

## REPORT

Report Date: March 10, 2020  
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Meeting Date: March 31, 2020  
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TO: Vancouver City Council

FROM: General Manager of Planning, Urban Design and Sustainability

SUBJECT: Climate Emergency Requirements for New Housing 3-Storeys and Under

### **RECOMMENDATIONS**

- A. THAT Council approve amendments to the *Building By-law*, generally as described in this report and as set out in Appendix A, to: increase the stringency of carbon pollution and energy efficiency requirements for residential buildings 3 storeys and under, including townhomes, to take effect June 1, 2021; to move closer into alignment with the *British Columbia Energy Step Code* for residential buildings 4-6 storeys, to take effect January 1, 2021; to set a 2 tonne carbon pollution cap for new single family and duplex dwellings 325m<sup>2</sup>+, to take effect January 1, 2021; and to make various housekeeping amendments and amendments to close a loophole in the current lighting alterations provisions, to take effect July 1, 2020;

FURTHER THAT Council instruct the Director of Legal Services to prepare and bring forward for enactment the by-law necessary to implement these amendments, generally as outlined in Appendix A.

- B. THAT Council approve updates to the requirements for electric vehicle charging infrastructure in new one- and two-family dwellings and any ancillary residential suites in the *Building By-law* and the *Parking By-law* as set out in Appendix E to this report, to take effect January 1, 2021;

FURTHER THAT Council instruct the Director of Legal Services to prepare and bring forward for enactment the by-laws necessary to implement these amendments, generally as outlined in Appendix E.

- C. THAT Council instruct staff to develop recommendations to complement the climate and energy efficiency requirements in A above to ensure that useable space inside a new home is not reduced as a result of the increased space needed for zero emission mechanical equipment, and interior height is not reduced as a result of the roof thickness required for additional insulation in typical assemblies.

## **REPORT SUMMARY**

This report recommends amendments to *Vancouver's 2019 Building By-law* (VBBL) that will help the City meet Big Move 4 of the Climate Emergency for zero emissions space and water heating. These amendments focus on reducing carbon pollution from new single family and multifamily residential buildings that are 3 storeys and under to near zero emissions. This will be achieved by introducing requirements to further reduce heat loss and for zero emissions space and water heating. This report also recommends lowering the cap on annual carbon emissions from the largest new homes from three tonnes to two tonnes of carbon pollution. If this report is approved, the VBBL changes will result in 63% less than the a typical home built to the 2019 by-law and 86% less carbon pollution than a similar home built to the 2007 requirements (Vancouver's baseline year). The cost implications of this change will average less than half of one percent of the value of the affected properties.

In 2018, City Council approved updates to the *Building by-law* and *Parking by-law* to require that all parking stalls in multi-family buildings, excluding visitor stalls, be equipped with electric vehicle ("EV") charging infrastructure. This report aligns the requirements for one- and two-family dwellings with those of multi-family dwellings. In addition, this report removes an exemption that allowed builders to omit electric vehicle charging circuits should they trigger an electrical service requirement over 200A. The removal of this exemption completes a commitment under the 2016 EV Ecosystem Strategy. Costs to require energized outlets in all parking stalls (instead of one in each garage or carport) are not expected to be material and are lower cost in many cases.

The proposed amendments would also close a lighting alterations loophole that will result in improved energy performance, while a replacement provision will help streamline permit reviews and further reduce permit wait times. Finally, the proposed amendments will incorporate 4-6 storey residential buildings into our Zero Emissions Building Plan, which aligns with the provincial Step Code, and will reduce the complexity of the *Building By-law*. Various minor housekeeping amendments are also being made to correct typographical and formatting errors.

## **COUNCIL AUTHORITY/PREVIOUS DECISIONS**

In July 2004, Council adopted the *Green Building Strategy* to demonstrate leadership in energy and water efficiency in new civic facilities, in order to help normalize these building and design approaches, and facilitate their adoption by the broader market.

In June 2008, Council adopted a set of *Building By-law* amendments directed at reducing the environmental impacts of new one- and two-family dwellings and introduced new requirements for air tightness and heat recovery ventilation.

In April 2014, Council adopted the *2014 Building By-law* that further increased the energy efficiency requirements for one- and two-family dwellings and laneway houses.

In July 2016, Council approved the *Zero Emissions Building Plan* to achieve zero emissions for all newly permitted buildings by 2030 that included intermediary, time stepped GHG emission and energy efficiency limits in the *Building By-law* for each building type.

In November 2016, Council approved changes to the *Green Buildings Policy for Rezoning*s that began the implementation of the *Zero Emissions Building Plan* by establishing GHG and heat loss limits on rezoned buildings while also requiring air tightness testing and direct ventilation.

In November 2016, City Council approved the *EV Ecosystem Strategy*, which established 32 priority actions to be undertaken to improve access to electric vehicle (“EV”) charging infrastructure between 2016 and 2021. The *EV Ecosystem Strategy* formalized the City of Vancouver’s role as a provider of, and a market enabler for, electric vehicle charging over the next five years. Actions within the strategy directly relevant to the recommendations in this report include:

Panel Exemption Quick Start: Remove 200A panel exemption [created in 2009] for new construction of one- and two-family homes under the Vancouver *Building by-law*

*H1*. Expand building requirements for EV charging readiness in MURBs such that each resident has access to EV charging in their own parking stall.

In January 2017, Council made changes to the VBBL to set a carbon pollution limit on larger homes

In March 2018 Council approved requirements that all non-visitor stalls in multi-family dwellings be equipped with an energized outlet for the purposes of EV charging.

In January 2019, Council approved the *Climate Emergency Declaration* recognizing the local and global threats posed by climate change and directing staff to develop plans to accelerate the City’s climate actions.

In April 2019, Council approved the Climate Emergency Response report, which established a ‘Big Move’ target for all new and replacement heating and hot water systems to be zero emissions by 2025. Further, ‘Accelerated Action’ 5a directed staff to “Explore opportunities to set lower carbon emissions limits for new construction faster than laid out in the Zero Emissions Building Plan.”

In November 2019, Council approved the Rental Incentives Review Phase II Report Back which will require zero emissions heating and hot water for low rise residential projects seeking incentives.

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

The recommended amendments accelerate the implementation of the Zero Emissions Building Plan as directed by the Climate Emergency Big Move 4. If these amendments are approved, new single family and multi-family buildings 3 storeys and under will be built with zero emissions space and hot water heating. In addition, the amendments increase flexibility and simplify compliance for builders and suppliers by largely aligning with the requirements of the *BC Energy Step Code*.

The City Manager supports these recommendations.

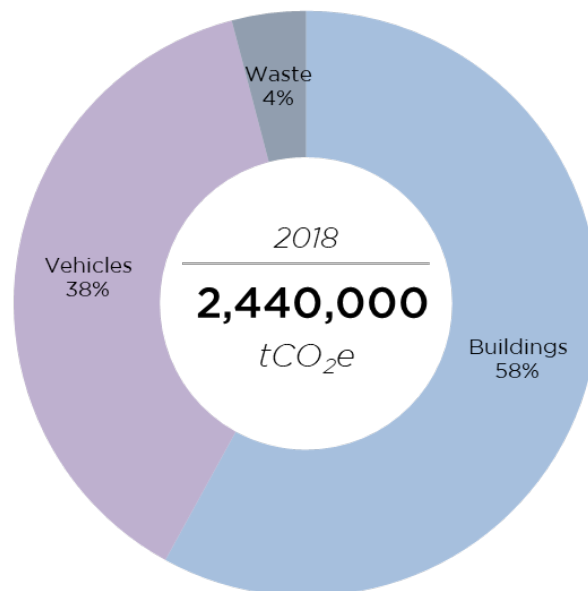
## REPORT

### Background/Context

#### Climate Emergency

The 2018 IPCC Report on Climate states we must reduce global emissions (GHGs) by 45% before 2030 to reduce the mounting damage from sea level rise, floods and droughts that will severely hinder efforts to tackle poverty, raise living standards and improve prosperity here and internationally. These proposed changes are required if Vancouver's is to reduce its GHG pollution toward this objective.

The 2016 *Zero Emissions Building Plan* called for time stepped reductions in carbon pollution emissions and heat loss for new buildings. Big Move 4 in the 2019 *Climate Emergency Response* directed staff to accelerate implementation of this Plan and introduce requirements for zero emission space and water heating in new buildings. The combustion of fossil fuels for heating and hot water are the largest source of carbon pollution in Vancouver – in 2018 emissions from buildings accounted for 58% of carbon pollution in Vancouver.



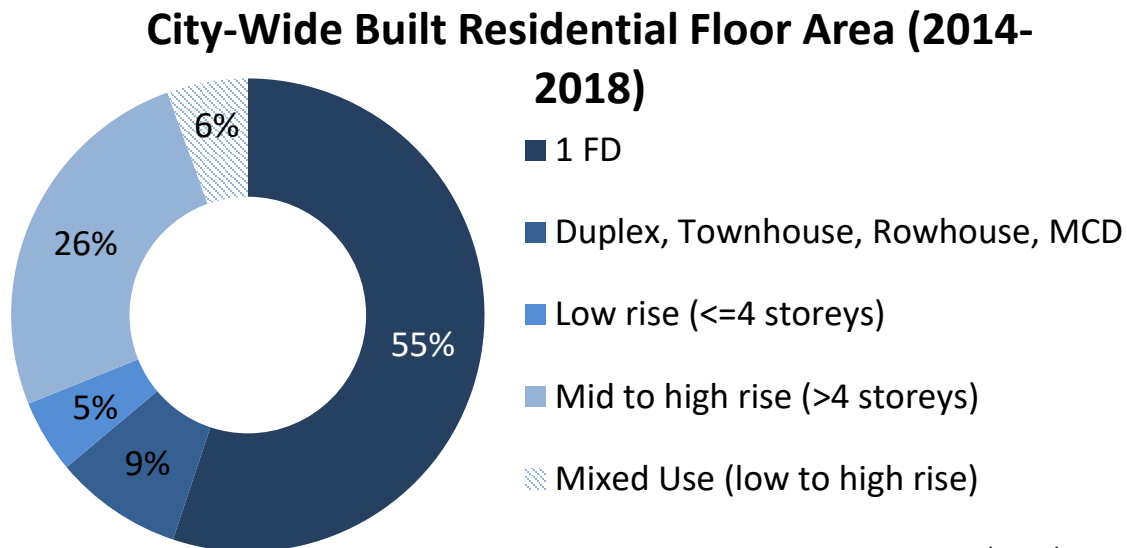
Vancouver's current (2019) *Building By-law* has only prescriptive requirements for energy efficiency in low rise residential buildings – these prescriptive requirements do not require the use of renewable energy and may limit industry flexibility in meeting the City's objectives.

#### The Energy Step Code

The *British Columbia Energy Step Code*, modelled off of Vancouver's *Zero Emissions Building Plan*, is a provincial energy performance code that sets heat loss limits for new construction. It has five performance steps for low rise housing that represent progressively more efficient construction than the requirements of the Provincial building code. The Energy Step Code has been voluntarily adopted by 60 BC municipalities representing 70% of building starts in BC. Vancouver is surrounded by municipalities that have adopted the BC Step Code including North Vancouver, West Vancouver, Burnaby, Richmond, New Westminister, and Surrey.

