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

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Reflects sustainable housing solutions and a commitment to environmental and social responsibility.
Socio-Economic Research

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

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.

› **Consumer protection** – 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.
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 modern communications such as social media, as well as lessons learned from non-market housing developments across British Columbia. The toolkit addresses when and how to engage the community, how to work toward community support for your development, and provides examples of how to successfully deliver non-market housing. 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 communities to use a variety of tools to gain community acceptance of new affordable and supportive housing.
Community Acceptance of Supportive Housing – Case Study Series

Description

This case study series focuses on research of supportive housing projects for individuals who were homeless, or at-risk of homelessness. The series looks at five different sites across British Columbia in Kelowna, Vancouver, Abbotsford, Surrey and Victoria.

The purpose of this research is to help future sites better address neighbourhood concerns at the initial stages of a project. The case studies focus on the types of concerns raised by neighbours of supportive housing developments, whether these concerns changed over time and the number of calls to police in the neighbourhood before and after site opening. This research also highlights lessons learned, as well as the strategies and actions taken by housing providers to address concerns, and build positive relationships with neighbours.

Impact

The Community Acceptance of Supportive Housing – Case Study Series helps future sites to better address neighbourhood concerns at the initial stages of a project.

Status: Reports available online at www.bchousing.org

Audience: Non-profit housing providers, municipalities, developers and other stakeholders
Exploring Impacts of Non-Market Housing on Surrounding Property Values – Case Study Overview Report

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 Property Values Case Study Overview 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.
Modular Housing Outcomes – Understanding Impacts for Residents and Local Communities

Description

In 2017, the Government of British Columbia announced the Rapid Response to Homelessness Program as an immediate response to address homelessness across the province. 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 seven 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

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

Audience: Non-profit housing providers, community associations, policy makers, other housing stakeholders
Province of BC Homeless Counts 2018

Description

This report and the 12 related community profiles summarize 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.

Impact

The 2018 Report on Homeless Counts in B.C. provides baseline information to measure progress. It also provides valuable information about the estimated number, key demographics and service needs of people who experience homelessness in B.C.
Research Summary: Community Benefits of Supportive Housing

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 BC Housing research that demonstrate the positive impact of supportive housing for communities.

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

Impact

This Research Summary demonstrates the benefits of supportive housing for communities to address concerns and increase understanding and acceptance.
Social Return on Investment (SROI) of Affordable Housing Development

Description

This study explores the Social Return on Investment (SROI) of constructing affordable housing in B.C. SROI analysis combines quantitative, qualitative, and participatory research techniques to demonstrate the value of outcomes from different stakeholder perspectives. The result is a SROI ratio that compares investment to the financial value of social outcomes achieved, showing — in monetary terms — the financial benefit of social investments.

Four affordable housing developments receiving investment from BC Housing were examined as case studies: Dahli Place and Pembroke Mews in Victoria, Qualicum Park Village in Qualicum Beach and Ellendale in Surrey. This study provides a snapshot of the range of value created through affordable housing in B.C., leading to a deeper appreciation of the overall social and economic value of investment.

Impact

The Social Return on Investment of Affordable Housing Development report shows that a range of significant social and economic value is created through investment in affordable and supportive housing.
Social Return on Investment (SROI) on Dedicated-Site Supportive Housing Development

Description

This study explores the Social Return on Investment (SROI) of operating dedicated-site supportive housing in British Columbia. SROI analysis combines quantitative, qualitative, and participatory research techniques to demonstrate the value of outcomes from different stakeholder perspectives. The result is a SROI ratio that compares investment to the financial value of social outcomes achieved, showing the financial benefit of social investments.

Five case studies of dedicated-site supportive housing programs receiving investment from BC Housing are featured: The Budzey Building in Vancouver, Cardington Apartments in Kelowna, The Kettle on Burrard in Vancouver, Queens Manor in Victoria and Wesley Street in Nanaimo. These case studies illustrate the range of supportive housing options across the province and the range of value created by dedicated-site supportive housing in B.C., leading to a deeper appreciation of the overall social and economic value of investment.

