

CONSUMER GUIDE



Window and Door Replacement

Even well maintained windows and doors will eventually need to be replaced due to age, wear and tear, and exposure to weather. Rising energy costs, drafts, condensation and aging appearance are a few signs that it's time to replace the doors and windows in your home or multi-unit residential building.

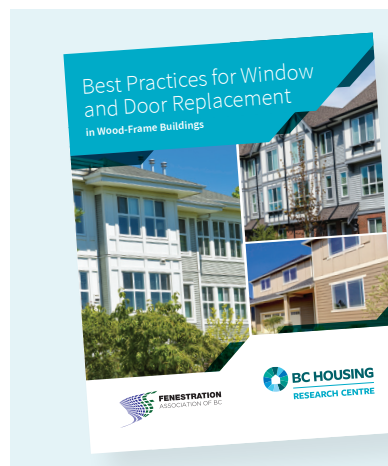


This guide addresses the key issues homeowners should consider when replacing windows and doors, from the initial conversation with replacement contractors, to products, installation options and maintenance. The term replacement contractor refers to any business that sells and installs window and door replacement products.

Although this publication focuses on wood-frame buildings (both single family residential and multi-unit buildings), many of the principles also apply to mid and high-rise buildings with concrete and steel-stud exterior walls.

This consumer guide gives homeowners the information they need to ensure their window and door replacement projects meet the highest standards. The publication serves as a companion to the industry guide Best Practices for Window and Door Replacement in Wood-Frame Buildings. Homeowners are encouraged to deal with replacement contractors who follow the principles outlined in the industry best practices guide.

This consumer guide, produced by BC Housing, was prepared by RDH Building Engineering Science in collaboration with Canada Mortgage and Housing Corporation, Fenestration Association of BC, BC Hydro, and the City of Vancouver.



This consumer guide is a companion to the industry guide Best Practices for Window and Door Replacement in Wood-Frame Buildings.

Getting Ready

As you start thinking about replacing your windows and doors, ask yourself these questions:

- What do you like about your current windows and doors (appearance, trim, operation)?
- What problems do they have (cold drafts, overheating, poor operation, water leaks, condensation)?
- Do existing operable windows work well? Are they located where you would like them to be? Do they allow enough natural ventilation?
- Are there any fixed windows you would like to replace with operable windows?
- Would you like to improve the security of your windows and doors, or reduce outdoor noise due to traffic or other sources?
- Is energy efficiency a primary goal for your replacement project? Do you want to take advantage of existing energy efficiency incentive programs? Replacing windows and doors is not simply a matter of swapping standardized components, like replacing tires on your car. Unlike tires, windows and doors have traditionally been installed as permanent elements within walls with no provision for future replacement.

Replacement of windows and doors is a complex process that involves:

- Cutting into a wall and disturbing the existing measures for controlling air and water penetration
- Removing all or part of the existing window framing
- Minimizing the disruption to the existing finishes
- Installing the new window or door to achieve air and water tightness

The variety of wall types, and window and door products makes this process challenging.

Meeting With Your Replacement Contractor

While you will likely have many questions for your replacement contractor, they will also have many questions for you. The replacement contractor will start by assessing the scope of the project and will need to examine both the outside and inside of the home or multi-family property. They will also look for water penetration or moisture intrusion problems related to windows and doors. If some are visible, then the contractor should assess whether or not the problems can be solved by replacing the windows or doors. They will determine if issues need to be addressed separately by appropriate professional consultants or specialized contractors.



Exposure to rain is a key consideration for the replacement contractor. Exposed windows and doors should have an appropriate water-penetration resistance rating and be installed with methods recommended for exposed conditions.

Discuss the following key questions with your replacement contractor as part of your information-gathering process.

How can I select a replacement contractor?

The following steps will help you choose a replacement contractor:

- Insist on references from both customers, and window and door manufacturers
- Request their WorkSafeBC clearance letter and evidence of their general liability insurance
- Find out how long they have been in business
- Consider written assurance that work will be performed according to the voluntary specifications outlined in BC Housing's industry guide entitled Best Practices for Window and Door Replacement in Wood-Frame Buildings

Why select a contractor who follows the best practices?

