), Natural Sciences and Engineering Research Council of Canada

**Audience:** Builders, developers, contractors, design professionals and other industry professionals

## Temperature, Airflow and Moisture Patterns in Attic Roofs

### Description

Hygrothermal performance analysis of a ventilated attic is used to study excessive moisture accumulation and durability of the attic structural components. This project builds upon BCIT's Building Science Centre of Excellence attic airflow research. Using computational fluid dynamics (CFD) and HAMFit 2D hygrothermal modelling, this research provides in-depth insight into the heat, air, and moisture transfers in an attic roof. In addition to climatic conditions, the study considers attic insulation levels, including a highly insulated attic roof case, ceiling airtightness levels and roof slopes.

Locations in the attic roof system that are susceptible to moisture damage are investigated in detail. The outdoor wind pressure effect on the sheathing moisture content is also studied. Results show that the roof sheathing maintains smaller amounts of humidity under a reduced insulation thickness. In addition, the roof sheathing parts in close proximity to the attic baffle, near the soffit region, are the most susceptible to moisture damage. The effect of ceiling leakage is higher in the upper parts of the sheathing.

### Impact

This research enhances understanding of hygrothermal performance considerations for the design and construction of durable and energy efficient attic roof systems. It identifies areas in the attic roof where moisture damage risk is expected to be higher and where extreme temperatures may affect the roof durability.

## Vienna House – Innovative High Performing Affordable Housing Research

### Description

BC Housing is developing an innovative zero-emissions rental apartment community in Vancouver. The Vienna House project is a partnership between BC Housing, the City of Vancouver through the Vancouver Affordable Housing Agency, and the More Than a Roof Housing Society. It is also part of a unique collaboration between the City of Vancouver and the City of Vienna, Austria.

Vienna House aims to demonstrate innovation and serve as a learning showcase for British Columbia's residential construction industry. Research partners will study the suitability of high-performance prefabricated systems to solve housing challenges and share lessons learned with industry and policymakers in other cities facing similar challenges.

### Impact

The lessons learned from Vienna House—including knowledge exchange between the City of Vancouver and the City of Vienna—will inform future sustainable and affordable housing projects in Vancouver, the province, and beyond. The construction project will provide 100 comfortable, efficient, and affordable homes.



#### NEW PROJECT

**Status:** Project underway

**Partners:** City of Vancouver, Vancouver Affordable Housing Agency, More Than a Roof Housing Society

**Audience:** Architects, building industry, construction industry, construction professionals, design professionals, developers, engineers, non-profit housing providers, planners, researchers, residential construction industry



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