Impact

The Social Return on Investment on Dedicated-Site Supportive Housing Development report shows that a range of significant social and economic value is created through investment in affordable and supportive housing.

Status: Report available online at www.bchousing.org

Audience: Non-profit housing providers, municipalities, developers and other industry stakeholders
Social Return on Investment (SROI) on Scattered-Site Supportive Housing Development

Description

This study explores the Social Return on Investment (SROI) of operating scattered-site supportive housing in British Columbia. SROI analysis combines quantitative, qualitative, and participatory research techniques to demonstrate the value of outcomes from different stakeholder perspectives. The result is a SROI ratio that compares investment to the financial value of social outcomes achieved, showing the financial benefit of social investments.

Five case studies of scattered-site supportive housing programs receiving investment from BC Housing are featured: CMHA Kelowna in Kelowna, CMHA Mid-island in Nanaimo, Lookout Housing and Health Society in Surrey, MPA Society in Vancouver and Pacifica Housing in Victoria. These case studies illustrate the range of supportive housing options across the province and the range of value created by scattered-site supportive housing in B.C., leading to a deeper appreciation of the overall social and economic value of investment.

Impact

The Social Return on Investment on Scattered-Site Supportive Housing Development report shows that a range of significant social and economic value is created through investment in affordable and supportive housing.
Supportive Housing Outcomes Evaluation

Description

The purpose of this evaluation is to determine if the investment in supportive housing results in positive outcomes for residents. This study examines the impacts of provincially-funded supportive housing and homeless rent supplement programs on quality-of-life, finances, housing, health, and justice outcomes for at-risk residents and homeless prevention program rent supplement recipients.

This report does not show the full spectrum of financial impacts of supportive housing on provincial government spending in the areas of health, income assistance, and justice.

Impact

The Supportive Housing Outcomes Evaluation will support building community acceptance of supportive housing and can be used in presentations to council and town hall meetings to address community concerns. The report demonstrates positive impacts of supportive housing, including improved health, reduced use of emergency health services (e.g. ambulance and emergency rooms), and reduced involvement in the criminal justice system.

Status: Project underway

Partners: Office of Housing and Construction Standards, Ministry of Health, Ministry of Social Development

Audience: Non-profit housing providers, municipalities, provincial and federal government, developers, neighbours of supportive housing, other stakeholders
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 100 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 report summarizes three years of indicators, including program statistics, program outcomes, and demographics of those accessing WTHSP programs. It also shows data aggregated among 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. 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.
Housing Options for Vulnerable Youth and Young Adults in BC

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 LGBTQ25+, 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

Partners: Simon Fraser University, School of Public Policy

Audience: Non-profit housing providers, municipalities, developers and other stakeholders
Interim Guide to Indigenous Housing, Development and Design

Description
Designing and building homes that better meet the needs of First Nations 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 across 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.
Understanding Housing Issues in Northern British Columbia

Description

This report seeks to address priority areas highlighted in Canada’s National Housing Strategy (NHS), which are intimately interwoven in the housing landscape and fabric of northern communities. Numerous issues covered in this research highlight the need to frame and address new research, policy, and investments for rural and northern housing. The research also aims to help bring about improvements in residential construction that focus on energy efficient, affordable and accessible housing.

Rural and northern housing in Canada is as complex as the rural and northern landscapes themselves. This report focuses on the research and information exchange directly related to the priority areas in Canada’s NHS, such as housing stock and appropriateness, as well as availability of housing options for identified vulnerable populations.

Impact

Understanding Housing Issues in Northern British Columbia will support the development, management and administration of subsidized housing to provide more affordable housing in rural and urban areas of B.C.
Building Knowledge and Capacity for Affordable Housing in Small BC Communities

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.
Community Housing for Resilient Communities

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 will be made 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 available online at chra-achru.ca

Partners: Vancity, Real Estate Foundation of BC

Audience: Building industry, researchers, housing providers and other levels of government
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 supply 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 cost of land 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 household burden many renters face when housing and transportation costs are considered together.