The Best Practices for Window and Door Replacement in Wood-Frame Buildings guide establishes a consistent

and sound standard of practice for the replacement contractor. It also identifies factors that need to be addressed in a successful window and door replacement project. Choosing a replacement contractor who follows the principles in this guide will help minimize the risk of problems and ensure the best long-term performance.

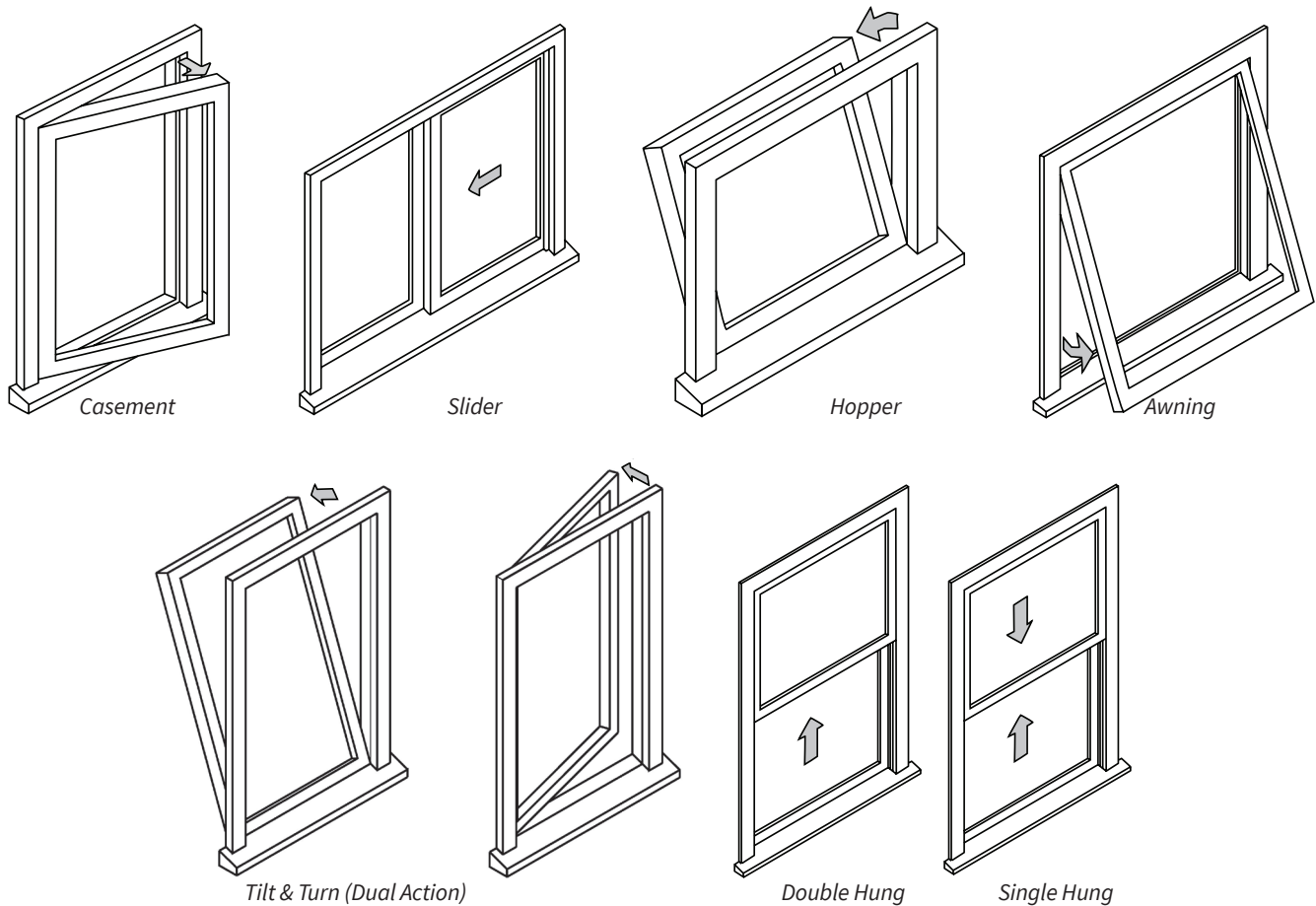
Ask prospective contractors if they follow the best practices guide and whether they are willing to commit, in writing, to perform the work according to the guide's voluntary specifications. Include this commitment in your contract with them.

