



## ADMINISTRATIVE REPORT

Report Date: October 23, 2017  
Contact: Chris Higgins  
Contact No.: 604.871.6288  
RTS No.: 11921  
VanRIMS No.: 08-2000-20  
Meeting Date: November 1, 2017

TO: Standing Committee on Policy and Strategic Priorities

FROM: General Manager, Planning, Urban Design and Sustainability

SUBJECT: Report Back on Energy Efficiency Updates to Vancouver's Building By-Law for Low-Rise Multi-family Residential Buildings

### **RECOMMENDATION**

- A. THAT the General Manager of Planning, Urban Design and Sustainability be instructed to make an application to amend the Zoning and Development By-law generally as presented in Appendix A, to amend Section 10.33 to update floor area exclusions for exterior wall thickness, and that the application be referred to a public hearing.
- B. THAT staff be directed to prepare and publish a bulletin clarifying upgrade options allowed under the Building By-law that provide flexibility for four to six storey multifamily residential.
- C. THAT staff be directed to recommend amendments to the Building By-law to provide greater flexibility in renovations of residential heritage or character buildings of three storeys or less; and to publish a guide for homeowners in consultation with the Vancouver Heritage Foundation.
- D. THAT the Director of Legal Services be instructed to prepare the necessary By-law amendments referred to in Recommendation A, generally in accordance with Appendix A, for consideration at Public Hearing.

### **REPORT SUMMARY**

This report responds to two Council directions that were given when the energy efficiency amendments to the Building By-law for multi-unit residential buildings six storeys and under were adopted in February 2017. The first was that new residential buildings of six storeys or less, including detached houses should not lose usable floor area due to increased thermal insulation. The second directed staff to ensure that heritage and character buildings undergoing renovations not be impacted negatively from increased energy efficiency requirements for buildings.

In response to the first direction, this report recommends amendments to Section 10.33 of the Zoning and Development By-law to update this floor space exclusion to accommodate the increased thermal insulation required by the Vancouver Building By-law.

In response to the second direction, staff will publish a bulletin and recommend Building By-law amendments to provide clarity and flexibility that protect the heritage and character elements of buildings that are undergoing renovation and ensure they do not lose occupiable floor space as a result of recently adopted requirements for energy efficiency.

### ***COUNCIL AUTHORITY/PREVIOUS DECISIONS***

In 2008, Council approved an amendment to the Zoning and Development By-law to exclude the floor space occupied by insulation beyond the requirements of the Building By-law. This was done in order to avoid penalizing applications that chose to provide additional insulation. The exclusion did not apply to insulation that met the minimum requirements of the Building By-law.

In 2011, updates were made to the exclusion to increase it to align with current practice that involved building thicker walls such as Passive House standard walls.

In 2014, updates to the Building By-law required the provision of thermal insulation to an increased standard of R-22 effective for one and two family houses. In response, most builders increased the thickness of thermal insulation by 38 or 45 mm (1 ½ or 1 ¾ inches) in the common wall assemblies used at this scale.

In 2015, Council approved the Renewable City Strategy requiring that all energy used in the City of Vancouver, including in buildings, be derived from renewable sources.

In 2015, updates were made to the aforementioned exclusion to align it to updates in the Building By-law.

In 2016, Council approved the Zero Emissions Building Plan which adopts a target to reduce emissions from new buildings by 90% as compared to 2007 by 2025 and to achieve zero emissions for all new buildings by 2030 including intermediary time-stepped greenhouse gas (GHG) emission and heat loss limits as described in the Plan.

In 2017, Council approved an amendment to the Building By-law for residential buildings six storeys and under. Among other changes, this amendment increased the prescriptive requirement for thermal insulation in four to six storey residential buildings to align with the 2014 changes for one and two family houses.

### ***CITY MANAGER'S/GENERAL MANAGER'S COMMENTS***

The City Manager supports the recommendations in this report.

## **REPORT**

### ***Background/Context***

In July 2016, Council approved the Zero Emissions Building Plan, which directed staff to achieve 90% carbon pollution reductions in new buildings by 2025, and to achieve zero emissions by 2030, including intermediary time-stepped GHG emission and heat loss limits. As one of the first steps toward implementing this plan, Council approved energy efficiency improvements for multi-family buildings up to and including six storeys in February 2017. These changes are expected to reduce greenhouse gases by over 50% in new buildings while aligning requirements with those already in place for detached homes by requiring the use of better insulated walls, as well as improved windows, heat recovery ventilation, better mechanical systems, and air tightness.