Impact

This study aims to increase transit-oriented affordable rental housing in Metro Vancouver.
Affordable Housing Redevelopment Lessons Learned: Building Knowledge Case Study

Description
This case study series highlights examples of how BC Housing has worked with non-profit providers to redevelop their sites. These reports capture lessons learned to share with non-profit housing providers and other stakeholders in British Columbia and across Canada who may be considering redevelopment.

The Affordable Housing Redevelopment Case Study series is intended to spark ideas by offering various strategies and techniques utilized in the redevelopment of four sites across the province. The four sites highlighted in this series are: Lynnhaven Society in Abbotsford, New Fountain Shelter in Vancouver, Pleasantvale in Kelowna and Kiwanis Towers in Richmond.

Impact
The Affordable Housing Redevelopment Lessons Learned: Building Knowledge Case Study series supports the non-profit sector in building capacity and finding ways to become more self-sufficient and increase housing options.

Status: Report available online at www.bchousing.org

Audience: Non-profit housing providers, municipalities, developers and other stakeholders
Business Transformation in the Community Non-Profit Housing Sector

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 funder/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.
Comparative Analysis of Mixed Model Developments in Meeting Canadian Housing Objectives

Description

The purpose of this research is to identify and demonstrate how mixed model developments can be achieved and sustained. This study will also promote a broader understanding of the key success factors for providing affordable housing within these mixed model developments.

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

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

Impact

The study will provide 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.
Mixed Tenure Case Study Series

Description

The purpose of this research study is to analyze opportunities and challenges posed by using mixed model development to achieve broader housing objectives.

This research examines five developments in the province of B.C. that involve mixed tenure, rental rates, and use, to understand the political, economic and social motivations that lead to this form of development and their operational benefits and challenges. Throughout the history of urban development, cities have attempted multiple urban development strategies for low income households.

As a method of revitalizing urban areas while mitigating the impacts of gentrification, the development of mixed use, mixed income buildings has emerged. While these methods have become a more common urban planning practice, the impacts of mixed use, mixed income developments on the urban poor has been relatively unexamined. This research analyzes five case studies across B.C. and provides insight on the benefits and challenges of this development type.

Impact

The Mixed Tenure Case Study Series will help demonstrate the motivations, financial considerations, different approaches, successful strategies, benefits, and challenges to mixed tenure housing.
Consumer Seminars

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 owners investment and 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 educational seminars educate homebuyers and homeowners on the importance of maintenance and a range of residential construction topics of interest.

Status: Seminars delivered as opportunities arise
Partners: Condominium Home Owners Association of BC, Canadian Condominium Institute, Homebuilders Association Vancouver
Audience: Consumers, builders, developers, and warranty providers
Energy Efficient Lighting Technologies for Multi-Unit Residential Buildings

Description

Lighting technologies and controls are changing rapidly, providing options for multi-unit residential buildings. The Condominium Home Owners Association of BC has identified options for lighting retrofits that reduce maintenance costs associated with lamp replacement, improve safety and security, reduce energy costs and contribute to a better lifestyle and environment. This guide addresses the key issues when replacing the lighting system in multi-unit residential buildings in B.C.

Impact

This step-by-step guide illustrates how to upgrade to Light Emitting Diodes (LED) in condominium and multi-unit residential buildings outlining the details from a case study example.

Status: Report available online at www.bchousing.org

Partners: Condominium Home Owners Association of BC

Audience: Homeowners, builders, developers, and the general public
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: Window and Door Replacement, The Impact of Delayed Maintenance and Renewals on Buildings, Replacing Podium Waterproofing, Repairing and Replacing Window Wall Systems, and Make-up Air Units and Corridor Pressurization.

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 19 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
Videos available on BC Housing’s YouTube channel
New bulletins are currently under development

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
Solar Photovoltaic Systems for Multi-Unit Residential Buildings

Description

Solar photovoltaic (PV) system prices have dropped considerably. Low and mid-rise multi-unit residential buildings typically have larger roofing areas for the installation of a PV system, and the energy benefits may offset some of the buildings’ common electricity consumption. The Condominium Home Owners Association of BC has identified that the installation of solar photovoltaic systems on the roofs of low and mid-rise strata-owned residential buildings can be a financially beneficial investment. This guide provides comprehensive information on installing a PV system.