## What Vancouver Builds

From 2014-2018, 69% of newly permitted residential-only floor space was low rise residential.



Source: BC Assessment (2019)

The BC Assessment data used above to categorize housing types includes low-rise multifamily up to 4 storeys, differing slightly from the scope of this report, which is limited to 3 storeys or less. The difference in categories is estimated to be less than 1% different because very few four storey residential-only developments are built in Vancouver.

Over 80% of the low-rise residential housing form does not result from rezoning, so the best policy tool to lower carbon pollution across Vancouver is the *Building By-Law* because it sets the minimum standard for all projects. For those 20% of projects that choose to rezone the requirements are more rigorous on energy efficiency, requiring a Thermal Energy Demand Intensity (TEDI of 15, which is equivalent to the requirements in Step 5, or in some cases Passive House.

In general, the average carbon pollution intensity of new Vancouver buildings is going down, but low rise housing as a category is falling behind. The current average carbon pollution of single family housing is 8 kg of carbon dioxide from every square metre of area, per year (CO<sub>2</sub>e/m<sup>2</sup>/yr.). This category has not had an energy update in the *Building By-law* since 2014. New buildings developed under the High Building Policy and the Green Buildings Policy for Rezoning's are achieving carbon pollution intensities well under 3 kgCO<sub>2</sub>e/m<sup>2</sup>/yr. This has been achieved through zero emissions space and water heating along with many of the measures in the updates recommended in this report.

### Strategic Analysis

The proposed *Building By-Law* updates respond to the Climate Emergency by transitioning to zero emissions space and water heating in single family, duplex, laneway, townhome and three storey and under low-rise multifamily residential buildings. The proposal also adds a performance path option aligned with Step 4 of the *BC Energy Step Code* as alternate step in implementing the *Zero Emissions Building Plan*. The updates will reduce wasted energy, which in turn will make the transition to zero emissions space and water heating more affordable.

Staff have identified six intended outcomes from this *Building By-law* update:

1. A requirement for zero emissions space and water heating, to deliver a 63% carbon pollution reduction compared to our current *Building By-law*, equivalent to an 86% carbon pollution reduction compared to our 2007 baseline By-law.
2. A requirement to improve the building envelope (roofs, windows, and air leakage) so that less energy is needed for space heating and the transition to zero emissions space heating can be achieved with a limited increase in operating costs, with potential savings for smaller homes.
3. Streamlined regulation by offering a more flexible performance compliance option (Step 4 of the *BC Energy Step Code*), which brings us into closer alignment with the Province and provides industry with a consistent approach across multiple municipalities.
4. Alignment with the national Energy Star program for the prescriptive elements of the code for windows, glass doors, heat recovery ventilation, and air tightness. Adopting prescriptive requirements that align with Energy Star for windows, airtightness, and heat recovery ventilators helps local manufacturers develop products with national markets.
5. Continued requirement for innovation in larger homes. The recommended *Building By-law* amendments require new homes over 325 m<sup>2</sup> (3,498 sq. ft.) to limit their carbon dioxide emissions to 2 tonnes per year. A 3 tonne cap has been in place for almost two years, and experience to date has shown that homes up to 3,200 m<sup>2</sup> (34,445 sq. ft.) can meet the recommended 2 tonne cap. The larger a home is beyond the 325 m<sup>2</sup> threshold, the greater the requirement for improved design, better building envelopes, and improved equipment to ensure equitable energy use.
6. Make it simple for high performance projects to comply with the *Building By-law* by having a compliance path that is not burdened by overlapping requirements.

#### Preparing industry for a responsible transition

The shift towards zero emissions space and water heating will lead to new heating systems. Air to water heat pumps produce hot water for space heating and are likely to be a common heating solution for new single family homes, as over 90% of typical single family homes built in 2019 were heated with hot water. For air to water heat pump systems to be properly designed and installed, some training is needed, which will take collaboration and time.

Staff are collaborating with industry, represented by the Canadian Institute of Plumbing and Heating of British Columbia, the Thermal Environmental Comfort Association, and others to develop two courses on air to water heat pumps that can be completed by working professionals. The first course will be for designers, and the second for installers. This training will ensure the local workforce is ready to design and install zero emissions space heating and hot water solutions.

The two new courses build upon previous educational work. The retraining and education element underway supports a responsible transition from a city where new buildings are heated with natural gas from fossil sources, to a city where buildings are heated from renewable sources. Funding for this training development will come from an existing budget.

These systems are more common in Europe, Asia and the East coast so staff are confident local industry will be able to adapt quickly. As well, our Green Building Policy for Rezoning has been in place since 2017 and this along with other activities to promote passive house design has been preparing industry for these changes.

Most building by-law updates are implemented within 6 to 12 months. For these changes, staff are proposing closer to 16 months before the changes come into effect, this is in response to feedback from industry. The extra time will allow time suppliers, designers, and installers to take training and gain experience with larger homes, where zero emissions equipment is already being used. By requiring new buildings to make the successful transition to zero emissions space and water heating first, we build the supply chain and help local industry get experience to enable the future transition for existing building retrofits.

These changes have been designed with staff in Development, Building and Licensing Services (DBL) to ensure there is no material change in permit processing times due to these updates. Staff are being trained to review these updates prior to implementation.

### Equal requirements across housing types

Several categories of new development in Vancouver already meet the standards proposed in this report:

1. Tall buildings under the Higher Buildings Policy were required to limit emissions to 3 kgCO<sub>2</sub>e/m<sup>2</sup> as of November 1<sup>st</sup>, 2018.
2. New townhomes and laneway homes typically install zero emissions space heating already, and while these outcomes aren't currently required, market forces have already encouraged the use of electric space heating in modest sized homes
3. Low rise rental will be required to install zero emissions space and hot water equipment, and to limit emissions to 3 kgCO<sub>2</sub>e/m<sup>2</sup> or less, according to Council direction in November 2019.

The proposed changes in this report will align the carbon pollution rules for all residential housing of three storeys or less.

### Adjusting Height and Making Space for Zero Emissions Mechanicals

Adding additional roof insulation to a typical flat roof assembly is expected to add about 153mm (6 inches) to the height of new one- and two-family homes, with a similar increase in pitched roof assemblies that include sloped ceilings. Allowing a similar increase in building height would accommodate better insulation without a reduction in living space.

The transition to air-to-water heat pumps will be aided by giving the right space to equipment. Recognizing the need for floor space for mechanical equipment through a floor space exclusion, in combination with inspections in the field, will help avoid mechanical equipment being placed into compromised spaces such as beneath stairs or behind washing machines.

If this report's recommendations are approved, staff will explore potential adjustments to the *Zoning & Development By-law* to accommodate the proposed VVBBL updates, and report to Council later in 2020 with proposed changes.

## The Role for Renewable Natural Gas

Renewable natural gas differs from fossil natural gas in that it comes from renewable or waste sources like landfill gas or bio-methane and contributes significantly less to climate change.

This report does not recommend banning new natural gas connections, as a number of municipalities like Berkeley, San Jose, and Brookline in the United States have done for residential buildings. This approach was considered, but the recommended approach achieves an 86% reduction in carbon pollution with acceptance from affected stakeholders, as other gas uses like cooking and fireplaces would continue to be allowed. This approach also keeps open a discussion on renewable natural gas with the local gas utility, FortisBC.

FortisBC is actively working to expand its offering of renewable natural gas including a partnership with Vancouver to upgrade landfill gas into renewable natural gas. The share of renewable natural gas is presently below 1%, but the Province of BC has committed to establishing a Renewable Gas Standard that would increase that share to 15% by 2030.

During consultation we received feedback requesting that renewable natural gas be recognized as a zero emissions energy source. Staff are supportive of recognizing the verified emissions intensity of renewable natural gas as its share of gas supply in the province increases. Further, staff will work with FortisBC and other partners as necessary on a mechanism for recognizing 100% renewable natural gas as a compliance option in the proposed updates. The City of Vancouver has an interest in ensuring that renewable gas can be secured for use by buildings for their expected life-spans, and that the renewable gas is additional to mandated provincial requirements.

## Cost

In providing cost estimates for the proposed changes, staff worked with an engineering, energy, and costing consultant (RDH Building Science). Based on feedback in previous bylaw updates, staff also worked with a number of local home builders and developers to get independent costing from actual new home projects. In general terms the cost implications are less than half of one percent of sale price for new homes, and for over 60% of new homes the changes will save homeowners money on a monthly basis. Homes more modest in size are more likely to save with the proposed changes.

A summary of the cost estimates for the recommended changes is as follows:

### Capital Cost:

Townhome incremental construction costs to implement these recommendations have been estimated by local builders at 0.1% of the sale price, which is \$1.40 per sq. ft. For context, the purchase price of a new townhome was approximately \$1,280.00 per sq. ft. over the last year, and the total construction cost is in the range of \$300.00 to \$450.00 per sq. ft.

Single family home incremental construction costs have been estimated by local builders at 0.3% of the sale price, which is \$3.90 per sq. ft. For context, the overall purchase cost of a new single family home is \$1,100.00 per sq. ft., and the construction cost is in the range of \$275.00 to \$400.00 per sq. ft.



## Operating Cost:

Over 60% of new homes are expected to see operating (utility) cost savings with these proposed changes. For example, operating costs for a 1,345 sq. ft. townhome built to the proposed requirements will see savings of \$35.00 to \$50.00 per month compared to a townhome built to the 2019 VBBL requirements. This is in the context of a monthly utility cost in the \$130.00 to \$140.00 range.

Operating costs for a 2,900 sq. ft. single family home built to the proposed requirements would be similar to a home built under the 2019 By-Law. Most homes are likely to see little to no change, some homes may see savings as high as \$8.00 per month. This is in the context of a monthly utility cost in the \$140.00 to \$170.00 range.

Additional costing detail can be found in Appendix C

## Consultation

A broad range of consultation activities were undertaken using multiple formats and across a wide diversity of stakeholders. Consultation took the form of stakeholder workshops, letters, presentations in temple, a public open house, and meetings and correspondence with individual stakeholders. The range of stakeholders engaged included: builders, developers, professional associations, industry groups, equipment manufacturers, equipment suppliers, energy utilities, designers, and NGO's. Organizations that represent over 50,000 people were consulted with feedback integrated. A full list of organizations is listed in Appendix D and includes:

- Homebuilders Association of Vancouver (971 members)
- Urban Development Institute (850 members)
- Architectural Institute of British Columbia (4674 people)
- Association of Professional Engineers and Geoscientists of British Columbia (37,000 people)
- Builders at the Ross Street Temple (70 people)
- Hearth Patio and Barbeque Association (6000 people)
- Canadian Institute of Plumbing and Heating of British Columbia
- Home Ventilation Institute
- Fortis BC
- David Suzuki Foundation
- Renewable Cities

The original draft recommendations for climate and energy efficiency were developed with stakeholder input in summer 2019. These included the streamlining of requirements and permitting processes, cost effectiveness, and industry capacity to implement the proposed changes.