Contact the Fenestration Association of BC (FENBC) if you have questions or concerns about the information provided by the replacement contractor you are considering for your project. FENBC has a list of third-party consultants and companies that can offer their knowledge to the consumer.

How can I take advantage of energy efficiency incentive programs?

If you intend to take advantage of a window replacement incentive program, learn about the program's requirements before you commit to a particular contractor. Incentive programs may require you to begin with an energy audit in order to be eligible for the rebates. This audit may identify other energy efficiency measures you may wish to consider. Replacement contractors can help you understand and access incentive programs.





However, be sure you thoroughly understand the rebate requirements before committing to particular products and a replacement contractor.

Can I improve the natural ventilation provided by my windows? Can I change the type and arrangement of the operating windows?

Natural ventilation through windows may be improved by exploring the location and type of operable window units.

You will probably be able to improve ventilation by using more operable units, preferably located on opposite or adjacent walls to encourage cross ventilation.

When cross ventilation is not possible, a single window can ventilate a room most effectively when it can be opened in a way that encourages air to move in at the lower portion of the window, and flow out at the top.

Many different types of operable windows are available.

Ask your replacement contractor about different styles of operators and how they impact appearance, ventilation, security and ease of use.

How can windows make my home more secure or keep noise out?

Windows and glass doors with laminated glass can be effective in blocking outdoor noise. When combined with appropriate hardware, they can also be highly resistant to forced entry. Some companies specialize in offering products with noise-blocking or higher security options.

How much work will need to be done to the walls?

Knowing the extent of work required for the walls is important to fully determine the scope and cost of the window replacement project. The type of wall cladding, the style of replacement window, and the rain exposure conditions all affect how much work must be done to the walls.

Depending on what style of windows you have now, and the type and condition of the existing wall, it may not be possible or practical to install the new windows and doors in exactly the same way. However, in many cases, replacement windows can be installed in ways that minimize disturbance to the existing walls. The addition of trim at the window perimeter can help to integrate the new windows and doors into the existing walls and minimize disruption to the wall itself.

You should discuss the merits of various approaches to installation with your replacement contractor.

Will the replacement project fix the water penetration problems?

Water leakage is often assumed to originate from the nearest window or door, but it could be related to problems in the adjacent walls, the roof, or the interface between the window and the wall. It's important to understand the cause of any existing problems in order to determine whether the window and door replacement project will address the leaks. If the source of the water cannot be addressed by the replacement project, you will need the help of an appropriate contractor or consultant to determine the cause.

How disruptive will the construction be?

The amount of disruption caused by the replacement

project will primarily depend on the installation methods and on the extent of work affecting the existing walls. Normally, work is done from both the exterior and the interior, but is localized to the immediate vicinity of the window and doors. The replacement contractor will require access to all rooms that contain windows and doors. Depending on the scope and complexity of the project, the construction time may vary from a few days to several weeks.

My house may contain lead paint or asbestos. How will these be addressed, if they exist?

Depending on its age, your house may contain building materials that are now considered hazardous and are no longer used. Paint used on older buildings may contain lead, and materials such as vermiculite insulation, plaster, stucco, siding materials and even some sealants may contain asbestos.

As owners, you are responsible for providing the contractor with information necessary to identify these hazards. Some window and door installation methods will not disturb these materials, while others are more disruptive. If you are not certain about the presence of these substances, it's wise to consult a specialist contractor to do the necessary sampling and testing. Understand the implications before committing to a window and door replacement project.



Will the improved airtightness affect the potential for back-drafting and carbon monoxide (CO) risk in my home?

The improved airtightness of new windows and doors, and how they are installed, can result in an increased risk of back-drafting from combustion appliances, such as gas stoves and fireplaces. If other aspects of the home have been improved, such as attic insulation and air sealing, it is advisable to have some simple testing done to evaluate the potential for CO backdrafting.

The Best Practices for Window and Door Replacement in Wood-Frame Buildings guide provides further information and references with respect to CO. As a minimum precaution, you should install CO monitors if they are not already in the home. Your replacement contractor will also be able to direct you to the appropriate resources should your home need additional or improved mechanical ventilation.

Will the improved airtightness affect condensation? How will this be addressed?