Impact

This guide will help inform builders and other industry professionals about how to install a PV system.
Cost and Benefits of Constructing to Post-Earthquake Operational Standards

Description
This report studies the estimated cost implications of select BC Housing buildings to be designed as post-earthquake operational as opposed to their current design for life safety/collapse prevention as per BC Building codes. The report uses eight BC Housing buildings as archetypes, reviews their design standards and structural approaches, and estimates the additional costs to build these buildings designed to be operational post-earthquake. The report aims to prepare for future buildings to be built to a post-earthquake operational standard meaning that after a major earthquake, there will be fewer building demolitions, less people displaced, and communities returning to normalcy 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.

Status: Project underway
Partners: Natural Resources Canada
Audience: Government audience initially with possible pilot projects within or beyond BC Housing
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, and 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.
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 and local home builders’ associations also played 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 events such as the Builder Technology Forums which took place in Vancouver, Kelowna, Prince George, Victoria, Nanaimo and Surrey. Videos have also been created showcasing lessons learned and successes of Net Zero level construction in the Lower Mainland, the Okanagan and around Prince George.

Impact

Local Energy Efficiency Partnerships aim to assess and screen technologies and conduct field trials to create educational and informational materials to guide energy efficient construction in our province.

Status: A multi-year project with videos available online at www.bchousing.org

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

Audience: Builders, suppliers, utilities and local government
Mobilizing Building Adaptation and Resilience

Description

Mobilizing Building Adaptation and Resilience (MBAR) is a new, 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 entails creating and curating a body of knowledge (and tools) to inform development, design and management decisions around new construction and renovation of buildings. The project will include 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) and help building owners and occupants better protect their investments and adapt to anticipated climate change stresses (e.g. higher precipitation, warmer summers, fire-related air pollution) and climate change shocks (e.g. severe flooding/fire/windstorms).

Impact

MBAR will accelerate the uptake of resilient design in Canada, contribute to climate and disaster resilience in local communities and socio-economic vitality, as well as reduce the risk of injury, building damage, and loss of life.

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
Modular Housing and the Affordable Housing Sector

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

Description

This research study will focus on the technical specifications for a building design tool to enhance the frequency of social contact in building design options to maximize 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 social housing tenants. 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 will provide 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 will identify lessons learned in other jurisdictions and explore barriers and opportunities for implementation in British Columbia. The research will showcase 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 will include findings and recommendations for addressing planning regulations, warranty provisions and cultural aspects for implementing tiny houses into new or established B.C. neighbourhoods.

Status: Project to be completed in 2019

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

Audience: Consumers, warranty providers, developers, planners, builders
**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.

**Status:**

Available online at www.bchousing.org for Lower Steps of the BC Energy Step Code

Updated versions to include Upper Steps planned for 2019 and 2020

**Partners:**

BC Hydro, FortisBC,

**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.

NEW PROJECT
Status: Available online at 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

Description

Air sealing and insulation retrofits of homes are reliable methods to reduce energy consumption, improve durability, reduce utility bills for the home owner, and reduce 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

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

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. The goals of the guide are to increase the level of awareness in the industry about the importance of site and foundation drainage, and to ultimately reduce the risk of post-construction water ingress into below-grade spaces, which is understood to be an increasing issue for warranty providers, insurers, and homeowners.

Impact

This guide will educate 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.

Status: Updated version planned for 2019

Audience: Builders, contractors, developers, designers and building officials
Builder Insight Technical Bulletins

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. The series includes 13 bulletins and two companion videos on select topics with future editions in the works. The bulletins 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 bulletins are developed based on industry requirements. For a detailed overview of changes to Part 9 of the BC Building Code 2018, see Builder Insight No. 17. These residential construction related changes are based on the 2015 National Building Code, and include updates to sound transmission requirements, seismic design and climatic data, as well as updates for stairs, handrails and guards.