A number of changes and additions to the recommendations were made resulting from the feedback and ideas generated through the 2019 consultation. Especially important to stakeholders was to allow enough time prior to implementation to develop and deliver training for designers and installers required to install zero emissions space heating and hot water equipment. The City has agreed to co-fund the development of this training. The timing of the report will also allow zoning regulation to be updated to accommodate the increased roof insulation and equipment space. Also important was expanding a dialogue with FortisBC on the role of renewable natural gas in Vancouver's building policies. Widely distributed stakeholder

letters can be found in Appendix B. These consultations resulted in general support for the final recommendations.

### Implementation Dates

The date of July 1, 2020, is recommended to close a loophole in the current lighting alterations provisions.

The date of January 1, 2021, is recommended both for the move closer to alignment with the *BC Energy Step Code* for residential buildings 4-6 storeys and to move the carbon pollution limit to 2 tonnes for homes over 325 m<sup>2</sup>. This timeline will help further develop the market for zero emissions space and water heating as the industry prepares for the standard to apply to all low-rise residential construction in Vancouver.

The date of June 1, 2021, is recommended for all other building bylaw changes. This timing will allow for the development of training for designers and installers of air to water heat pumps, which are likely to be the most popular zero emissions space heating solution in single family homes.

### Electric Vehicle Charging Infrastructure

Two substantive changes are proposed for EV-readiness requirements for new one- and two-family dwellings:

- 1) updating the requirements to align with those of multi-family dwellings; and
- 2) removing the exemption for calculated loads over 200A to omit an energized outlet in one- and two-family homes

Access to residential charging is considered to be one of the single greatest enablers of electric vehicle uptake. Ensuring that EV charging is available to all residents, regardless of income or home ownership status, will support the City's goal to transition responsibly to 100 per cent zero emissions transportation before 2050.

The City's previous requirements for one- and two-family homes did not explicitly require that all parking stalls be 'EV-ready': they required that "each garage or carport" be so-equipped. By aligning the requirements for one- and two-family homes with those of multi-family homes, the City ensures that all residential parking stalls will enable electric vehicle charging. Furthermore, it removes ambiguity by simplifying the regulatory language. Now in all cases, parking spaces intended for residents of a building will allow for electric vehicle charging without the need for those residents to undertake costly upgrades.

The previous exemption in the *Building by-law* that allowed builders to forego installing an EV charging circuit if that circuit brought the building's electrical service requirement over 200A did not consider the entire building's energy system. This exemption is not practical, given the increasing number of electrical loads in new buildings. It is also not necessary, given the availability of many "load management" technologies that minimize the impacts of EV charging on a building's electrical load. Removing this exemption will have no material impact on builders' ability to keep electrical service under 200A.

The costs associated with the removal of the 200A exemption are not expected to be material; inexpensive technologies can be incorporated in an EV charging circuit to reduce or eliminate the impact to a building's calculated load. In essence, the 200A exemption is obsolete, and its removal will encourage more efficient EV charging design.

Similarly, the costs to include energized outlets for EV charging in every residential parking stall, rather than one in each garage or carport, will not be material. Given the total energy used by electric vehicles, the additional hardware costs can be mitigated through more efficient design that reduce or eliminate the costs of added plug loads.

The Draft By-laws presented in Appendix E also make minor administrative changes to the text.

### ***Implications/Related Issues/Risk***

#### ***Financial***

There are no negative financial implications for the City. There are potential savings in taking a regulatory approach, by avoiding incentives that might be needed in a future voluntary program.

#### ***Human Resources/Labour Relations***

There are no Human Resources or Labour Relations implications.

#### ***Environmental***

After five years of building to the recommended VBBL updates in this report, new homes are expected to produce 4,678 fewer tonnes of carbon pollution per year than homes built to the 2019 VBBL. This is equivalent to permanently taking 1,170 cars off the road.

If all jurisdictions in British Columbia adopted these requirements, the resulting reduction would be 199,015 tonnes of carbon pollution per year. This would be equivalent to permanently taking 49,754 cars off the road.

#### ***Legal***

The Vancouver Charter authorizes Council to enact by-laws to regulate the construction of buildings where the conservation of energy or water, or the reduction of greenhouse gases is concerned.

### ***CONCLUSION***

In order to meet Vancouver's climate commitments this report recommends amendments to *Vancouver's 2019 Building By-law* that focus on reducing carbon pollution and energy use in new single family and multi-family residential buildings three storeys and under by transitioning space heating and hot water to zero emissions solutions and aligning closer to the *BC Energy Step Code*. If approved, these changes are expected to lower carbon pollution from these buildings by 86% compared to 2007. The changes are consistent with the approach recommended in the Climate Emergency declared in 2019 and the *Zero Emissions Building Plan* adopted by Council in 2016.

The report also recommends amendments to *Vancouver's 2019 Building By-law* and *Parking By-law* that simplify electric vehicle charging infrastructure, aligning all forms of parking in residential buildings under the same requirements. In addition, it clarifies a broader set of compliance options that are available to home builders.

\* \* \* \* \*

**DRAFT By-law to amend Building By-law No. 12511  
Regarding Various Energy Requirements and Housekeeping Amendments**

*Note: A By-law will be prepared generally in accordance with the provisions listed below, subject to change and refinement prior to posting.*

1. This By-law amends the indicated provisions of Building By-law 12511.
2. In Article 10.2.1.2. of Division B of Book I, Council:
  - a) In Clauses (1)(b) through (1)(d), and (1)(h), strikes out the word “reserved” and substitutes “[UTV Deleted]”, and
  - b) In Clause (1)(i), strikes out the words “fire places” and substitutes “gas-fired fireplaces”.
3. In Article 10.2.1.3. of Division B of Book I, Council:
  - a) In Clauses (1)(b) through (1)(d), and (1)(h), strikes out the word “reserved” and substitutes “[UTV Deleted]”, and
  - b) In Clause (1)(i), strikes out the word “gas” and substitutes “gas-fired”.
4. In Article 10.2.1.6. of Division B of Book I, in Clause 1(h), Council adds the words “except for laneway houses,” to the beginning of the clause.
5. In Article 10.2.2.3. of Division B of Book I,
  - a) In Sentence (1) after the words “(NBCC), and shall be designed,” Council inserts the words “as applicable,” and
  - b) At the end of Clause (1)(e), Council inserts the word “and”.
6. In Article 10.2.2.4. of Division B of Book I, Council strikes out the word “reserved” and substitutes “[UTV Deleted]”.
7. In Article 10.2.2.22. of Division B of Book I, Council strikes out Sentence (4) and substitutes “**4** In spaces required to comply with Sentence (3), the design of exterior space heating or occupant heating systems shall comply with Table 10.2.2.22, as applicable.”.
8. In Article 10.2.2.22. of Division B of Book I, Council strikes out Table 10.2.2.22 and substitutes the following:

Table 10.2.2.22. Exterior Space or Occupant Heating System Design Requirements Forming a part of 10.2.2.22.			
System Type	Maximum output	Control type	Management Requirements
In-slab or in-floor radiant heat	15 W/ft <sup>2</sup>	Zone-based controls interconnected with centralized automatic control system	Independent zone management
Electric radiant heat	18 W/ft <sup>2</sup>	Unit-based or zone-based controls interconnected with centralized automatic control system	Independent unit or zone management
Heated seating	20 W per seat	Zone-based controls, interconnected with i) individual seat shutoff, or ii) a centralized automatic control system	Individual seat heater shutoff and independent zone management
Non-electric and non-fossil fuel radiant heat	18 W/ft <sup>2</sup>	Unit-based controls interconnected with centralized automatic control system	Independent zone management

”

9. In Article 11.7.1.2. of Division B of Book I, in Sentence (1), Council strikes out the words “all buildings” and substitutes “a *building*”.

10. In Article 11.7.1.3. of Division B of Book I, in Sentence (1), Council strikes out the words “all buildings” and substitutes “a *building*”.

11. Council strikes out Article 10.2.2.2. of Division B of Book I, and substitutes the following:

**“1)** A *building* designed in accordance with this Article shall be designed and constructed in accordance with ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings, except Low-Rise Residential Buildings”.

**2)** A *building* designed in accordance with Sentence (1), shall be designed, as applicable, with

- a) a climate zone of 4,
- b) no requirement to comply with the Fenestration Orientation provisions of ASHRAE 90.1, Article 5.5.4.5.,
- c) ventilation in conformance with ASHRAE 62-2001 (except addendum n), or if applicable, 6.3.1.1.(3)(b) of the Building By-law,
- d) no requirement to comply with Automatic Receptacle Control, per ASHRAE 90.1, Article 8.4.2,
- e) lighting alterations in conformance with the following provisions, which replace Lighting Alterations, per ASHRAE 90.1, Article 9.1.2:

**9.1.2 Lighting Alterations.**

For the *alteration* of any *lighting system* in an interior *space* or exterior area, that *space* or area shall comply with the entirety of Chapter 9, as applicable to that *space* or area.

**Exception to 9.1.2:**

1. Interior lighting *alterations* where the total new wattage of all *replaced luminaires* on a project is 2,000 watts or less, the total wattage of *replaced luminaires* of a *lighting system* within a *space* shall be at least 50% below the total wattage of all *removed luminaires* of that *lighting system*, unless the *space* is at or below the LPD allowance of Table 9.6.1 or Section 9.6.2 as applicable.

Controls shall comply with the requirement of either Section 9.4.1.1(h) or Section 9.4.1.1(i).

2. Exterior lighting *alterations* where the total number of *replaced luminaires* on a project is 10 or less, the total wattage of *replaced luminaires* shall be at least 50% below the total wattage of all *removed luminaires*, unless each altered area is at or below the LPD allowances of Table 9.4.2-2.

Controls shall comply with the requirement of Section 9.4.1.4(a).

3. The replacement of a failed *lamp* or *ballast/driver* in an individual *luminaire* or the replacement of any failed lighting control.
4. The removal or relocation of interior or exterior *luminaires* as part of, or independent of, exceptions 1, 2, or 3.

- f) the 5% in Table 11.5.1.5. Building Envelope, Exception a., being replaced by 2%, if designed in compliance with ASHRAE 90.1, Section 11, and
- g) the 5% in Table G3.1.5.a. Building Envelope, Exception 1., being replaced by 2%, if designed in compliance with ASHRAE 90.1, Appendix G.”.

12. In Article 11.7.1.1. of Division B of Book I, in Clause (3)(a), after “Energy Standard for Buildings Except Low-Rise Residential Buildings,” Council inserts the reference “and Sentence 10.2.2.2.(2),”.

13. In the Notes to Part 11 of Division B of Book I, in Note A-11.7.1.1.(3), Council:

- a) strikes out the words “May 8, 2019” and substitutes “July 1, 2020”,
- b) strikes out the Scope section, and substitutes the following:

“SCOPE

This document applies to the alteration of existing buildings, specifically buildings:

- designed to NECB 2011
- designed to ZEBP (10.2.2.5.), or

- subject to 11.7.1.1.(3)(b) requirements”, and
- c) In section 2.1.2., Council strikes out 2.1.2.1. and substitutes the following:

**“2.1.2.1. Lighting Alterations.** For the *alteration* of any *lighting system* in an interior *space* or exterior area, that *space* or area shall comply with the entirety of Part 4, as applicable to that *space* or area.