Are there indications of condensation problems inside the home? Condensation may be an indication of inadequate ventilation or excessive moisture generation within the home. The new windows and doors will be more airtight, which is a good thing from a thermal comfort and energy perspective. However, greater airtightness can also lead to increased condensation if the existing ventilation system is not adequate. You may need to tune up your

existing ventilation system, or replace it with new energy efficient ventilation. Your replacement contractor may or may not be able to assist you in addressing ventilation issues in your home. The Thermal Environmental Comfort Association (www.teca.ca) may be able to assist you in identifying appropriate mechanical ventilation contractors.

How long will the replacement windows and doors last?

Windows typically have a life span of 20 to 50 years. This can vary significantly depending on the type of windows and the level of exposure to weather. While certain types of windows may cost more, a longer service life will provide a better investment over the long term. Ask the replacement contractor about the service life expectancy of different types of windows and doors, as well as what warranties apply to both the products and installation.

What maintenance is required for new windows and doors?

Windows and doors require ongoing maintenance to ensure good long-term performance. The replacement contractor should be able to provide a maintenance plan that includes regular inspection of exposed sealants and weather seals, cleaning, adjustments, and minor repairs and replacement of materials. You can also consult the Maintenance Matters bulletins on residential windows and exterior doors, available at www.bchousing.org.



This next section will guide you through the process of selecting and installing energy efficient window and door products with helpful tips and examples.

Exposure to Rain Considerations

It is not unusual for some windows and doors in your house to be somewhat sheltered from the rain and for others to be very exposed. For replacement windows to last as long as possible, it's important to identify high exposure conditions. This will ensure that the new windows and doors do not make the walls more vulnerable to damage from water penetration.

Doors are generally less resistant to water penetration than windows. When they cannot be protected from exposure to wind-driven rain, they should be replaced with doors that have an appropriate water penetration resistance rating.

Some traditional replacement installation practices do not adequately take exposure to rain into account and can result in premature failure. The examples provided in the Best Practices for Window and Door Replacement in Wood-Frame Buildings guide are classified according to their suitability for use in situations of low exposure to rain, or alternately, moderate to high exposure to rain.



These windows are exposed to wind-driven rain. Water resistant products and installation methods must be used.

Water Penetration

Water is every building's greatest enemy. Whether it penetrates the wall from the outside, or accumulates within the wall in the form of vapour, the most costly and common cause of building enclosure damage is poorly controlled water penetration through walls, roofs and foundations. Mould is a related hazard that can arise from the presence of moisture.

If the walls were damaged by water penetration or excessive humidity, due to the condition of existing windows and doors, the new installation will help manage these risks. At the same time, not all the windows and doors in your home are subject to the same water penetration risk. Some window and door locations will likely need greater resistance to water penetration than others.

Evaluating the exposure to rain is a key part of the discussion that you should have with your replacement contractor. These decisions have a significant impact on product selection, installation detailing and cost, as well as on the long-term effectiveness and value of the replacement.



The upper windows on this home are protected by overhangs, allowing for more options when selecting products or evaluating installation methods.

Energy Efficiency

One of the primary reasons for replacing windows and doors may be the energy savings associated with better-performing products and a more airtight installation. The amount of energy saved will depend on the climate, the type of existing windows and doors, the airtightness of the existing building, the amount of window area, window orientation and shading, and the energy performance characteristics of the new windows and doors.

Energy savings can be estimated through computer modeling done by an energy advisor. Replacing older single-glazed aluminum framed windows with energy efficient products can reduce heating energy consumption by as much as 30 to 40%.

There are three commonly used terms to describe the energy performance of windows, doors and skylights, including:

U-Factor

This is a measure of the overall rate of heat transfer through the entire window or door product. While the rate of heat transfer varies through the frame, the glass edge and the centre of glass, the U-Factor represents the combined rate of heat transfer through all of these

components. Lower U-Factors are always desirable as they represent less heat transfer (primarily winter heat loss) and therefore less energy needed for heating and cooling.

