Number 13

MAINTENANCE MATTERS

BC HOUSING
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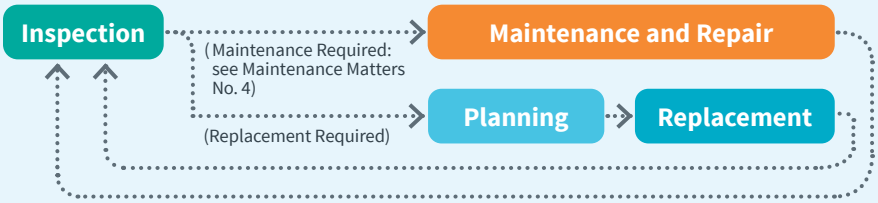
Window and Door Replacement

Windows and doors are part of the ongoing maintenance and renewals planning for your home or multi-unit residential building. Water leaks, comfort problems, condensation, mould growth, sound transmission, and aesthetics are reasons to consider replacing your windows and doors.

This bulletin explores considerations for replacing windows and doors. For more information on routine inspections and maintenance, consult the Maintenance Matters No. 4 bulletin on Residential Windows and Exterior Doors, available at www.bchousing.org.

This bulletin is designed to help homeowners discuss the relevant issues with replacement contractors.



This Maintenance Matters focuses on windows in single-family and multi-unit residential buildings constructed with wood-frame, concrete, and steel-stud exterior walls. The replacement processes may differ for small residential buildings (for example, single-family home, townhouse, laneway) versus larger residential buildings (for example, low-rise to high-rise multi-family buildings), though the need for inspections and planning is similar.

The scope of this bulletin does not include heritage windows and doors, which have their own specialized requirements related to heritage conservation.

Maintenance Matters

This series of bulletins and companion videos is designed to provide practical information on maintaining residential buildings. Produced by BC Housing, this bulletin was prepared by RDH Building Science in collaboration with the Condominium Home Owners Association, Canada Mortgage and Housing Corporation, BC Hydro, Fenestration Association of BC, and the City of Vancouver.

How to Tell if Your Windows and Doors Need Replacement

There are some tell-tale signs that windows or doors are reaching the end of their service life or that your home would benefit from an upgrade. Doing an assessment of current conditions helps determine when to seek further assistance from experts. For some buildings that have the issues noted below, a full-scale replacement can be avoided by doing substantial maintenance and repair instead, while in other cases replacement will be necessary.

Have you noticed any moisture issues?

Windows provide a barrier between the indoor home environment and the outdoor elements. If you notice water leakage around the window perimeter, this could mean that your windows are no longer sealed to the outdoors and may need to be replaced (and moisture damage may need to be remediated). Damage to interior finishes like cracking, blistering, and peeling paint around windows are possible signs of water ingress and water damage.

Condensation

Condensation on the window glass or frame can sometimes be mistaken for leaks. Although condensation is not a result of leaking, it may be a sign that your windows could be replaced with a more insulative product that will stay warmer on the interior, which reduces the chance of condensation.

Condensation at windows occurs when the moisture from the warm interior air hits the cold glass or frame. This can be recognized by seeing liquid water form on the interior surfaces of windows and can result in damage or mold growth on adjacent trim and/or drywall. This condition is generally found to be worse on single pane and metal window frames, especially non-thermally broken ones. This also happens in areas of high humidity such as bathrooms. Ventilation improvements can help reduce the chance of condensation. Condensation may lead to durability issues as water degrades the materials and finishes of the window installation. Until the cause of the condensation is fixed, it is up to the owner/occupant to clean up condensation as it occurs to minimize damage (see Maintenance Matters No. 3: Avoiding Condensation Problems for more details).

Fogging

Multiple panes of glass sealed together is called an Insulated Glass Unit (IGU). Fogging or moisture accumulation between panes of glass occurs in windows with multiple panes and is a sign that the seal between the panes of glass has failed, allowing humid air in the window cavities. This is called IGU failure, which may not require a full window replacement and can be fixed with an IGU replacement.

Fogged, failed IGU

Condensation on the interior of the glass

Replacing only the IGU's or doing refurbishment

In some cases, a full-scale window replacement can be avoided by doing substantial maintenance and repair. For example, depending on the age of the frame, it may only be necessary to replace the IGU or sash if it has failed (for example, if there is condensation between the panes of glass or if the edge sealant is migrating). Window frames can have a service life of approximately 40 years while most IGU's have product warranty for 10 years against fogging. This means that it may be necessary to replace the windows IGU's several times through the total service life of the frame.