**Exceptions:**

1. Interior lighting *alterations* where the total new wattage of all *replaced luminaires* on a project is 2,000 watts or less, the total wattage of *replaced luminaires* of a *lighting system* within a *space* shall be at least 50% below the total wattage of all *removed luminaires* of that *lighting system*, unless the *space* is at or below the *LPD* allowances of Part 4.

Controls shall comply with the requirement of 4.2.2.1.(20).

2. Exterior lighting *alterations* where the total number of *replaced luminaires* on a project is 10 or less, the total wattage of *replaced luminaires* shall be at least 50% below the total wattage of all *removed luminaires*, unless each altered area is at or below the *LPD* allowances of Part 4.

Controls shall comply with the requirement of 4.2.4.

3. The replacement of a failed *lamp* or *ballast/driver* in an individual *luminaire* or the replacement of any failed lighting control.
4. The removal or relocation of interior or exterior *luminaires* as part of, or independent of, exceptions 1, 2, or 3.”

14. In Article 10.2.1.3. of Division B of Book I, in the title, Council strikes out the words “7 Storeys or More, and Commercial Buildings (with or without residential components)” and substitutes “4 Storeys or More, and Commercial Buildings (Including Hotels and Motels)”.

15. In Article 10.2.1.4. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “[UTV Deleted]”.

16. In Article 10.2.2.5. of Division B of Book I, in Table 10.2.2.5.B, Council inserts a new row above the row for “Residential *occupancies* in *buildings* over 6 *Storeys*”, as follows:

“

Group C <i>occupancies</i> in <i>buildings</i> 4 to 6 <i>Storeys</i> , except Hotel and Motel	100	15	N/A
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”

17. In Article 11.7.1.3. of Division B of Book I, Council strikes out the title and substitutes “Residential Buildings of 4 Storeys or More, Commercial Buildings, and Mixed-Use Residential Buildings”.
18. In Article 11.7.1.4. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “[UTV Deleted]”.
19. In Table 1.3.1.2. of Division A of Book I, under ASHRAE 90.1, Council strikes out the reference “Table 10.2.2.5.” and substitutes “Table 10.2.2.5.A”.
20. In Article 10.2.1.1. of Division B of Book I, in Sentence (3), Council strikes out the reference “10.2.1.6.” and substitutes “10.2.1.5.”.
21. In Article 10.2.1.2. of Division B of Book I, Council, in Sentence (1), strikes out the reference “10.2.1.6.” and substitutes “10.2.1.5.”.
22. In Article 10.2.1.3. of Division B of Book I, Council, in Sentence (1), strikes out the reference “10.2.1.6.” and substitutes “10.2.1.5.”.
23. In Article 10.2.1.5. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes the following:

**“10.2.1.5. Residential Buildings of 1 to 3 Storeys and Houses (excluding Hotels/Motels)**

- 1) A *building* shall comply with the requirements of Sentence (2), where it
- a) is entirely of Group C *major occupancy* except subsidiary *occupancies*,
    - i) less than 4 storeys in building height, or
    - ii) containing not more than 2 principal *dwelling units* and their subsidiary structures with conditioned space, and
  - b) does not include a Hotel or Motel use.
- (See Note A-10.2.1.5.(1)(a)(ii))
- 2) A *building* conforming with the criteria of Sentence (1),
- a) shall be designed in compliance with
    - i) the energy and emissions performance of Article 10.2.2.5. and Sentences 10.2.2.15.(1) through (4) where domestic gas-fired fireplaces are provided, or
    - ii) Article 10.2.2.15. where domestic gas-fired fireplaces are provided.
  - b) shall be designed with thermal performance in compliance with Article 10.2.2.6.,
  - c) shall be designed with exterior closures and fenestration with thermal performance in compliance with Article 10.2.2.7.,
  - d) except for *residential buildings* with not more than 2 principal *dwelling units*, shall be provided with vestibules in compliance with Article 10.2.2.8.,
  - e) shall be provided with metering equipment in compliance with Article 10.2.2.9.,



- f) shall be provided with lighting in compliance with Article 10.2.2.10.,
- g) shall comply with Articles 10.2.2.11. through 10.2.2.13. where domestic boilers generate space heating or hot water,
- h) shall comply with Article 10.2.2.14. where domestic heat pumps, furnaces, or make-up air units are provided,
- i) shall comply with Article 10.2.2.16. where domestic wood fireplaces are provided,
- j) shall be provided with heat recovery ventilators in compliance with Article 10.2.2.17.,
- k) **[UTV Deleted]**,
- l) shall provide documentation in compliance with Article 10.2.2.20.,
- m) shall provide airtightness testing in compliance with Article 10.2.2.21.,
- n) except for *residential buildings* with not more than 2 principal *dwelling units*, may provide exterior heated spaces in compliance with Article 10.2.2.22.”.

24. In Article 10.2.1.6. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “**[UTV Deleted]**”.

25. Council strikes out Article 10.2.2.5. of Division B of Book 1 and substitutes the following:

**“10.2.2.5. Building Energy and Emissions Performance**

1) For a *building* required to conform with this Article, energy modelling shall conform to:

- a) the applicable requirements of ASHRAE 90.1 ECB, or Part 8 of the NECB, and
- b) the City of Vancouver Energy Modelling Guidelines.

2) Except as permitted in Sentences (3) or (4), a *building* designed with this Article shall demonstrate the performance values of the proposed building comply with the limits in Table 10.2.2.5.A1.

3) Compliance with the GHGI limits in Table 10.2.2.5.A1 is not required where a *building* can demonstrate the performance values of the proposed *building* comply with the TEUI and TEDI limits in Table 10.2.2.5.B.

4) Buildings and major occupancies designed and constructed to conform to the certification criteria for the Passive House Standard, are deemed to comply with this Article provided the design’s energy model is

- a) version 9 or newer of the Passive House Planning Package, and
- b) prepared by a Certified Passive House Designer, or Certified Passive House Consultant.

(See Note A-10.2.2.5.(4).)

5) Compliance with the TEUI and TEDI limits in Table 10.2.2.5.A1 is not required where a building is connected to a Low Carbon Energy System, and can demonstrate the performance values of the proposed building comply with the limits in Table 10.2.2.5.C.

<p style="text-align: center;"><b>Table 10.2.2.5.A1</b> <b>Maximum Energy Use and Emissions Intensities</b> Forming part of Sentence 10.2.2.5.(2)</p>
---

<b>Occupancy Classification (1)</b>	<b>Total Energy Use Intensity (kWh/m<sup>2</sup>a)</b>	<b>Thermal Energy Demand Intensity (kWh/m<sup>2</sup>a)</b>	<b>Greenhouse Gas Intensity (kgCO<sub>2</sub>e/m<sup>2</sup>a)</b>
Group C occupancies complying with 10.2.1.5.(2)(a)(i)	See Table 10.2.2.5.A2	20	3
Group C occupancies in buildings up to 6 Storeys, except Hotel and Motel	100	15	5.5
Group C occupancies in buildings over 6 Storeys, except Hotel and Motel	120	30	6
Hotel and Motel occupancies	140	20	8
Group D and E occupancies, except Office	120	20	3
Office occupancies	100	20	3

**Notes to Table 10.2.2.5.A1.:**

<sup>(1)</sup> For buildings containing multiple occupancies, refer to the procedures on mixed-use buildings in Section 5 of the CoV Energy Modelling Guidelines.

<b>Table 10.2.2.5.-A2 Mechanical Energy Use Intensity in Buildings under 4 Storeys for Group C Major Occupancies except Hotel and Motel</b>	
<b>Conditioned Floor Area</b>	<b>Mechanical Energy Use Intensity (MEUI) (kWh/m<sup>2</sup>a)</b>
≤ 50 m <sup>2</sup>	125
≤ 75 m <sup>2</sup>	108
≤ 120 m <sup>2</sup>	78
≤ 165 m <sup>2</sup>	58
≤ 210 m <sup>2</sup>	48
> 210 m <sup>2</sup>	45

<b>Table 10.2.2.5.B Maximum Energy Use and Emissions Intensities Forming part of Sentence 10.2.2.5.(3)</b>			
<b>Occupancy Classification</b>	<b>Total Energy Use Intensity (kWh/m<sup>2</sup>a)</b>	<b>Thermal Energy Demand Intensity (kWh/m<sup>2</sup>a)</b>	<b>Greenhouse Gas Intensity (kgCO<sub>2</sub>e/m<sup>2</sup>a)</b>
<b>Group C occupancies</b>	<b>100</b>	<b>15</b>	<b>N/A</b>

**Table 10.2.2.5.C**  
**Maximum Energy Use and Emissions Intensities**  
**For Buildings Connected to a Low Carbon Energy System**  
Forming part of Sentence 10.2.2.5.(4)

<b>Occupancy Classification</b>	<b>Total Energy Use Intensity (kWh/m2a)</b>	<b>Thermal Energy Demand Intensity (kWh/m2a)</b>	<b>Greenhouse Gas Intensity (kgCO2e/m2a)</b>
Group C occupancies in buildings up to 6 Storeys, except Hotel and Motel	110	25	5.5
Group C occupancies in buildings over 6 Storeys, except Hotel and Motel	130	40	6
Hotel and Motel occupancies	170	30	8
Office occupancies	170	30	3
Business and Personal Services or Mercantile Occupancies, except Office	170	30	3

”.

26. In Article 10.2.2.6. of Division B of Book I, Council strikes out Table 10.2.2.6 and substitutes the following:

“

<b>Table 10.2.2.6.</b> <b>Minimum Effective Thermal Resistance of Assemblies</b> Forming part of Sentences 10.2.2.6.(1)		
<b>Building Assembly</b>	<b>Assembly Minimum RSI Value (m<sup>2</sup>K/W)</b>	
	<b>Complying with Article 10.2.2.5</b>	<b>Not subject to Article 10.2.2.5</b>
<b>Roof Assemblies – Houses<sup>(1)</sup> Only</b>		
Houses with total conditioned space < 110 m <sup>2</sup> <sup>(2)</sup>	4.3	5.28
Houses with total conditioned space ≥ 110 m <sup>2</sup> <sup>(2)</sup>	4.3	7.0
<b>Roof Assemblies - Other</b>		
All projects	5.28	7.0
<b>All Buildings</b>		
Attic Space <sup>(3)</sup>		8.5
Walls (including frame crawl space walls) <sup>(4)</sup>		3.85
Foundation Walls		3.85
Box and Rim Joists		3.85
Concrete or Masonry Walls (other than foundation walls)		3.85
Suspended Floors (framed)		4.2
Suspended Floors (concrete slab)		4.2
Concrete Slabs on Ground at, above, or below grade (insulation under all slab area and around edge of slab)		2.5
Radiant Heating Suspended Floor Assembly Over Heated Area (insulation between heated floor and heated area below) <sup>(5)</sup>	2.5	
Concrete Balconies, Eyebrows, and Exposed Slab Edge (wrapped or using manufacturer thermal break in structure)	0.42	

**Notes to Table 10.2.2.6.:**

<sup>(1)</sup> The term “Houses” shall represent *buildings* containing not more than 2 principal *dwelling units*.