In adopting these new efficiency requirements, including increased wall insulation for multi-unit residential buildings six storeys and under, Council directed staff to report back with recommendations to ensure that usable floor space was not negatively impacted. They also directed staff to make recommendations to ensure that the wall insulation requirements for detached homes introduced in 2014 did not reduce the usable floor space of these buildings.

Finally, as the Building By-Law applies to both new and existing buildings, such as when a renovation takes place, Council directed staff to ensure that these increased efficiency requirements not negatively impact heritage or character homes.

The current Building By-law already provides flexibility for four to six storey character and heritage buildings undergoing renovations to demonstrate compliance with current energy efficiency requirements. In general, if current insulation and window efficiency requirements cannot be met without compromising the character of these homes, the home can make other improvements such as heating systems, air sealing or heat recovery to meet the same efficiency improvement outcome. This flexibility is not widely understood by staff or builders and requires better clarity.

A Renovation Energy Upgrade Process (REUP) is currently in use on some existing single family projects. The REUP allows a house undergoing renovation to avoid having to thicken their walls, and instead allows for other energy upgrades that reduce energy use or greenhouse gases by an equal or greater amount. For example, instead of adding an extra 51 mm (2 inches) of insulation in one area of the home, an applicant can upgrade the hot water heater.

### ***Strategic Analysis***

The following analysis describes how staff propose to address Council's direction on maintaining usable floor space and the character features of older homes while still meeting the intent of the recently adopted energy efficiency requirements.

### Thermal Insulation and Floor Area

#### One and Two Family Dwellings:

When the 2014 Building By-law came into effect for one and two family dwellings, most builders chose to meet the prescriptive requirement of RSI 3.85 (R-22) effective walls by increasing the thickness of thermal insulation from 138 mm (5 ½ inches) to either 178 or 184 mm (7 or 7 ¼ inches). The floor area occupied by the thermal insulation added as a result of the 2014 requirements is approximately 2% of the floor area of a typical house.

Staff therefore recommend amending the Zoning & Development By-law to exclude 2% of floor area for residential buildings of three or fewer storeys including one or two family houses that provide at least 175 mm of thermal insulation as is now typical practice meet the 2014 By-law requirements, along with a similar exclusion for Laneway Houses.

#### Multi-Unit Residential Buildings Six Storeys and Less:

The thermal insulation in typical construction assemblies is expected to increase to 102 mm (4 inches) or more in response to the prescriptive requirements of the Building By-law for RSI 3.85 (R-22) effective walls that will take effect in 2018 for new multi-unit residential buildings of six storeys or less. For four to six storey buildings, this added insulation will occupy approximately 1% of floor area.

Staff therefore recommend amending the Zoning and Development By-law to exclude 1% of floor area for buildings at this scale that provide at least 100 mm of thermal insulation.

As the proposed new exclusions in the Zoning and Development By-law would be available to all residential buildings under seven storeys, and not just to the minority of permit applications that exceed the Building By-law, they must be as simple as possible in order avoid any impact on application or process times.

The new exclusions will require only that applications show the minimum thickness of insulation so as to minimize application complexity and reduce the potential for calculation errors and increased processing time. As development permit applications typically contain wall assembly diagrams, no increase in application or process time is expected. In addition, the proposed increases in floor area of 1% or 2% can be accommodated within existing zoning envelopes and do not require additional research or adjustments to other areas of the Zoning and Development By-law.

In preparing these recommendations staff consulted with a range of stakeholders including the Greater Vancouver Homebuilders Association, the Urban Development Institute, a large number of independent builders, and experienced designers and architects.

Staff note that during consultation a number of stakeholders made additional suggestions for changes to the Zoning and Development By-law. Most builders who construct one and two family houses to the requirements of the Building By-Law acknowledged the benefit of excluding 2% of the floor area as proposed in this report. Many also requested the City consider a further 2% or 3% exclusion to address other changes to their work in 2014. These include changes in setback measurements, rain screen assembly, and accessibility that required one and two family builders to adopt new design and construction practises in 2014. While these go beyond Council's direction to staff, they could be considered in upcoming regulatory reviews if broadly supported by Council.