Replacing IGUs is faster and less costly than replacing the whole window, including its frame. It may, however, be better to upgrade the frame at the time of an IGU failure to benefit from energy savings and thermal comfort improvements. If there are performance issues with the frames (for example, condensation, open mitres, cracked frame) these issues are not addressed by a new IGU.

Have you noticed any frame deterioration?

No matter what the window or door frame type, generally warping, misalignment of frame components, difficulty opening or closing and/or locking of windows are signs that the windows or door frame may need to be replaced. In some cases, a window technician may be able to make adjustments to repair the window.

Soft, rotting, or warped wood are indicators of wood frame deterioration. If degradation is limited to surface finishes, wood windows may be sanded and repainted. If you have wood framed windows, repaint or stain them periodically when signs of finish cracking, bubbling, fading, or chipping occur as preventative maintenance. New operable sashes may also be installed.

Vinyl and metal window frames are sealed or heat welded at the corners (miter joints). Misaligned miters or gaps at window frame corners are indicators of frame deterioration and could lead to water draining into the wall cavity. The operability of windows may be impacted by frame misalignment (for example sliders not moving smoothly in their tracks). The hardware such as gaskets and handles may degrade or break and will need to be replaced. If frames and hardware are degraded throughout the building, this is a sign that it is time for a full-scale window replacement project.

Does your home currently feel drafty during the winter or too hot during the summer?

If your home feels drafty during the winter and too hot during the summer, this may be a sign that your current windows are not carrying out their function to provide interior comfort to your home. Windows control the movement of heat and air between the interior and exterior of a building. Windows with lower U-values have a lower rate of heat transfer (are more insulative), which means the area by your window won't feel as cold or drafty, resulting in better comfort during cold times of the year.

A rotten wood frame window

Misaligned miter at the corner of aluminum window frame

A well-chosen window product with thoughtful design and placement can mitigate overheating in warmer times of the year by controlling solar heat gains either with integrated exterior shading, strategic placement, or coatings that block unwanted solar energy. The solar heat gain coefficient (SHGC) of a window tells you how much solar radiation it will let through. In general, you should aim for a value below 0.3 if you want to limit the amount of solar heat gains to prevent overheating.

Choosing a more insulative and airtight window with considerations for controlling solar heat gains improves the interior comfort of your home.

Does your home feel stuffy with stagnant air?

If your home feels stuffy, this may be a sign that your windows are not carrying out their function to provide natural ventilation. Although modern homes are designed with mechanical ventilation to provide fresh outdoor air, older homes may rely on natural ventilation. Operable windows can act as natural ventilation for a whole home or a room and can sometimes be crucial in controlling summer temperatures in a home without air conditioning.

Natural ventilation through windows may be improved by exploring the location and type of operable window units when choosing replacement products. Natural ventilation can be improved by using more operable units, preferably located on opposite or adjacent walls to encourage cross ventilation. Additionally, mechanical ventilation such as heat recovery ventilators (HRVs) could be implemented to provide adequate fresh air throughout all seasons.

Are you bothered by noise from outside?

Windows and doors are usually the weakest part of the exterior of a building for blocking sound. Older, drafty windows and doors can allow for outside noise to enter a building. If your home relies on opening windows to receive fresh air and is also impacted by loud outdoor noises, consider installing alternate means of ventilation, such as HRVs. Doing this, in conjunction with a window upgrade will improve your home's indoor air quality while minimizing outdoor noise transfer.

Windows and doors with laminated glass can be effective in reducing outdoor noise transfer. The more airtight the window and installation are, the better at blocking sound the window will be. This also means that fixed windows are generally better for sound control. There are also more complex approaches to achieving acoustic performance from windows, and an acoustical expert can help determine what window arrangement would work best for your particular situation.

Does your home have high heating and cooling costs?

Windows and doors are usually the weakest link on a building's exterior when it comes to heat loss and unwanted solar heat gain. Building energy costs can be reduced by using higher performance windows that reduce the need for heating (during winter) and cooling (during summer). If you are not comfortable in your home (too hot or too cold) and have high utility bills, this may be a sign that a window upgrade can provide energy savings to your home.

Who to Call if You Think Your Windows and Doors Need Replaced

Once an initial assessment is complete, engage a qualified professional to confirm if a replacement is needed. As the project proceeds, it will involve various designers, architects, engineers, contractors, and suppliers, depending on the size of the project. The following table defines the different **qualified industry professionals** and their roles during a replacement project. See also The Replacement Process section for further details on their involvement.