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.
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 six 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.

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.

Status: Guide available online at www.bchousing.org
Order online at www.crownpub.bc.ca

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

Audience: Builders, contractors, architects, house designers, engineers, trades, suppliers, students, apprentices, and others involved in residential construction
Building Envelope Guide for Houses – Part 9 Residential Construction

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 waterproofing, 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.
Building Envelope Retrofit for Improved Durability and Energy Performance

Description

Adding exterior insulation is considered the most effective solution to improve both durability and energy performance of older wood-frame multi-unit residential buildings (MURBs). However, the effect of such thermal upgrades on building envelope performance and on whole-building energy use in wood-based MURBS has rarely been studied. This project investigates post-retrofit building envelope hygrothermal performance of MURBs with exterior insulation added during the building envelope retrofit.

Impact

This project will provide best practice guidelines, evidenced by case studies, for building envelope retrofit and assess the effect of building envelope thermal upgrades on whole-building energy consumption.

Status: Project to be completed by winter 2021
Partners: FPInnovations, BC Hydro, FortisBC
Audience: Builders, developers, contractors, design professionals and the industry in general
Building Envelope Thermal Bridging Guide
(Second Edition)

Description

This guide has been updated for the purpose of developing residential construction wall assemblies for wood-frame, concrete and steel-frame buildings. Version 1.2 expands the thermal performance catalogue to over 400 construction detail assemblies. It includes steel-framed walls, cladding attachments, thermally broken components, and a detailed analysis for mitigating thermal bridges at wall interfaces. It addresses concrete walls, thermally broken precast concrete, insulated floor columns, and brick veneer interfaces. 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 B.C. construction sector realize more energy efficient buildings.


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 other topics of importance to the residential construction industry. More than 44,000 industry professionals have participated since the inception of the program with 5,200 taking part in sessions last year to learn about changes to the BC Building Code.

BC Housing has a reputation as a leading provider of building science-related research and education in British Columbia. Researchers and residential construction experts from across the country share their knowledge and insights at Building Smart workshops and seminars. Understanding and interpreting Building Code is a complex process. BC Housing helps bridge Code knowledge and research gaps with training programs and resources to ensure that B.C. Licensed Residential Builders have opportunities to meet and surpass their Continuing Professional Development requirements.

Impact

The Building Smart seminar series promotes 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.
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 under-utilized, 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 B.C. cities in ASHRAE Climate Zones 5, 6, and 7. Creating a detailed 3D model of two case studies of B.C. 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.
Guide to Low Thermal Energy Demand for Large Buildings

Description

This guide aims to broaden the common understanding of how large buildings can meet higher levels of performance as required by Passive House, BC Energy Step Code, City of Vancouver Zero Emission Building Plan, and City of Toronto Zero Emissions Building Framework. It compares thermal bridging methodology to ISO and Passive House, and identifies the impact and implications for Part 3 buildings in B.C. This guide focuses on current Canadian code requirements, construction practice and tested systems.

Impact

The goal of this project is to provide guidance on the different thermal bridging standards and methods for determining thermal energy demand.
High Performance Builder Training

**Description**

The High Performance Builder Training program will open 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 will also contribute to CleanBC energy and Greenhouse Gas (GHG) reduction commitments. By producing and sharing training videos and case studies, this program will make high performance building education more accessible to B.C. building professionals.

**Impact**

This project will positively impact 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.

**NEW PROJECT**

**Status:** Project underway

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

**Partners:** Builders, architects, engineers, and the residential construction industry
Illustrated Guide – Achieving Airtight Buildings

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.

**Description**

This guide consolidates information on above and below grade wall assemblies for low- and mid-rise buildings that are capable of achieving R22 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 R22 or higher thermal performance.