Solar Heat Gain Coefficient (SHGC)

This is the proportion of solar radiation transferred through the window or door, and is a decimal fraction between zero (no solar radiation passing to the interior) and 1.0 (a hole in the wall, where all of the solar radiation passes to the interior). Windows with high solar heat gain can reduce the need for heating in winter. However, in some buildings it is also beneficial to reduce solar heat gain in summer for comfort or to reduce the need for cooling. When using high SHGC windows to maximize heat gains in the winter, it is wise to use external shading to minimize unwanted heat gain in the summer by means of trees, roof overhangs, awnings or exterior shades.

Energy Rating (ER)

This is a value used to compare the energy performance of windows under winter conditions only. It is calculated using a formula that evaluates both heat lost through the window and incoming heat captured during the day from the sun. The higher the ER number, the more energy efficient the product.



A comparison between a large single-pane fixed window with a narrow frame (left) and a sub-divided window with a wider frame, operable sashes and less glass area (right), illustrates how replacement windows can affect the appearance of a home.

The regulations for the Energy Efficiency Act (EEA) establish minimum energy performance requirements for windows and glazed doors sold in B.C. The Act requires all windows and doors sold in B.C. to display labels. These labels verify a window’s energy performance characteristics, whether installed in new homes or as replacement products in existing homes. The windows should arrive at your home with temporary labels showing the U-Factor. The labels may show additional information as well, as in the sample label below. ENERGY STAR® is a voluntary program that identifies windows and doors with superior energy performance ratings. For more information visit Natural Resources Canada (energystar.nrcan.gc.ca).

Sample of an ENERGY STAR® product label.

ENERGY STAR® Certified in Canada Certifié ENERGY STAR au Canada	
 Canada energystar.gc.ca	
DO NOT REMOVE UNTIL FINAL INSPECTION/NE PAS RETIRER AVANT L'INSPECTION FINALE	
Energy Performance Ratings Évaluation des propriétés énergétiques	
U-Factor Facteur-U 1.10 <small>W/m²·K</small>	Solar Heat Gain Coefficient Coefficient de gain de chaleur solaire 0.35
Energy Rating Rendement énergétique 36	Visual Transmittance Transmission visible 0.53
Window Company Ltd. Triple X Operable Casement Vinyl frame, triple glaze, Low-e coating (e=0.022, S3, S5) Krypton/air filled (both cavities), Grills <=13mm WCTXCAP0.022G	
	Energy performance and visual transmittance ratings certified to CSA A440.2-14 . Ratings are determined for a fixed set of environmental conditions and a specific product. Certification agency does not recommend or warrant product for any specific use. Les taux de performance énergétique et de transmission visible sont certifiés CSA A440.2-14 . Les taux sont déterminés selon une série de conditions environnementales fixes et une taille de produit particulière. L'agence de certification ne recommande ni ne garantit le produit aux fins d'utilisation particulière.

Window and Door Products

Many types of window and door products are available, most having better energy performance than in the past. Differences in frame material, glass panes and coatings, as well as differences in the type of operation are some of the variables to consider. You should explore the alternatives that may be suitable for your building with your replacement contractor.

Some changes may be necessary in order to meet current building code requirements, such as the ability to escape a bedroom in the event of fire. Others will depend on available technology. For example, double/triple-pane windows typically have wider frames and heavier glass, and cannot be supplied in the very large sizes that were possible with single-pane windows.

Consumers should insist on products that meet the BC Energy Efficiency Standards Regulation or ENERGY STAR®, and have labels showing their certified energy performance. The windows should also meet a variety of performance requirements such as water penetration resistance, air leakage and structural wind load resistance. The labels on the windows will indicate these performance levels and the replacement contractor should confirm that the ratings are appropriate for your location. Appropriate ratings are listed in the Appendix section of the Best Practices for Window and Door Replacement in Wood-Frame Buildings guide.

Condensation performance is almost always improved because more energy efficient replacement products have warmer interior surfaces and are therefore less prone to condensation. Of course, a more airtight home, or one with higher relative humidity levels, may need additional ventilation to help manage condensation.

The new window and door products will also provide improved performance with respect to sound transmission. This is primarily because of the upgrade from single to double, or triple glazing and improved airtightness of the installed windows and doors.

Window and Door Installation

Because of the many variables in a window or door replacement project, an appropriate installation method is as important as the choice of product. For example, the installation must consider how much the windows and doors are exposed to rain, and the type of adjacent wall cladding. It's also important that the interface between the window or door and the wall is adequately watertight and airtight, durable, and can be reasonably maintained.