Industry Professional	When they are involved	How to choose the right one
Building Envelope Consultant A professional specialized in identifying the issues and recommending retrofit solutions that will improve the building envelope.	Building Envelope Consultants are generally engaged to investigate and design the window and door replacement work on medium and large (i.e. multi-unit) buildings, as well as small buildings with complex or unique window configurations. They are involved with: › investigation and design › applying for building permits › creating construction documents › construction management including budgeting and tendering › overseeing the installation work and quality assurance reviews	Local authorities having jurisdiction may have a list of approved Building Envelope Consultants. Property managers or strata agents can typically recommend a building envelope consultant or search through Architects Institute of British Columbia (AIBC) or Engineers and Geoscientists of British Columbia.
Replacement Service Provider A contractor or window product company specifically hired to complete the window and door replacement work.	Replacement Service Providers may be hired directly by owners to lead window and door replacement projects for small buildings with simple window configurations. Their services in this context may also include those provided by a Building Envelope Consultant, as a one-stop approach, though they are generally not qualified to assist in this manner on larger projects. For larger projects, they would be hired as a subcontractor under the Building Envelope Consultant acting as a Construction Manager or by a General Contractor to complete the removal/demolition work as well as the supply and installation of the replacement products.	Look for qualifications in terms of experience and project success, including example projects. Request references from previous customers and suppliers. Request their WorkSafe BC clearance letter and evidence of their general liability insurance. Request warranty information.
General Contractor or Construction Manager A contractor with expertise in managing large-scale building retrofit work involving window replacement projects. A contractor is not necessarily the one completing the actual window replacement work (see Replacement Service Provider).	General Contractors or Construction Managers are hired to assist with the project planning and contracting to other professionals (including the Replacement Service Providers) where appropriate. They are involved with: › planning and budgeting › bidding/contracting of subtrades › accountability as the single point of contact for owners/stakeholders › full-time site management	Look for qualifications in terms of experience and project success, including example projects. Request references from previous customers and suppliers. Request their WorkSafe BC clearance letter and evidence of their general liability insurance. Request warranty information.

Industry Professional	When they are involved	How to choose the right one
Hazard Management Specialist A qualified contractor who specializes in hazardous materials, such as asbestos removal, lead mitigation, or mould remediation.	A Hazard Management Specialist is involved if hazardous substances are detected during the investigation/design work, to manage any removal or mitigation to minimize the risk of exposure.	Certification through a recognized industry program such as the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), Asbestos Hazard Emergency Response Act (AHERA), or other as applicable for the type of remediation.
Building Official A personnel representing the authority having jurisdiction that check code and bylaw compliance.	A Building Official can help determine if a building permit is required and will review and approve building permit applications for window and door replacement projects. Building officials may visit sites to check that work is being conducted in accordance with the applications submitted.	The municipal website typically includes instructions on how to engage with the local authority having jurisdiction and submit permit applications, if required.

The Replacement Process

If the windows cannot be adjusted or repaired to operate as intended and refurbishment is too costly or impractical, then a complete window replacement may be required.

For strata/multi-family buildings, budget for annual inspection and maintenance of your window systems. A depreciation report will identify the life-cycle of window systems and estimate costs for consultants and the window systems when a strata corporation is preparing for renewals (See Maintenance Matters No. 7: Building Envelope Maintenance and Renewals Planning for more information).

The steps to complete a window replacement project are outlined below. A comprehensive window/door refurbishment project would likely follow similar steps.