**Status:** Guide available online at www.bchousing.org
Order online at www.crownpub.bc.ca

**Partners:** City of Vancouver, Building and Safety Standards Branch, City of New Westminster, FPInnovations, Canadian Wood Council, 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
Order online at 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 for Building Safe and Durable Wood Decks and Balconies

Description

While wood decks and balconies can be robust and long-lasting structures, they can be challenging to design and construct, primarily because of their exposure to the elements. This guide provides an overview of commonly occurring durability issues and is an excellent resource for designing, constructing, and maintaining wood deck and balcony structures. The information is relevant for single and multi-family wood-frame residential buildings in British Columbia.

Impact

This guide is intended to assist designers and builders construct safe and durable wood deck and balcony structures.

Status: Guide available online at www.bchousing.org

Partners: New home warranty providers, Canadian Wood Council

Audience: Builders, architects, engineers, and the construction industry in general

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
Order online at www.crownpub.bc.ca

Partners:

Audience:
Builders, building officials, developers, architects, manufacturers, and other industry professionals
Mid-Rise Best Practice Guide – Proven Construction Techniques for Five- and Six-Storey Wood-Frame Buildings

Description

This guide spotlights five mid-rise wood-frame construction projects with different geographic and market conditions – from small towns to dense urban centres and affordable rental accommodation to high-end condominiums. With more than 100 five- and six-storey wood-frame buildings completed in B.C. since 2009, and many others designed or under construction, there is clear market confidence in this new type of building. This construction supports the goals of many municipalities: to find affordable and sustainable ways to accommodate their growing populations, as well as create more complete and resilient communities.

Impact

This guide outlines the best practices for wood-frame construction in mid-rise buildings from five building projects that are representative of the different geographic and market conditions in British Columbia.
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-storeys 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 2020 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 R-22+ 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 will test wall assemblies that will be most commonly used in B.C. to meet the new energy requirements to generate performance data and help improve related hygrothermal modelling and building envelope design.

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 to be completed in 2021

Partners: Forestry Innovation Investment and other industry partners

Audience: Designers, builders, manufacturers, architects, 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 Telus World of Science 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.

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.
Alkali Lake Health & Wellness Centre

Description

The Alkali Lake Health & Wellness Centre features five supportive recovery beds and culturally appropriate recovery and stabilization services for Indigenous people in the Thompson Cariboo region. The centre was the first Net Zero Energy Ready building to be designed and built on First Nations land. The project also tested the use of high performance technologies in a northern location.

As a result of the project, the Esk’etemc and other Indigenous people will be better able to consider moving to Net Zero Ready on their construction projects. They now have the opportunity to use a template for design and construction on their upcoming buildings (daycare, elders’ centre and band office). A video was developed showcasing the project, which is available on the BC Housing website.

Impact

This project represents the first Net Zero Energy Ready building to be designed and built on First Nations land using high performance technologies in a northern location.
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


Audience: Local governments, residential construction industry, professional associations, energy utilities and other industry stakeholders
BC Energy Step Code Metrics Research

Description

This study explores and anticipates the implications of the BC Energy Step Code in terms of its impact on the design and construction sector. More specifically, the study is designed to identify potential design solutions and other technical responses to the Step Code (e.g. design and construction practices).

This report also anticipates implementation impacts of the proposed metrics and targets, including both benefits and outcomes relative to building size, climate zone, greenhouse gas (GHG) emissions, peak electrical demand, first and operating costs, and lifecycle GHG abatement costs. The study aims to identify any modifications needed to the Step Code to ensure that it effectively and efficiently achieves the desired outcomes, while mitigating negative impacts.

Impact

The BC Energy Step Code Metrics Research explores and anticipates the implications of the Step Code in terms of its key impacts on the development, design and construction sector.

Status: Report available online at www.bchousing.org

Partners: Energy Step Code Council, Building and Safety Standards Branch, BC Hydro, City of Vancouver

Audience: All levels of government, and construction industry, professional associations, energy utilities and other industry stakeholders
British Columbia Post Disaster Building Assessment Framework and Recommendations

Description

This research provides a framework and guidelines for local and regional disaster planning and emergency preparedness across Canada. The goal of Post-Disaster Building Assessment (PDBA) is to enable communities to more rapidly assess the safety of structures, and allow people to remain in or return to their homes and businesses as soon as possible.