Also during consultation, some designers who employ advanced wall assemblies that exceed the requirements of the Building By-law recommended that the current performance-based exclusion be replaced with a geometric-only calculation that would exclude all wall assemblies beyond an initial 152 mm (6 inches) of thickness. This method would still require a calculation for each wall assembly and each floor, but would not include performance-based calculations to show that the exclusion was accompanied by better than required insulation values. Staff have not assessed the implications of this alternate method to sustainability, urban design or permit processing, as it goes beyond Council's direction to staff, would not ensure increased energy efficiency, and would introduce additional complexity of analysis that would have delayed this report. This new approach could be considered in upcoming regulatory reviews if broadly supported by Council.

The current exclusion method will remain available for super-insulated walls, as these applications employ multiple professionals and represent a minority of cases. A revision is recommended to provide the Director of Planning with discretionary approval, which can help ensure that alternate assemblies represent best practise in terms of safety, performance, and deconstruction.

An updated Administrative Bulletin will be provided to guide applicants through the proposed floor area exemptions.

#### Character and Heritage Buildings

In existing buildings (character and heritage included) adding insulation to the exterior will increase the thickness of the walls and change the building's appearance. Adding insulation to the interior can mean a loss of usable space, make a room's central light fixture or inlaid wood floor feel off centre, or alter the depth of window sills. Replacing single glazed windows with double or triple glazed windows can alter the look of the windows.

Council asked staff to ensure heritage and character town homes and multifamily buildings were protected from any negative impacts from the Building By-law changes. In the spring of 2017, staff engaged the Vancouver Heritage Foundation (VHF) to survey its stakeholders on City of Vancouver processes for character and heritage homes and buildings. Staff that process these applications were also consulted to ensure any new process would not be negatively affected by processing times, while giving homeowners a clear sense of the energy related costs when retaining a heritage or character home.

In multi-unit residential buildings of four to six storeys (of any type, character and heritage included), the Building By-law has alternative upgrade options that do not require energy upgrades to the windows or walls of the building. Heritage and character elements in these buildings can be retained and the only requirement of these elements is that performance is not made worse. When undertaking renovations, there are options that don't affect the envelope while still lowering energy use. This option will be clarified in a bulletin from staff and a user's guide will be developed in collaboration with the Vancouver Heritage Foundation.

Similarly, in order to protect multifamily heritage buildings three storeys and under that are undertaking renovations, staff will develop and recommend Building By-law amendments and update the bulletin on the existing Renovation Energy Upgrade Proposal (REUP) option that will allow a similar performance based alternative to the By-law's prescriptive requirements. A REUP will be available for projects when making an application, or in advance of making an application, to achieve the energy requirements of the Building By-law.

The REUP is a simpler process that provides flexibility and greater certainty to homeowners considering heritage or character retention. The REUP will help to protect heritage and character using an existing City process and form with only modest modifications. This is a new option which utilizes an existing City process and application form to allow Energy Advisors to propose alternative upgrades such as domestic hot water heaters, furnaces, boilers, heat pumps in lieu of envelope upgrades that affect heritage or character elements of the home. Typically these heritage or character features focus on the walls, though in the case of heritage register properties may also extend to windows, skylights, and doors. Any alternative upgrades must achieve equal or better GHG reductions compared to code minimum. In the case of heritage buildings, the process goes further by excluding some elements like single glazed windows from upgrade requirements.

The existing REUP process is not applied in all cases and only is available to single family homes. The recommendations in this report will formalize the process to apply to all character and heritage single family homes along with heritage town homes and heritage three storey multi-unit residential buildings. The REUP provides a performance based alternative to the current prescriptive requirements. The most current draft of the REUP form at time of writing is provided in Appendix B.

For example, a renovation may include a kitchen upgrade, new cabinets, new flooring, new lighting, new outlets, opening an exterior wall, and replacing a window. When using the REUP process, the homeowner can propose an alternative to upgrading the wall insulation to RSI 3.85 (R-22) effective. For example, the homeowner could propose a domestic hot water heater upgrade from 50% efficient natural gas to either 99% efficient electric or 78% efficient natural gas, and insulate the current wall cavity to its existing depth. This would achieve the same level of energy use compared to adding deeper insulation to the wall.