At times a complete window replacement may be required

	SMALL BUILDINGS AND SINGLE FAMILY HOMES	LARGE AND MULTI-UNIT RESIDENTIAL BUILDINGS
STEP 1 **Engage a Qualified Professional**	• Engage a Building Envelope Consultant and/or General Contractor if appropriate to assist in the replacement process. • Check with your local Building Official to confirm if permits are necessary. • If preferred, engage a qualified Replacement Service Provider directly from the outset.*	• Engage a Building Envelope Consultant to assist in the replacement process prior to engaging with any contractors. • Obtain quotes/bids for project assistance where appropriate.
STEP 2 **Determine Replacement Needs** (INVESTIGATION)	• The qualified professional will determine the necessary product and installation requirements for the new windows/doors by assessing the existing conditions, including the interior and exterior environment, and reviewing the code requirements. • Have the qualified professional produce a preliminary replacement scope/budget at this step. • Establish priorities for selecting product options/installation approaches that consider capital cost, energy performance, comfort, constructibility, and service life (see decision matrix tool).	
STEP 3 **Plan Replacement Project** (DESIGN + BUDGETING)	• While full construction documents are not typically required for smaller projects, the qualified professional will at least produce a detailed scope of work and budget for the replacement project.	• The Building Envelope Consultant will produce construction documents that include typical removal/installation details, product options, and project specifications (i.e. a bid package). • Have a detailed budget estimate and a schedule produced by the Building Envelope Consultant at this step as well.
STEP 4 **Complete Replacement Project** (BIDDING + CONTRACTING)	• Use the scope of work to collect bids/quotes from qualified Replacement Service Providers; make selection based on appropriate qualifications. • Proceed with the replacement project under a robust stipulated price contract. • Replacement work may take as little as a few days. Occupants can expect to stay in their homes during the replacement project unless hazardous material is being disturbed (in which case a Hazard Management Specialist is needed).	• Use the bid package to collect detailed bids from qualified contractors; make the selection based on appropriate qualifications and stakeholder priorities. • Proceed with the replacement project under a robust stipulated price contract. • Replacement work generally takes several weeks or months, but may only take several days per suite/unit. Occupants can expect to stay in their homes during the replacement project unless hazardous material is being disturbed.
STEP 5 **Implement Maintenance Plan**	• A maintenance plan will be provided by the qualified professional to reflect the new window/door products and their service requirements. • Integrate the maintenance plan with the regular inspections and maintenance of the property. • Refer to Maintenance Matters Bulletin No. 4: Residential Windows and Exterior Doors.	

* Engaging a Replacement Service Provider from the outset may limit design/product options and essentially jumps to Step 4. Review Step 2 and Step 3 with your Replacement Service Provider for reference.

Replacement Window Decision Matrix Tool

The design professional/contractor/replacement service provider will work with the owners to understand their objectives for the new windows, learning from pre-existing problems with the current windows. The following decision matrix tool may help owners identify the priority areas for the replacement. Consider what the objectives are for each category (for example, is there a certain timeline that products need to last until or a specific aesthetic that is desired?).

Desired Window Characteristic	Low Priority	Medium Priority	High Priority
Insulative Properties (for example U-value)			
Solar Heat Gain Control (for example mitigating overheating)			
Operability (for example for ventilation or egress)			
Aesthetics (for example colour, hardware)			
Noise Dampening			
Durability/Longevity			

What to expect during the replacement

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. Occupants may expect to stay in their homes during the replacement project, except in cases of hazardous material abatement.

Depending on the installation procedure, some damage to the interior finishes is typical (wood trim, drywall) and finish carpentry is required to complete the installation. Where drywall repair is completed, it may be repainted within the project or left primed (paint ready) for each owner to paint themselves.

Blinds may need to be modified or replaced at the end of the project. Although the contractor can attempt to mitigate against dust during the work, some amount of dust is unavoidable.

Window and door energy efficiency

In BC, window and door products need to meet the BC Energy Efficiency Standards Regulation (Energy Efficiency Act, EEA) and have labels showing their certified energy performance. The EEA establishes minimum energy performance requirements for windows and glazed doors sold in British Columbia. The Act requires all windows and doors sold in B.C. to bear labels verifying their energy performance characteristics, whether installed in new homes or as replacement products in existing homes. ENERGY STAR® is a voluntary program that identifies windows and doors with superior energy performance ratings. See www.oee.nrcan.gc.ca.

Window upgrade incentive programs

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

Many window replacement incentive programs are available, such as the CleanBC Better Homes. If you are intending to take advantage of a window replacement incentive program, first learn about the program's requirements to understand which product may qualify and the application process. Replacement contractors or building enclosure consultants may help you understand and access incentive programs.

Maintaining Your New Windows and Doors

Windows typically have a life span of 20 to 50 years. This varies significantly depending on the type of windows, the level of exposure to weather, and the maintenance they receive. While certain windows may have a higher cost, a longer service life could make them 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 the warranties that apply to both the products and installation.

More Information

- Consumer Guide to Window and Door Replacement, available at www.bchousing.org
- Maintenance Matters No. 3: Avoiding Condensation Problems, available at www.bchousing.org
- Maintenance Matters No. 4: Residential Windows and Exterior Doors, available at www.bchousing.org
- Maintenance Matters No. 5: Sealants, available at www.bchousing.org
- Best Practice for Window and Door Replacement in Wood-frame Buildings, available at www.bchousing.org
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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.

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