The PDBA framework identifies key concepts to support community-level emergency planning and building assessment as well as recommendations for implementation and the sustainability of the program.

Impact

The purpose of the Post-Disaster Building Assessment is to empower non-credentialed professionals to perform safety assessments in an emergency or disaster and reduce the impact on emergency and social service resources.

NEW PROJECT

Status: Report available online at www.bchousing.org

Partners: Architectural Institute of British Columbia, Engineers and Geoscientists of British Columbia, Justice Institute of British Columbia, Public Works and Government Services of Canada

Audience: Provincial and federal government, municipalities, government and policy makers, building officials, Indigenous communities, professional associations, health authorities, engineers, architects, city planners, home inspectors and warranty providers.
Building Performance Monitoring and Assessment of an Innovative Six-Storey Building in Victoria

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.
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.

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 GHG emissions in buildings.

NEW PROJECT

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

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.
Considerations for Detailing the Closure Penetration and Gypsum Fire Separation Wall Interface

Description

Vertical gypsum fire separation walls that have fire-resistive ratings evaluated in accordance with a recognized standard are permitted for use in building construction. When approved doors are inserted in such walls, the details must be presented for consideration as an alternative solution. This guide is based on observations of two CAN/ULC S101 (ULC, 2007) tests on gypsum fire separation walls with S104 (ULC, 2010) approved closure penetrations. It is intended to inform designers about potential issues that might impact the performance of a closure penetration in gypsum separation walls that use a thick wood-based sheathing (i.e. combustible) for carrying the weight of the fire door assembly.

General guidance is provided on sizing the sheathing and the need for protecting the sheathing from fire, while permitting the assembly to accommodate building movements in-service. This guide augments the standard practice for developing an alternative solution. It provides a complete description of all steps required to develop an alternative solution. Recognizing that there may be several possible design solutions, this guide offers principles to follow and does not prescribe specific details.

Impact

The purpose of this guide is to recommend considerations when designing the interface between a fire door (closure penetration) in gypsum separation walls to ensure best building practices.
Deep Building Enclosure Energy Retrofit Study (Phase 2)

Description

Phase 1 of the Deep Building Enclosure Energy Retrofit project focused on the cost-effective implementation of energy efficiency measures as part of enclosure renewals work at a pilot building. Phase 2 will focus on the retrofit of the building’s mechanical ventilation system to realize further energy savings and improve the interior environment for occupants.

The performance of the existing system was extensively measured and monitored during the initial phase of the study, providing a unique opportunity to compare pre- and post-retrofit performance data for ventilation and energy consumption. Opportunities for this type of pre- and post-retrofit comparison in multi-unit residential buildings (MURBs) are extremely rare and highly valuable for confirming system performance.

Impact

This project will expand the industry’s understanding of the design, implementation, and performance of heat recovery ventilator retrofits in MURBs and facilitate the development of educational and guideline material to move the industry towards healthier and more energy efficient buildings.
Design Versus Actual Energy Performance in Green Buildings

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. Despite achieving the sustainable building certifications targeted, many buildings constructed within the past five to seven years, have not been performing as expected when compared to their energy models. This project will be conducted in three phases. Phase one will compare green buildings programs. Phase two will collect performance data in 20 BC Housing buildings and the final phase will examine individual buildings.

Impact

The purpose of this project is to identify major issues with building performance versus expectedmodeled performance, and to find solutions for these problems moving forward.
Developing Durable Wood-Frame Building Envelope Systems for Net-Zero Energy Ready Buildings

Description

Approximately one third of Canada’s greenhouse gas emissions are attributed to the energy consumption of buildings. The residential sector accounts for approximately 16% of Canada’s energy use and 15% of its greenhouse gas emission. To meet government mandates for reducing greenhouse gas emissions and to offset climate change, energy efficiency requirements for buildings within national, provincial, and municipal building codes across Canada and the US have been rapidly changing in recent years.