<sup>(2)</sup> The conditioned area of 110 m<sup>2</sup> pertains to the entire building and not only the suite.

<sup>(3)</sup> The thermal resistance rating of attic space insulation may be reduced to value required for frame walls for a distance of 1200 mm from the exterior wall. A minimum nominal RSI of 3.52 m<sup>2</sup>K/W is required above the top plate in the attic space.

<sup>(4)</sup> Headers and lintels: cavities between structural members are to be fully insulated, except where a framing plan provided by the builder, architect, designer, or engineer indicates that full-depth solid headers are structurally required.

<sup>(5)</sup> Not applicable when heating elements or piping are located within a concrete topping on a suspended floor assembly or within an internally heated suspended slab.”.

27. In Article 10.2.2.7. of Division B of Book I, Council strikes out Table 10.2.2.7.(1) and substitutes the following:

“

Table 10.2.2.7.(1) Maximum Thermal Transmittance of Exterior Closures and Fenestration Forming part of Sentence 10.2.2.7.(1)		
Conditions	Assembly Maximum USI Value (W/(m <sup>2</sup> K))	
	Complying with Article 10.2.2.5	Not subject to Article 10.2.2.5
<b>Windows, sliding, and folding doors with glazing</b>		
Window-to-wall ratio is $\geq 30\%$ , and One family dwelling with conditioned space $\geq 325$ m <sup>2</sup>	1.4	Average of 1.0 or lower and no individual window can be above U1.2 <sup>(2)</sup>
All other	1.4	1.2
<b>Curtainwall and Window Wall Assemblies</b>		
Window-to-wall ratio is $\geq 30\%$ , and One family dwelling with conditioned space $\geq 325$ m <sup>2</sup>	1.4	Average of 1.0 or lower and no individual window can be above U1.2 <sup>(2)</sup>
All other	1.4	1.2
<b>Other Types of Closures</b>		
Storefront curtainwall, window, and door assemblies	2.27	
Doors with or without glazing <sup>(1)</sup>	1.8	
Doors with a required fire resistance rating	Exempt	
Roof access hatches	2.9	
Skylights (not larger than 1220 mm in both directions), roof windows and sloped glazing systems	2.4	
Skylights larger than 1220 mm in both directions	2.95	
Tubular daylight devices	2.6	

**Notes to Table 10.2.2.7.(1):**

<sup>(1)</sup> Includes doors swinging on a vertical axis with or without glazing, door transoms, and sidelites.

<sup>(2)</sup> See note A-10.2.2.7.(3)."

28. Council strikes out Article 10.2.2.12. of Division B of Book I, and substitutes the following:

**“10.2.2.12. Domestic Hot Water Heaters**

1) In a *building* required to comply with this Article, water heating appliances shall comply with the following and be electrically operated except as permitted by Sentence (2).

- a) CSA C191, “Performance of electric storage tank water heaters for domestic hot water service”, or
- b) CAN/CSA-C745 “Energy Efficiency of Electric Storage Tank Water Heaters and Heat Pump Water Heaters, or
- c) CAN/CSA-P.9 Combined space- and water-heating systems.

2) *Buildings* that are complying with Article 10.2.2.5 may provide gas-fired appliances providing domestic hot water, and shall have a uniform energy factor of not less than 0.92 or alternatively a thermal efficiency of not less than 90% as determined by the following:

- a) CSA P.3-04, "Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Storage Water Heaters",
- b) CSA P.7-10, "Testing Method for Measuring Energy Loss of Gas-Fired Instantaneous Water Heaters",
- c) CAN/CSA-P.9 Combined space- and water-heating systems,
- d) CSA C191, "Performance of electric storage tank water heaters for domestic hot water service", or
- e) CSA 4.3/ANSI Z21.10.3, "Gas Water Heaters Volume III, Storage Water Heaters, with Input Ratings above 75,000 Btu per hour, Circulating and Instantaneous".

29. Council strikes out Article 10.2.2.13. of Division B of Book I, and substitutes the following:

**"10.2.2.13. Domestic Boilers**

- 1) Except as permitted by Sentence (2), in a *building* required to comply with this Article, domestic boilers providing heat, or heat and domestic hot water, shall be electric and be tested using CAN/CSA-C22.2 No 165, "Testing Method for Electric Boilers",
  
- 2) *Buildings* that are complying with Article 10.2.2.5 may provide gas-fired appliances have an Annual Fuel Utilization Efficiency (AFUE) rating of not less than 92%, and be tested using CSA P.2-07, "Testing Method for Measuring the Annual Fuel Utilization Efficiency of Residential gas fired Furnaces and Boilers".

30. Council strikes out Article 10.2.2.14. of Division B of Book I, and substitutes the following:

**"10.2.2.14. Domestic Heat Pumps, Furnaces or Make Up Air Units**

- 1) In a *building* required to comply with this Article, except as permitted by Sentence (5), domestic heat pumps, furnaces or make up air units shall be electrically-operated and have been tested using CAN/CSA-C22.2 No. 236 "Heating and Cooling Equipment",
  
- 2) Heat pumps equipped with supplementary heaters shall incorporate controls to prevent supplementary heater operation when the heating load can be met by the heat pump alone, except during defrost cycles,
  
- 3) Heat pumps with a programmable thermostat shall be equipped with setback controls that will temporarily suppress electrical back-up or adaptive anticipation of the recovery point, in order to prevent the activation of supplementary heat during the heat pump's recovery, and
  
- 4) Heat pumps shall conform to the performance requirements of Table 10.2.2.14

Table 10.2.2.14 Heat Pump Equipment Performance Requirements			
Component or Equipment	Heating or Cooling Capacity kW	Standard	Minimum Performance (no units)
<b>Air Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated</b>			
Split Systems	≤ 19	CSA C656	SEER = 14.5 EER = 11.5 HSPF = 7.1
Single Package System	≤ 19	CSA C656 (Including General Instruction No 2)	SEER = 14 EER = 11 HSPF = 7.0
All Systems	> 19	CAN/CSA-C746	See Level 2 in standard
<b>Water Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated</b>			
Ground Source Closed Loop			COP <sub>h</sub> ≥3.91
Water loop heat pumps		CAN/CSA-C13256-1	COP <sub>h</sub> ≥3.91
<b>Direct Expansion Ground Source Heat Pumps – Electrically Operated</b>			
Direct Expansion Ground Source Heat Pumps	≥ 21	CSA C748	COP <sub>h</sub> ≥3.1

**Notes to Table 10.2.2.14**

The symbols and abbreviations that appear in this column have the following meanings:

COP = coefficient of performance, in W/W (COP<sub>c</sub> = in cooling mode and COP<sub>h</sub> = in heating mode)

EER = energy efficiency ratio, in (Btu/h)/W (no metric equivalent)

HSPF = heating season performance factor, in watt-hours

SEER = seasonal energy efficiency ratio, in (Btu/h)/W (no metric equivalent)

**5)** Buildings that are complying with Article 10.2.2.5 may provide domestic gas-fired furnaces or make up air units that shall have an Annual Fuel Utilization Efficiency (AFUE) rating of not less than 92%, as tested using CSA 2.6/ANSI Z83.8, “Gas unit heaters, gas packaged heaters, gas utility heaters and gas-fired duct furnaces”.

31. In Article 10.2.2.15. of Division B of Book I, Council at the end of the article inserts the following new Sentence:

“**5)** In a *building* required to comply with this Article, the total rated input of all gas fireplaces installed shall not exceed 17.59 kW (60,000 Btu per hour).”.

32. In Article 10.2.2.17. of Division B of Book I, Council strikes out Clause (3)(a) and substitutes the following:

“a) be sized to run at its rated speed for continuous operation while achieving the performance requirements of Table 10.2.2.17 as designed and tested in conformance with CAN/CSA-C439:

Table 10.2.2.17 Heat Recovery Ventilator Performance Requirements	
Building's Conditioned Space (m <sup>2</sup> )	Sensible Heat Recovery Efficiency (SRE) at 0°C
≤110 m <sup>2</sup>	65%
>110 m <sup>2</sup>	75%

”

33. In Article 10.2.2.18. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “[UTV Deleted]”.

34. In Article 10.2.2.19. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “[UTV Deleted]”.

35. In Article 10.2.2.20. of Division B of Book I, in Sentence (3), Council strikes out the words “and where a *one family dwelling* or *two family dwelling*, with or without *ancillary residential units*, contains *conditioned space* of more than 325 m<sup>2</sup>, including *suites* that are not strata titled” and substitutes “that contains more than 325 m<sup>2</sup> of *conditioned space*, and does not consist of more than one *principal dwelling unit*.”

36. In Article 10.2.2.21. of Division B of Book I, Council strikes out Table 10.2.2.21. and substitutes the following:

“

Table 10.2.2.21. Maximum Tested Air Leakage Rates Forming part of Sentence 10.2.2.21.(2)	
Building Classification	Maximum Tested Air Leakage Rate
<i>Buildings, excluding buildings containing not more than two principal dwelling units and ground-oriented dwelling units</i>	2.0 L/s/m <sup>2</sup> at 75 pascals
<i>Ground-oriented dwelling units</i>	2.5 air changes per hour at 50 pascals
<i>Ground-oriented dwelling units alternative measure</i>	Normalized leakage area of 1.7 cm <sup>2</sup> /m <sup>2</sup> at 10 Pa
<i>Suites in multi-family buildings</i>	1.23 L/s/m <sup>2</sup> at 50 pascals

”

37. In the Notes to Part 10 of Division B of Book I, Council strikes out the reference “A-10.2.1.6.(1)” and substitutes “A-10.2.1.5.(1)(a)(ii)”.

38. In Article 11.2.1.4. of Division B of Book I, Council strikes out Table 11.2.1.4.(2) and substitutes the following:

“



<b>Table 11.2.1.4.(2) Energy Efficiency Upgrade Requirements for Residential Buildings containing not more than Two Principal Dwelling Units (except as permitted by Clause 11.2.1.2.(9)(d))</b>			
	<u>EnerGuide</u> Assessment <sup>(1)</sup>	Air tightness upgrades <sup>(2)</sup>	Attic and sloped roof insulation <sup>(3)</sup>
<b>Alteration construction value (\$)</b>			
\$0.00 to \$19,999	N	N	N
\$20,000 to \$74,999	Y	N	N
>\$75,000	Y <sup>(1)</sup>	Y	Y
<b>Scope of Work</b>			
Strata Property Conversion <sup>(4)</sup>	Y	Y	Y
Relocation	Y	Y	Y
Reconstruction	See Note (5)		

**Notes to Table 11.2.1.4.(2):**

- (1) An EnerGuide assessment of the *building* completed within the last 4 years must be submitted; a post-construction assessment must also be completed where the cost of construction exceeds \$75,000.  
 (2) Where EGH > 5 air changes per hour, air sealing is required.  
 (3) Where attic insulation <R12 (2.11RSI), increase to R28 (4.93 RSI); where attic insulation is ≥ R12 (2.11RSI), increase to R40 (7.04RSI); Insulation in existing attics shall not exceed R43.7 (7.7RSI). All flat roof and cathedral ceiling insulation shall be upgraded to ≥ R14 (2.47RSI).  
 (4) An existing building or parcel converted into 2 or more strata lots  
 (5) Alterations that are defined as Reconstruction in the Upgrade Mechanism Model in Appendix A Division B shall comply with Article 11.7.1.5

”.