The REUP for heritage and character homes and buildings was developed in partnership with the Vancouver Heritage Foundation (VHF), with industry input, and review from heritage Planners. If the recommendations of this report are accepted the Building By-law changes for single family homes, multifamily homes and buildings three storeys or less will be developed and implemented with input from VHF and heritage Planners.

***Financial***

There are no financial implications.

***Human Resources/Labour Relations***

There are no HR implications.

***Environmental***

Approving the updates proposed will facilitate the use of well-insulated walls and other energy conserving measures that lead to better performing buildings, thereby reducing GHG emissions and protecting the environment.

***CONCLUSION***

The recommended changes will ensure that usable floor area is not lost due to recent increases in thermal insulation requirements; ensure that there is no impact on heritage buildings as a result of updates to the Building By-law; and address the potential effect on character buildings.

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Zoning & Development By-law  
Floor Area Exclusions

Draft for Public Hearing

BY-LAW NO. \_\_\_\_\_

A By-law to amend  
Zoning and Development By-law No. 3575  
regarding floor area exclusions

THE COUNCIL OF THE CITY OF VANCOUVER, in public meeting, enacts as follows:

1. This By-law amends or adds to the indicated provisions of the Zoning and Development By-law.
2. In section 10.33, Council strikes the existing section and replaces it with:  

**“10.33 Exclusions for Exterior Wall Thickness**

10.33.1 For residential buildings less than seven storeys in height, computation of floor area shall exclude 2% of the total area in buildings of three storeys or less if the majority of the exterior wall space contain at least 175 mm of thermal insulation in total thickness, or 1% of total area in buildings of four to six storeys where the majority of exterior wall space contain at least 100 mm of thermal insulation in total thickness.

10.33.2 Where no exclusion under sections 10.33.1 or 11.24.18 is granted, the Director of Planning may exclude an area equal to the area occupied by the insulation thickness that exceeds the applicable thermal performance value for exterior walls in the Building By-law, as verified by a Building Envelope Professional, to a maximum exclusion of 330 mm of thickness for buildings of six storeys or less, and a maximum exclusion of 179 mm of thickness for all other buildings.

10.33.3 Computation of floor area shall exclude an area equal to the area occupied by a rain screen system in a wall that exceeds 203 mm in thickness, as verified by a Building Envelope Professional, to a maximum exclusion of 152 mm of thickness, except that this exclusion shall not apply to laneway houses or to one or two-family dwellings of three storeys or less with or without a secondary suite.”
3. In section 11.24.18, Council strikes the period “.” at the end of 11.24.18 (c) (iv) and replaces it with a semi-colon “;”, and then adds the following text:





# Renovation Energy Upgrade Proposal

This Renovation Energy Upgrade Proposal is to quantify the energy requirements of Parts 10 and 11 in the 2014 VBBL, specifically.

Further review of each unique application, plans or documents may reveal additional requirements. Please note that 2014 Vancouver Building By-law (VBBL 2014) is in effect for all applications received after January 1, 2015.

This checklist **MUST** be completed electronically and submitted with your Renovation Permit Application for any renovation over \$5,000. If you have any questions regarding the information requested on this form, please call the Enquiry Centre at 604-873-7611. Space is not limited to that provided.

Project Address:		Date:
Energy Advisor (EA) Name:		EA #:
Company:	EA Email:	
EA Phone Number:	EA City Business License #:	