As well as generating knowledge of the hygrothermal performance of energy efficient wood-frame envelope systems, this project will help the construction industry meet more stringent requirements for building energy efficiency mandated by building codes across the country. The project will also help to improve design and construction quality of the changed building envelope assemblies and prevent premature building envelope failures during extensive building code changes driven by higher energy efficiency requirements.

Impact

The goal of this project is to advance knowledge and best practices for constructing energy efficient, cost effective and sustainable residential buildings with ensured long-term durability.
Energy Efficiency Related to Hydronic Heating Systems in MURBs

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 GHG 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.

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: Project underway

Audience: Builders, building officials, developers, architects, manufacturers, and other industry professionals
Field Evaluation of Roof Sheathing Surface Treatments – Asphalt Shingle Sloped Roofing Research Study (Phase 2)

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

The objective of this study is to quantify the risk and identify safe insulation and ventilation strategies for low-sloped roofs.
Impacts of Oxygen Deprivation and Noxious Gas Circulation During Fire Development in Energy Efficient Homes

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
Indigenous Housing Series: Building Knowledge Case Studies

Description

The purpose of this case study series is to highlight 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. 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.
Indoor Air Quality in BC Social Housing Buildings

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 BC Housing 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.
Innovative Procurement in Social Housing Construction – Documenting the First Integrated Project Delivery (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 outcome, 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 project will develop and advance knowledge and best practices on delivering a project with multiple stakeholders and high-performance building targets using an IPD model.
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.
Residential Solar Power Systems for Affordable Housing in BC

Description

In 2009, as part of a project to create a zero-emissions building complex, a solar photovoltaic (PV) system was installed at the Greenbrook public housing site in Surrey, British Columbia. This research report looks back at the project details and lessons learned to educate the construction industry about PV systems, which are now more affordable and in higher demand.

The objective of the renovation project was to reduce the greenhouse gas (GHG) emissions of the complex by 90%. To offset the remaining 10%, the project implemented the largest PV installation in western Canada at the time. This resulted in the site being almost carbon neutral.

Impact

This research report reviews the project details and lessons learned about PV systems for affordable housing in B.C. as a financially beneficial option.
Sound Transmission of Wood-Frame Wall Assemblies

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 Province 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 completion in late 2019
Partners: British Columbia Institute of Technology, Natural Resources Canada
Audience: Builders, contractors and other industry professionals
Structural Considerations for Frame Supported Gypsum Area Separation Firewalls

Description

The National Building Code of Canada (NBCC) permits firewalls – having a fire-resistance rating of not more than two hours – to be constructed with non-combustible materials other than masonry or concrete. One type of system is proprietary firewalls offered by the gypsum industry. This guide provides information on gypsum firewalls and design considerations when used with wood-frame construction meeting the requirements of the NBCC. Structural issues are explored so that due attention is paid to the structural detailing of these firewalls to ensure that they are sufficiently robust and will perform as expected.

Impact

This guide provides background information on gypsum firewalls and design considerations when gypsum firewalls are used with wood-frame construction.

Status: Available online at www.bchousing.org

Partners: FPInnovations, Forestry Innovation Investment, Province of British Columbia, Ministry of Technology, Innovation and Citizens’ Services

Audience: Builders, engineers, educators, researchers, and the construction industry in general
Using Overhangs to Reduce Building Facade Exposure to Rain

Description
Overhangs are a traditional approach used to protect building facades from rain. However, their effectiveness to protect a building from wetting due to wind-driven rain has never been quantified under field conditions, especially for mid-rise and taller buildings. This research project explores this concept by fitting a six-storey BC Housing building in British Columbia’s Lower Mainland with a retractable overhang and instruments to measure weather and wetting. It assesses the wind-driven rain loads on mid-rise multi-unit buildings and evaluates the impact. Technical solutions to reduce building envelope failures related to wind-driven rain are included as well as recommendations for building envelope detail design.

Impact
The research makes design recommendations for roof overhang widths to protect mid-rise buildings from rain damage.

Status: Report available at www.bchousing.org
Partners: Concordia University, Natural Resources Canada, FPInnovations
Audience: Researchers, design professionals, builders, developers and the industry in general