39. In Article 11.7.1.1. of Division B of Book I, in Sentence (3), Council strikes out the reference “11.7.1.6.” and substitutes “11.7.1.5.”.

40. In Article 11.7.1.2. of Division B of Book I, in Sentence (1), Council strikes out the reference “11.7.1.6.” and substitutes “11.7.1.5.”.

41. In Article 11.7.1.5. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes the following:

**“11.7.1.5. Residential Buildings of 1 to 3 Storeys and Houses (excluding Hotels/Motels)**

1) Except as otherwise required in this Subsection, *alterations* to energy systems or components of a *building*, described in Sentence 10.2.1.5.(1), shall comply with

- a) the thermal performance requirements of Article 10.2.2.6, except as permitted by Sentence (2);
- b) the fenestration performance requirements of Article 10.2.2.7., except as permitted by Sentence (2);
- c) Articles 10.2.2.8 through 10.2.2.11. as applicable;
- d) domestic hot water requirements of Article 10.2.2.12. except the system may be gas-fired with a uniform energy factor of not less than 0.78 or a thermal efficiency of not less than 90%;
- e) space-heating appliance performance requirements of Articles 10.2.2.13. and 10.2.2.14, except a system may be gas-fired with an Annual Fuel Utilization Efficiency (AFUE) rating of not less than 92% as tested using CSA 2.6/ANSI Z83.8, “Gas unit heaters, gas packaged heaters, gas utility heaters and gas-fired duct furnaces”;

- f) domestic fireplace performance requirements of Articles 10.2.2.15 (1) to (4) and 10.2.2.16;
- g) heat recovery ventilators of Article 10.2.2.17, except non-reconstruction projects may provide continuous exhaust ventilation in accordance with Section 9.32;
- h) Article 10.2.2.20. for all *alterations*, except Sentence (3) shall apply to Reconstruction projects only;
- e) Article 10.2.2.21 except an airtightness performance of 3.5 ACH may be used for reconstruction projects, and
- f) Article 10.2.2.22. as applicable.

2) Where it is deemed prohibitive by the CBO, an *alteration* or upgrade to a *building* may:

- a) achieve the applicable minimum standard of performance in Table 11.7.1.5 or as otherwise permitted by the CBO, and
- b) trade-off the remaining emissions-reduction outcomes with other building systems or components, acceptable to the CBO

<b>Table 11.7.1.5 – Permitted minimum standards (with equivalent emissions reduction trade-offs selected and approved)</b>	
<b>10.2.2.6 Wall assemblies</b>	Shall achieve a minimum nominal RSI of 2.5 m <sup>2</sup> K / W in the affected assemblies with heat transfer, air leakage and condensation control per Section 9.25
<b>10.2.2.6 Roof assemblies</b>	Shall achieve a minimum nominal RSI of 3.8 m <sup>2</sup> K / W in the affected assemblies with heat transfer, air leakage and condensation control per Section 9.25
<b>10.2.2.7 Windows, Curtainwall, sliding or folding doors with glazing</b>	Shall achieve a maximum USI of 1.4 W/ m <sup>2</sup> K

”

42. In Article 11.7.1.6. of Division B of Book I, Council strikes out the title and Sentence (1) and substitutes “[UTV Deleted]”.

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CONSULTATION OUTCOMES 2021 VVBBL LETTER



PLANNING, URBAN DESIGN AND SUSTAINABILITY  
Sustainability Division  
Green Building

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January 20, 2020

To Whom It May Concern:

**RE: Proposed Low Carbon and Energy Efficiency Updates to the Vancouver Building By-law for Low Rise Residential (under 4 storeys)**

This letter summarizes stakeholder input, staff responses, and costing information related to the City's proposed updates to the energy and carbon emissions requirements in Vancouver's Building By-law shared with stakeholders on October 28<sup>th</sup> 2019 (original letter available on request and sent as an attachment).

We would like to thank stakeholders for the time they took to read, understand, and give feedback on the proposal. We have received a wide degree of support for this By-law update proposal and its objectives, and a number of recommendations on how the proposal can be improved.

The proposed changes apply to new low rise residential buildings including single family and laneway homes, townhomes, and multi-family buildings under four storeys in height. The proposed updates would achieve an 80 percent reduction in carbon emissions from the operation of a new home and lower energy use by an average of 40 percent compared to a home built to the British Columbia Building Code.

Through the feedback period, the key requests and comments from stakeholders were:

- suggested changes to the By-law requirements and timing
- to prioritize commitments and funding to invest in industry capacity training,
- to evaluate space and height modifications to accommodate the changes,
- to enable the use of renewable natural gas as a compliance option
- And to consider how a prescriptive limit is set on fireplaces.

These suggestions and staff responses are summarized below:

**1. Modifications to the proposed code updates and timing**

We received feedback on a number of specific elements in the proposal including the timing of implementation. Changes from the draft updates circulated in Oct 2019 are shown on pages 3-7 in **bold yellow highlight**. Further to these, staff support delaying the effective date of the proposed updates to June 2021 for new permit applications to provide adequate time to develop and deliver training with industry for successful implementation.

**2. Work with industry to develop training on air to water heat pump design and installation.**

We received feedback that the training available to industry for the design and installation of air to water heat pumps is currently inadequate. In response, the City will co-fund and collaborate with related industry associations (such as CIPH-BC, TECA, etc.) to develop and begin delivering a course on the design and installation of air to water heat pumps in advance of the bylaw requirement. This work has begun.

**3. Accommodate impacts on effective buildable height and floor space**

We received feedback that the proposed changes would reduce the effective buildable height and floor space of new developments. In response, staff are looking at specific changes to the Zoning and Development Bylaw. This work is ongoing and we don't have specifics to report back on at this point.

**4. Allow renewable natural gas as a zero emissions fuel**

We received feedback requesting that renewable natural gas be recognized as a zero emissions energy source. Staffs are supportive of recognizing the verified emissions intensity of renewable natural gas as its share of gas supply in the province increases. Further, staff will work with FortisBC, and other partners as necessary, on a mechanism for recognizing 100 percent renewable natural gas as a compliance option in the proposed updates. The City of Vancouver's primary interests in developing that option are ensuring that the renewable gas can be secured for use by the building for its expected life-span, and that the renewable gas is additional to mandated provincial requirements.

**5. Consider Step 5 of the BC Step Code in the Passive House Path**

We received feedback that the Step 5 of the BC Step Code should be recognized as a compliance option as part of these updates. Projects that achieve Step 5 would be able to use the performance path and exceed the Step 4 metric. As a result, the City of Vancouver will not be adding Step 5 as a metric to the Passive House (PHI) path. Adding Step 5 to the Passive House path would add complexity to compliance when a path designed for the BC Step code metrics exists.

**Costing**

Further to these changes, the City's consultants (RDH Building Science) and a number of local builders have developed cost estimates for the proposal.

- Townhome construction costs were forecasted to increase in a range of \$0.75/square foot to \$2.50/square foot. Working with local builders of townhomes the average increase was forecast to be \$1.40/square foot.
- Single family home construction costs were forecasted to range between a savings of \$5.10/square foot up to an increase of \$5.30/square foot depending on the heating and hot water systems selected by the design team (e.g. electric resistance, air-to-air heat pump, air-to-water heat pump, etc.). Working with local builders of single family

homes the average cost increase was forecast to be \$3.90/square foot using air to water, or air to air heat pumps for space heating.

- Operating costs for a 1,345 square foot townhome built to the proposed requirements will see savings of \$35 to \$50 per month compared to the significant majority of townhomes in Vancouver (using townhome built in 2006 as a proxy comparator).
- Operating costs for a 2,900 square foot single family home built to the proposed requirements would range from a savings of \$8/month to an increase of \$18/month as compared to the majority of similarly sized contemporary homes in Vancouver (using a single family home built in 2006 as a proxy comparator). This range varies depending on the heating and hot water system used in a new home, homes using an air to water heat pump for space heat and hot water tend to have the lowest operating cost.

### Closing Remarks

If you would like to discuss how the feedback has been incorporated into the By-law updates, costing, or any other details outlined in this letter, please reach out to me. Staff are working towards bringing a report forward to a Vancouver City Council before the end of March 2020.

Thank you for your time, feedback, and assistance in developing these bylaw updates that respond to the climate emergency while delivering homes that are more comfortable to live in, resilient, and energy efficient.

Sincerely,

**Chris Higgins**, CPHC, LEED AP Homes | Green Building Planner  
Sustainability Group | City of Vancouver  
City Hall, 7th Floor | 453 West 12th Ave | V5Y 1V4  
Chris.higgins@vancouver.ca

cc: Sean Pander, Green Buildings Program Manager  
Pat Ryan, Chief Building Official

Section 1: The following proposals are applicable to new residential construction under 4 storeys, through the Vancouver Building By-law:

Item	Description	Proposal
<b>1.1 Updated Prescriptive Path</b>		
1.1.1	Airtightness	<ul style="list-style-type: none"> <li>Airtightness of 2.5ACH50 for detached homes (aligning with Energy Star metrics). Any new low rise home can achieve as an alternative an NLA of <math>1.7\text{cm}^2/\text{m}^2</math></li> </ul>
1.1.2	Windows and glass doors	<ul style="list-style-type: none"> <li>Windows and Glass doors USI <math>1.2\text{ W}/\text{m}^2\text{K}</math> (aligning with Energy Star 2020 metrics)</li> </ul>
1.1.3	Heat Recovery Ventilation	<ul style="list-style-type: none"> <li><b>Heat recovery ventilator (HRV) of 75%</b> SRE at <math>0^\circ\text{C}</math> on continuous or 'normal' operation mode (aligning with Energy Star metrics)</li> </ul>
1.1.4	Space Heating and Domestic Hot Water	<ul style="list-style-type: none"> <li>Space heating must be zero emissions on site. Some examples of compliant equipment include a heat pump, electric resistance, and an electric boiler.</li> <li>Domestic hot water must be zero emissions on site. Some examples include a heat pump hot water tank, an electric resistance tank, or an electric boiler.</li> <li>This path would allow cooking with natural gas with venting to the outside and fireplaces with natural gas (<b>60,000 BTU limit on the total input of all fireplaces</b>).</li> </ul>
1.1.5	Flat and cathedral roofs	<ul style="list-style-type: none"> <li>RSI 7.04 (R40) effective</li> </ul>
<b>1.2 New Performance Path</b>		
1.2.1	Step 4 Metrics	<ul style="list-style-type: none"> <li>Thermal Energy Demand Intensity (TEDI) <math>20\text{kWh}/\text{m}^2/\text{annual}</math> (based on Step 4 of the BC Energy Step Code)</li> <li>Mechanical Energy Use Intensity (MEUI) targets based on Step 4 of the BC Energy Step Code (floor area and cooling dependent)</li> <li><b>1.5ACH50</b></li> </ul>

Item	Description	Proposal
1.2.2	GHGI	<ul style="list-style-type: none"> <li>Greenhouse Gas Intensity (GHGI) of 3kg/CO<sub>2</sub> equivalent/m<sup>2</sup>/annually.</li> <li>This would allow cooking with natural gas and fireplaces with natural gas.</li> </ul>
1.2.3	Prescriptive Minimums	<ul style="list-style-type: none"> <li>This path would maintain the 2019 VVBBL prescriptive path for envelope as floor minimums. For example, walls must meet R22 effective; etc.</li> </ul>
<b>1.3 NEW Passive House Path</b>		
1.3.1	Required to Certify	<ul style="list-style-type: none"> <li>Certify to the requirements of the Passive House International Standard, CHBA Net Zero Standard, or Living Future Zero Energy Standard. This path would maintain the 2019 VVBBL prescriptive path for the envelope as floor minimums except air tightness.</li> </ul>
1.3.2	Fuel Flexible	<ul style="list-style-type: none"> <li>This path would allow heating, domestic hot water, cooking and fireplaces, with any typical fuel type.</li> </ul>

**Section 2:** The following proposals are applicable to homes under 110 square meters and provide an additional option for these homes.