Each building will have distinct characteristics and features that will affect the installation details. In some cases it makes sense to add exterior wood trim at the window perimeter to create an effective interface. Similarly, interior trim is sometimes added to hide damage to existing finishes, as well as sealants and other materials used to install new windows and doors. Changes to the interior trim might make it necessary to modify how existing drapes or blinds are installed.

The replacement installation sometimes needs to be more robust than the original installation. This may be the case if there is moisture-related deterioration in the vicinity of the window or door.

Replacement Process Steps

Step 1 The replacement contractor assesses the exterior environment and determines the rain exposure conditions. They will also assess the performance grade for the new windows and doors.

Step 2 The environment inside the home is also assessed. The replacement contractor asks the homeowners about their objectives for the new windows and about problems they may have with the existing ones. The home is inspected for water penetration and other performance issues.

Step 3 Replacement product options and the installation methods are discussed. The installation method must be appropriate for the home's rain exposure conditions.

Step 4 Depending on the replacement method agreed on, part or all of the existing windows will be removed. In most cases it is possible to minimize disturbance to existing interior finishes, and in some cases, to the exterior finishes as well.

Step 5 The new window and door products will be labeled to show they have the correct performance grade and energy efficiency properties that comply with the B.C. Energy Efficiency Act. These labels show they meet minimum quality requirements and may be eligible for incentive and rebate programs.

Key Objectives

Several key objectives must be met for a successful installation, regardless of the existing wall type or the choice of replacement products:

- ▶ **Identify and address rain exposure conditions**
This will affect both product selection and the installation details.
- ▶ **Develop an appropriate water penetration control strategy**
The Best Practices for Window and Door Replacement in Wood-Frame Buildings guide provides strategies for both low and moderate-high exposure conditions.
- ▶ **Ensure air barrier continuity**
This is important for energy savings, water penetration control, comfort and noise control.
- ▶ **Minimize condensation risk**
Apply installation procedures that use metal flashing and anchors that do not conduct heat to the exterior.
- ▶ **Provide structural anchoring and support**
Ensure new windows and doors are adequately supported and attached to the wall framing.

Action Plan Tips

- ❑ Select a replacement contractor who follows the principles outlined in the Best Practices for Window and Door Replacement in Wood-Frame Buildings.
- ❑ Make a list of things that you like and dislike about your current windows and doors.
- ❑ Make a list of current problems you are experiencing with your windows and doors.
- ❑ Investigate energy retrofit incentive programs.
- ❑ Discuss the following items with your replacement contractor:
 - Appropriate window and door products, and installation methods for the typical weather exposure at your home
 - General arrangement, colour, location and size of fixed and operable windows, and insulating glass properties
 - Potential presence of hazardous substances that may be affected by the replacement project
 - Maintenance instructions

More Information

- › Best Practices for Window and Door Replacement in Wood-Frame Buildings guide
- › Residential Windows and Exterior Doors, Maintenance Matters
- › Subscribe to receive Maintenance Matters bulletins
- › All publications are available at www.bchousing.org



Notice to Readers

This bulletin is intended to provide readers with general information only. Issues and problems related to buildings and construction are complicated and may have a variety of causes. Readers are urged not to rely simply on this bulletin and to consult with appropriate and reputable professionals and construction specialists before taking any specific action. The authors, contributors, funders, and publishers assume no liability for the accuracy of the statements made or for any damage, loss, injury or expense that may be incurred or suffered as a result of the use of or reliance on the contents of this bulletin. The views expressed do not necessarily represent those of individual contributors or BC Housing. The regulations under the Homeowner Protection Act contain specific provisions requiring owners to mitigate and restrict damage to their homes and permitting warranty providers to exclude coverage for damage caused or made worse by negligent or improper maintenance. These apply to both new and building envelope renovated homes covered by home warranty insurance. Failure to carry out proper maintenance or carrying out improper maintenance either yourself or through qualified or unqualified personnel may negatively affect your warranty coverage. It is important for the property owner to read and review their warranty documents to understand how to file any claims and correspondence in the proper written form directly with the warranty company. Refer to your home warranty insurance documentation or contact your warranty insurance provider for more information.

About BC Housing's Research Centre

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