## HOME AND RENOVATION SUMMARY

<p><input type="checkbox"/> No, the building envelope was not compromised at time of assessment.</p> <p>The home condition is intact, a blower door test can be performed and an existing home report will be completed.</p> <p><input type="checkbox"/> Yes, the building envelope was compromised at time of assessment (A blower door test cannot be performed on the house at time of visit)</p> <p>In this case submit the following:</p> <ol style="list-style-type: none"> <li>Create a mock report using NRCan (Hot2000) historical values from the decade of the house. Use results to fill in 'Condition Prior to Alteration' column on page 2.</li> <li>Fill in the remaining columns: 2014 VBBL requirements and any proposed alternative upgrades.</li> <li>Home evaluation and blower door test lower door test results <u>must</u> be provided to the inspector in order to complete the renovation permit.</li> </ol>	<p><b>Reason for compromised building envelope</b></p> <p><input type="checkbox"/> Fire or flood damage</p> <p><input type="checkbox"/> Work Without Permit</p> <p><input type="checkbox"/> Other (please specify)</p> <p><b>Please check if known:</b></p> <p><input type="checkbox"/> Major gut renovation (majority of home components are to be removed)<sup>1</sup></p> <p><input type="checkbox"/> Registered Heritage Home</p> <p><input type="checkbox"/> City-confirmed Character Home</p> <p><input type="checkbox"/> Home is being stratified</p> <p><input type="checkbox"/> Additional floor area being added</p> <p><input type="checkbox"/> Seeking EnerPHit standard or other low energy standard</p>
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## ENERGUIDE HOME EVALUATION REPORTS

Existing Home Report - File #: _____ (if compromised envelope, write 'mock report')	Date: _____
<input type="checkbox"/> Post-renovation assessment is required	
Post-Renovation Assessment - File #: _____	Date: _____

<sup>1</sup> It is strongly recommended to have a mid- and final evaluation (incl. blower door test) completed for major gut renovations

## PROPOSED ALTERNATIVES TO ENVELOPE UPGRADES

NO alternative upgrades are proposed. Fill in the 'Existing House' energy and GHG values, and the first two columns of the Components table. Only one (1) HOT2000 model is required to be completed.

YES, alternative upgrades included. Fill out all three columns in both tables below. Three (3) HOT2000 models are required to be completed. The alternative upgrades must have equal or better energy or greenhouse gas reductions compared to the home with envelope upgrades.

	Existing House	House with VBBL 2014 Envelope Upgrades	House with Alternative Upgrades
<i>Estimated Annual Space + DHW Consumption (MJ or kWh / year)</i>			
<i>Greenhouse Gas emissions (CO2 tonnes/year)</i>			

Components (indicate 'Y' or 'N' if included in renovation scope of work)			Condition Prior to Alteration	Proposed House Upgrades	
				Required Upgrades per 2014 Vancouver Building Bylaw	Alternative Upgrades
Opaque Envelope	<i>Above grade walls</i>	Y / N			
	<i>Attic</i>	Y / N			
	<i>Flat and Vaulted Roof</i>	Y / N			
	<i>Foundation walls and under slab</i>	Y / N			
	<i>Exposed floors</i>	Y / N			
	<i>Rim/Box joist (headers)</i>	Y / N			
	<i>Blower Door Air Tightness (ACH)<sup>2</sup></i>	Y / N			
	<i>Doors (side hinged)</i>	Y / N			
Transparent Envelope	<i>Glazed Doors<sup>1</sup></i>	Y / N			
	<i>Windows<sup>1</sup></i>	Y / N			
	<i>Skylights</i>	Y / N			
Mechanical	<i>Heating System</i>	Y / N			
	<i>HRV / Ventilation</i>	Y / N			
	<i>Hot Water System</i>	Y / N			
	<i>Solar PV and other</i>	Y / N			
	<i>Recirculating systems and DWHR</i>	Y / N			

<sup>1</sup> In addition to envelope alternative upgrades, registered Heritage Homes (noted on page 1) can also keep their original heritage windows and doors (or replace with replicas) by providing alternative upgrades

<sup>2</sup> If air tightness is used as an alternative upgrade, a final blower door test is required to demonstrate sufficient air sealing upgrades from pre-renovation

## Renovation and Upgrade Summary

### Summary of Project Scope

#### Description of Upgrades Required to meet VBBL 2014

- *if no upgrades are required by the renovation scope, indicate this.*
- *if alternative upgrades are proposed in lieu of envelope upgrades, provide a description and reasoning.*

Project Address: \_\_\_\_\_

EA: \_\_\_\_\_

EA #: \_\_\_\_\_

EA Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name of Builder (company) completing the renovation work:  
*(if not known provide homeowner's name and signature)*

Primary contact person completing the renovation work:

Builder representative signature:

Inspector Sign-Off: \_\_\_\_\_

Date: \_\_\_\_\_

**\*\*Leave blank for City stamps\*\***