Item	Description	Proposal
<b>2. Homes under 110m2 (approximately 1200 square feet)</b>		
2.1	Flat and Cathedral Roofs	<ul style="list-style-type: none"> <li>RSI 5.28 m<sup>2</sup>K / W (R30) effective</li> </ul>
2.2	Air Tightness	<ul style="list-style-type: none"> <li>Achieve a Normalized Leakage Area of 1.7cm<sup>2</sup>/m<sup>2</sup></li> </ul>
2.3	Heat Recovery	<ul style="list-style-type: none"> <li>HRV 65% SRE at 0°C on continuous or normal operation mode</li> </ul>
2.4	Greenhouse gas footprint	<ul style="list-style-type: none"> <li>Overall Greenhouse gas footprint must be 0.5 tonnes / year or less in modeled operation</li> </ul>

**Section 3:** The following proposals are applicable to homes 325m<sup>2</sup> and larger. Limit the total greenhouse gas footprint to 2 tonnes annually on the property and improved glazing if the home exceeds 30% glazed wall or roof area.

Item	Description	Proposal
<b>3. Homes 325m2+ (approximately 3500 square feet)</b>		
3.1	Greenhouse Gas Limit	<ul style="list-style-type: none"> <li>Two (2) tonnes annually for all energy use regulated by the Vancouver Building By-law on the site. This primarily deals with space heating, domestic hot water, heated pools, and snow melting equipment.</li> </ul>
3.2	Glazed wall area	<ul style="list-style-type: none"> <li>If the home <b>exceeds 30% glazed wall area</b>, then the average window performance is increased to USI 1.0 or better</li> </ul>



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CONSULTATION LETTER 2021 ENERGY UPDATES TO BUILDING BYLAW PART 9



PLANNING, URBAN DESIGN AND SUSTAINABILITY  
Sustainability Division  
Green Building

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October 28, 2019

To Whom It May Concern:

**RE: Proposed Low Carbon and Energy Efficiency Updates to the Vancouver Building By-law for Low Rise Residential (under 4 storeys)**

We are consulting on a planned update to Vancouver's Building By-law that regulates low rise residential buildings including single family homes, townhomes, and multi-family buildings up to three storeys in height. This part of the VVBBL was last updated in 2014. Since that time, with direction from the Zero Emissions Building Plan, the remainder of the VVBBL has been updated to reduce energy waste and greenhouse gas pollution. This update takes direction from Council's Climate Emergency Response report [<https://vancouver.ca/green-vancouver/climate-emergency-response.aspx>] to transition to zero emissions space heating and hot water, see Big Move four: "By 2025, all new and replacement heating and hot water systems will be zero emissions."

In addition to that Council direction, the draft proposal described in this letter has been informed by early dialogues with the Homebuilders Association of Vancouver, the Urban Development Institute, the Architectural Institute of British Columbia, and the Engineers and Geoscientists of British Columbia on what this update will look like.

We are now seeking input on the specific proposals, outlined below, that transition toward an 80% reduction in emissions from the operation of a new home, and lower energy use by an average of 40% compared to a home built to the BC Building Code. This will be achieved by largely transitioning new housing off of fossil fuel for space heating and hot water.

The proposed changes will help Vancouver align with BC wide efforts to use the BC Step Code. Vancouver's existing prescriptive building by-law is better than Step 3 metrics in most cases (a 20-25% reduction in energy use compared to the BC code). Through the process of energy modeling, costing and consulting it has become clear that Step 4 metrics (a 40% energy savings) are achievable. Some projects are already pursuing Step 4 and Step 5 metrics throughout British Columbia.

We have done costing with RDH Building Science and are doing additional costing with a number of local homebuilders. Costing information will be made available by mid-November.

Proposed 2021 VVBBL Energy Updates for Low Rise Residential:

1. Updates that apply to all Low Rise
  - 1.1 Update the prescriptive path to achieve an average greenhouse gas reduction of 80%+ relative to current BC code.

- 1.2 Introduce a new performance path option to achieve an average greenhouse gas reduction of 80%+ relative to current BC code.
  - 1.3 Introduce a new Passive House path option to achieve an average energy use reduction of greater than 60% relative to current BC code.
2. Put in place prescriptive requirements appropriate for homes under 110m<sup>2</sup>.
  3. Update the requirements for homes over 280m<sup>2</sup>.

In all above cases the change will remove the requirement for homes to be “solar ready”, based on feedback from the solar industry that the solar ready requirement is no longer needed.

For more information or to sign-up for the public information session to be held on November 12, 2019 at City Lab at 511 W Broadway, contact us at [green.buildings@vancouver.ca](mailto:green.buildings@vancouver.ca).

All written feedback on these proposals must be submitted by email by 5PM PT Friday, November 29, 2019.

Yours truly,

**Chris Higgins**, CPHC, LEED AP Homes | Green Building Planner  
Sustainability Group | City of Vancouver  
City Hall, 7th Floor | 453 West 12th Ave | V5Y 1V4

cc: Sean Pander, Green Buildings Program Manager  
Pat Ryan, Chief Building Official

**Section 1:** The following proposals are applicable to new part 9 residential construction, through the Vancouver Building By-law:

Item	Description	Proposal
<b>1.1 Updated Prescriptive Path</b>		
1.1.1	Airtightness	<ul style="list-style-type: none"> <li>Airtightness of 2.5ACH50 (Aligning with Energy Star)</li> </ul>
1.1.2	Windows and glass doors	<ul style="list-style-type: none"> <li>Windows and Sliding Glass doors U1.22 (Aligning with Energy Star 2020)</li> </ul>
1.1.3	Heat Recovery	<ul style="list-style-type: none"> <li>Heat recovery ventilator 85% efficient at 0C</li> </ul>
1.1.4	Space Heating and Domestic Hot Water	<ul style="list-style-type: none"> <li>Space heating must be zero emissions on site. Some examples include a heat pump, electric resistance, and an electric boiler.</li> <li>Domestic hot water must be zero emissions on site. Some examples include a heat pump hot water tank, an electric resistance tank, or an electric boiler.</li> <li>This path would allow cooking with natural gas with venting to the outside and fireplaces with natural gas.</li> </ul>
1.1.5	Flat and cathedral roofs	<ul style="list-style-type: none"> <li>RSI 7.04 (R40) effective</li> </ul>

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## 1.2 New Performance Path

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|-------|----------------|--|
| 1.2.1 | Step 4 Metrics | <ul style="list-style-type: none"><li>• Step 4 metrics from the BC Step Code (Thermal Energy Demand Intensity /TEDI 20kWh/m2/annual)</li></ul> |
|-------|----------------|--|
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- |       |      |   |
|-------|------|---|
| 1.2.2 | GHGI | <ul style="list-style-type: none"><li>• Green House Gas Intensity /GHGI of 3kg/co2 equivalent/m2/annually.</li><li>• This would allow cooking with natural gas and fireplaces with natural gas.</li></ul> |
|-------|------|---|
- 

- |       |                       |   |
|-------|-----------------------|---|
| 1.2.3 | Prescriptive Minimums | <ul style="list-style-type: none"><li>• This path would maintain the 2014 VVBBL prescriptive path as floor minimums. For example, walls must meet R22 effective; Air tightness must meet 3.5ACH50, etc.</li></ul> |
|-------|-----------------------|---|
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## 1.3 NEW Passive House Path

- |       |                     |   |
|-------|---------------------|---|
| 1.3.1 | Required to Certify | <ul style="list-style-type: none"><li>• Certify to the requirements of the Passive House International Standard, CHBA Net Zero Standard, or Living Future Zero Energy Standard.</li></ul> |
|-------|---------------------|---|
- 

- |       |               |   |
|-------|---------------|---|
| 1.3.2 | Fuel Flexible | <ul style="list-style-type: none"><li>• This path would allow heating, domestic hot water, cooking and fireplaces, with any typical fuel.</li></ul> |
|-------|---------------|---|
-

**Section 2:** The following proposals are applicable to homes under 110 square meters and provide an additional option for these homes.

Item	Description	Proposal
<b>2. Homes under 110m2 (approximately 1200 square feet)</b>		
2.1	Flat and Cathedral Roofs	<ul style="list-style-type: none"> <li>RSI 5.28 (R30) effective</li> </ul>
2.2	Air Tightness	<ul style="list-style-type: none"> <li>Achieve a Normalized Leakage Area of 1.8cm<sup>2</sup>/m<sup>2</sup></li> </ul>
2.3	Heat Recovery	<ul style="list-style-type: none"> <li>HRV 65% at 0C</li> </ul>
2.4	Greenhouse gas footprint	<ul style="list-style-type: none"> <li>Overall Greenhouse gas footprint must be under 0.5 tonne in operation</li> </ul>

**Section 3:** The following proposals are applicable to homes 280m<sup>2</sup> and larger. Limit the total greenhouse gas footprint to 2 tonnes annually on the property and improved glazing if the home exceeds 40% glazed wall or roof area.

Item	Description	Proposal
<b>3. Homes 280m2+ (approximately 3010 square feet)</b>		
3.1	Greenhouse Gas Limit	<ul style="list-style-type: none"> <li>Two (2) tonnes annually for all stationary energy use regulated by the Vancouver building bylaw on the site. This primarily deals with space heating, domestic hot water, heated pools and snow melting equipment.</li> </ul>
3.2	Glazed wall area	<ul style="list-style-type: none"> <li>If the home exceeds 40% glazed area then the window performance is increased to U1.0 or better.</li> </ul>

## **COSTING DETAIL**

### Capital / Construction Cost Summary

- For townhome construction, incremental costs to implement these recommendations have been estimated by local builders as 0.1% of the sale price per sq.ft., which is \$1.40 per sq. ft. RDH estimated an average cost range from \$0.75 to \$2.50 using typical construction practice. For context, the purchase price of a new townhome is approximately \$1,280.00 per sq. ft., and the total construction cost is in the range of \$300.00 to \$450.00 per sq. ft. or more.
- Single family home construction costs have been estimated by local builders at 0.3% of the sale price, which is \$3.90 per sq. ft. using air-to-water or air-to-air heat pumps for space heating. RDH estimated a price range from savings of \$5.00 per sq. ft. to incremental costs of \$5.00 per sq. ft. For context, the overall purchase cost of a new single family home is \$1,100.00 per sq. ft., and the construction cost is in the range of \$250.00 to \$400.00 per sq. ft.

### Operating Cost Summary

- Operating costs for a 1,345 sq. ft. townhome built to the proposed requirements will see savings of \$35.00 to \$50.00 per month compared to a townhome built to the 2019 BBL requirements. This is in the context of a monthly utility cost in the \$130.00 to \$140.00 range.
- Operating costs for a 2,900 sq. ft. single family home built to the proposed requirements would be similar to a home built under the 2091 By-Law. Some homes may see savings as high as \$8.00 per month, most homes are likely to see little to no change. This range is a home using what is expected to be the most popular mechanical choice, an air to water heat pump, when compared to the majority of similarly sized 2019 homes in Vancouver. This range varies depending on the heating and hot water system used in a new home. Homes using an air to water heat pump for space heat and hot water tend to have the lowest operating cost. This is in the context of a monthly utility cost in the \$140.00 to \$170.00 range.

Detailed Capital Cost

Builder Code	Single Family Builder EL-3	Single Family E3-2
Chosen Path	Performance	Prescriptive
Envelope Upgrade	\$5,000.00	No breakout
Mechanical Upgrade	7500	No breakout
Upgrade cost	\$12,500.00	\$11,347.00
Home size in m2	245	245
Home size in ft2	3604	2637
Cost per m2	\$51.02	\$46.31
Cost per ft2	\$3.47	\$4.30

Townhome	Townhome EL-3	Townhomes E3-2
Chosen Path	Performance	Performance
Upgrade cost	\$2,300.00	\$2,371.32
Home size in m2	154.12	159.6
Home size in ft2	1659	1718
Cost per m2	\$14.92	\$14.86
Cost per ft2	\$1.39	\$1.38

The largest two upgrade costs noted are local green economies, air tightness and windows. Both require local trades to install and in the cases of windows are mostly made in the lower

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## LIST OF CONSULTED GROUPS

Groups consulted are estimated to represent well over 50,000 people engaged in related and affected industries.

- Homebuilders Association of Vancouver (1100 companies, no estimate of number of people)
- Urban Development Institute (850 companies, no estimate number people)
- Architectural Institute of British Columbia (4674 people)
- Association of Professional Engineers and Geoscientists of British Columbia (37,000 people)
- Builders at the Ross Street Temple (70 people)
- Hearth Patio and Barbeque Association (6000 people)
- Canadian Institute of Plumping and Heating of British Columbia
- Home Ventilation Institute
- Fortis BC
- David Suzuki Foundation
- Renewable Cities
- Sustainabiliteens
- Wilderness Committee
- Force of Nature
- Clean Energy Canada
- Pembina

**DRAFT By-law to amend Building By-law No. 12511  
Regarding Electric Vehicle Charging Stations**

*Note: A By-law will be prepared generally in accordance with the provisions listed below, subject to change and refinement prior to posting.*

43. This By-law amends the indicated provisions of Building By-law 12511.
44. In Article 10.3.1.1. of Division B of Book I, Council:
  - a) strikes out Sentence (2);
  - b) renumbers Sentence (3) as Sentence (2);
  - c) in renumbered Sentence (2), inserts the word “the” before “*Chief Building Official*”; and
  - d) in renumbered Sentence (2), strikes out the quotation mark at the end of the Sentence.

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**DRAFT By-law to amend Parking By-law No. 6059  
Regarding Electric Vehicle Charging Stations**

*Note: A By-law will be prepared generally in accordance with the provisions listed below, subject to change and refinement prior to posting.*

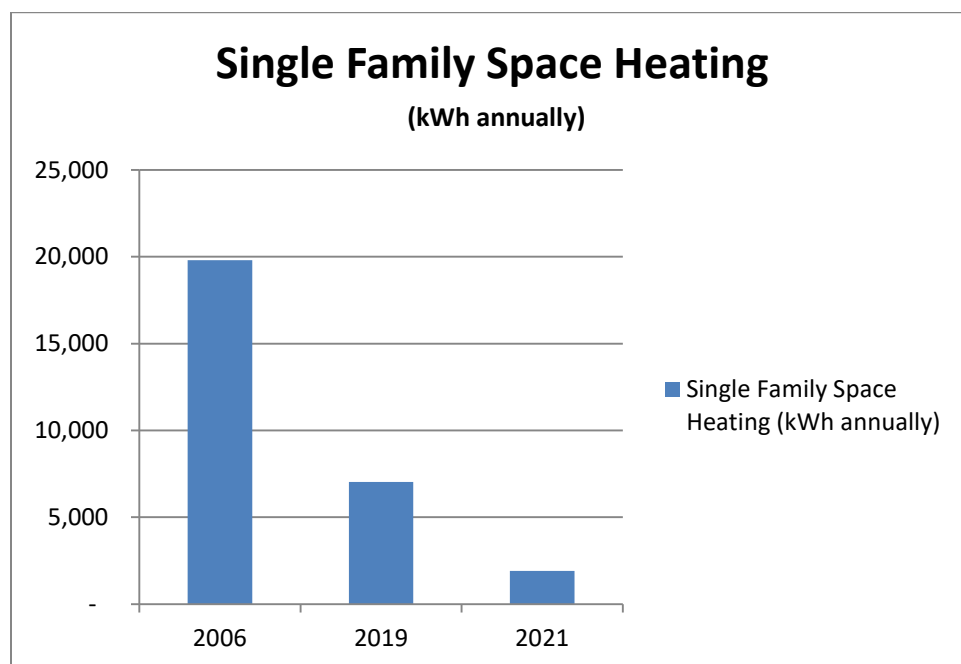
1. This By-law amends the indicated provisions of the Parking By-law No. 6059.
2. Council strikes out the title of section 4.14 and substitutes “**Electric Vehicle Charging Infrastructure Requirements**”.
3. In section 4.14.1, Council:
  - (a) strikes out subsections (a) and (b) and substitutes the following:

“(a) one-family dwelling, two-family dwelling, one-family or two-family dwelling with a secondary suite or lock-off unit, rowhouse, laneway house, multiple dwelling, or multiple dwelling component of a multiple-use development, all parking spaces provided for residential use, excluding visitor parking spaces, shall be provided with an energized outlet capable of providing Level 2 charging or higher to the parking space;” and
  - (b) renumbers subsections (c) and (d) as (b) and (c), respectively.
4. In section 4.14.2, Council strikes out “Sentence 10.4.3.1(1)” and substitutes “Sentence 10.3.1.1.(1)”.

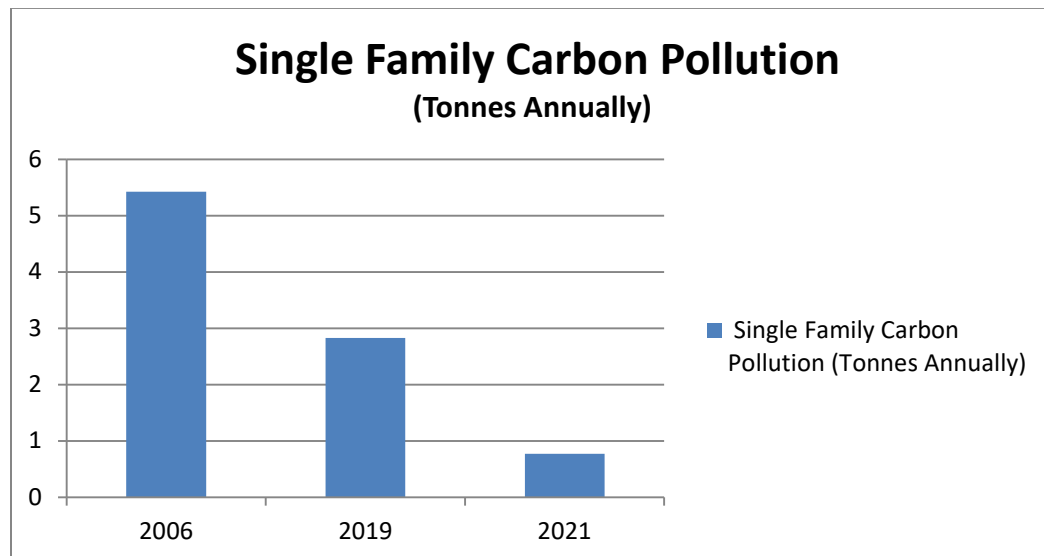
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Detail of changes

The changes proposed will reduce the energy needed to heat a new home significantly. This is primarily achieved by reducing energy waste through a thermally leaky building envelope and moving to more efficient heat pumps for space heat. As shown in the following chart, the energy needed for annual space heating was almost 20,000 kWh per year in a new home built to the 2006 VBBL, which would drop to about 2,000 kWh per year with the recommended updates.



By switching to zero emissions space and water heating we greatly reduce the carbon pollution annually. Most of the remaining carbon pollution comes from gas cooking and fireplaces. As shown in the following chart, the annual carbon pollution from a single family home was over five tonnes per year in a new home built to the 2006 VBBL. That would drop to under one tonne per year with the recommended VBBL updates.



Under the prescriptive path these changes reduce energy waste through better windows, better heat recovery, improved air tightness, and better insulated flat roofs. The table below highlights proposed 2021 values as well as current values and how they align with the national Energy Star standard.

Aligning prescriptive values with Energy Star			
Component	2021 Prescriptive Value	Energy Star Value	2019 Values
Windows and sliding doors or folding doors with glazing	1.2 W/(m <sup>2</sup> K))	1.2	1.4
Curtainwall and window wall assemblies	1.2 W/(m <sup>2</sup> K))	1.2	1.4
Heat Recovery Ventilation	75% efficient	75% Efficient	65% Efficient
Airtightness	2.5 ACH@50Pa	2.5 ACH@50Pa	3.5ACH@50Pa
Flat Roofs	RSI 7.0 (R 40)	N/A	RSI 4.3 (R 28)
Windows in highly glazed homes	Average 1.0 W/(m <sup>2</sup> K))	N/A	N/A

The below table outlines the new option of a performance path metrics from Step 4 of the BC step code that homes choosing the performance path will have to meet. In addition Passive House is an option to meet the requirements of the proposed bylaw changes.

Maximum Space Heating Energy Use and Emissions Intensities		
Occupancy	Thermal Energy Demand Intensity (kWh/m <sup>2</sup> a)	Greenhouse Gas Intensity (kgCO <sub>2e</sub> /m <sup>2</sup> a)
Residential buildings 3 storeys and under except Hotel and Motel	20	3