

Report Date: April 20, 2018
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Meeting Date: May 2, 2018

TO: Standing Committee on City Finance and Services

FROM: General Manager of Planning, Urban Design, and Sustainability, in consultation with the Chief Building Official

SUBJECT: Energy and Water Efficiency Updates to the Building By-law and Rezoning Policy

RECOMMENDATION

- A. THAT Council approve, in principle, amendments to the Building By-law generally in the form attached as Appendix A, including:
- i. Energy efficiency and airtightness requirements for residential buildings over 6-storeys and commercial buildings that align with:
 - 1. Step 2 of the BC Energy Step Code, and greenhouse gas limits, beginning in June, 2019;
 - 2. Step 3 of the BC Energy Step Code, and with the limits in the current Green Buildings Policy for Rezonings, beginning in June, 2021;
 - ii. Energy efficiency requirements, previously approved by Council for 4-6 storey residential buildings, to also be applied to mixed-use residential buildings up to 6-storeys, where commercial uses may be present on the first and second storey, including preserving both a prescriptive and a performance option;
 - iii. Creating alternate compliance pathways to these requirements, where a development may choose a higher Step of the BC Energy Step Code in lieu of a GHG limit;
 - iv. Energy efficiency requirements for all other building types that reference the most up-to-date North American energy standards for buildings, as required by the upcoming updates to the base BC Building Code, provisional upon Provincial approval of those updates; and
 - v. Addressing minor housekeeping changes to past updates, and the removal of drain water heat recovery requirements pending further implementation research and industry education;

FURTHER THAT that the Director of Legal Services be instructed to prepare the necessary amending by-law generally in accordance with Appendix A.

- B. THAT Council approve, in principle, amendments to the Building By-law generally in the form attached as Appendix B, to enhance water efficiency requirements pertaining to plumbing fixtures, appliances and equipment in all building types;
- FURTHER THAT that the Director of Legal Services be instructed to prepare the necessary amending by-law generally in accordance with Appendix B.
- C. THAT Council approve amendments to the Green Buildings Policy for Rezoning attached as Appendix B, including:
- i. A change to the heat loss limit for residential buildings over 6-storeys from 32 to 30, to align with Step 3 of the BC Energy Step Code;
 - ii. Creating alternate compliance pathways, where a development may choose a higher Step of the BC Energy Step Code, or Passive House, in lieu of a GHG limit; and
 - iii. The addition of low-VOC materials, and energy metering and reporting requirements, for buildings pursuing the near-zero emissions building pathway (e.g. Passive House).

REPORT SUMMARY

This report proposes energy efficiency improvements to the Building By-law that represent the last of the initial changes to policy and regulation identified in the Zero Emissions Building Plan (ZEBP). The BC Energy Step Code grew out of the same research and collaborations that created the ZEBP and uses most of the same metrics. This makes it simple to align energy efficiency improvements with the BC Energy Step Code while it is also being adopted by neighbouring local governments.

This report also recommends water efficiency updates to the Building By-law that will reduce the impact of growing communities on City infrastructure.

Finally, this report recommends minor improvements to the Green Buildings Policy for Rezoning.

These proposed changes together provide:

- Improved indoor air quality, thermal comfort, and soundproofing in new buildings
- Alignment with requirements being adopted by other local governments and utility incentive programs
- Clear direction on future requirements for industry
- Reduced greenhouse gas emissions by up to 66% compared to current code
- Reduced energy costs between 2% to 23% compared to current code
- Increased construction costs of 1% or less for developers

Aligning these updates with the BC Energy Step Code will build industry capacity and lower future costs, enabling the future adoption of zero emissions and net zero energy ready buildings in Vancouver and across BC.

COUNCIL AUTHORITY/PREVIOUS DECISIONS

In June 2008, as part of the Green Homes Program, Council adopted Building By-law amendments for new one- and two-family dwellings requiring air tightness testing and heat recovery ventilation.

In April 2014, Council adopted the 2014 Building By-law that further increased the energy efficiency requirements for single-family homes through increased prescriptive requirements for walls, windows, mechanical equipment and airtightness. Large buildings were required to use the most up-to-date North American energy standards for buildings.

In July 2016, Council approved the Zero Emissions Building Plan that included time-stepped GHG emission and energy efficiency limits for each building type for inclusion in policies and the Building By-law.

In November 2016, Council approved changes to the Green Buildings Policy for Rezoning, establishing GHG emissions and energy efficiency limits on rezoned buildings while also requiring air tightness testing and direct ventilation. This policy also allows Passive House certification as an alternative compliance pathway.

In February 2017, Council adopted a Building By-law amendment to extend the prescriptive energy efficiency measures in single-family homes to all residential buildings up to 6 storeys. For 4-6 storey residential buildings, it also provided a performance option that has GHG emissions and energy efficiency limits.

In April 2017, Council adopted enhanced water efficiency measures for the Vancouver Building By-law and the Water Works By-law. Council also directed staff to review opportunities to further strengthen performance requirements for commercial and household fixtures and appliances.

CITY MANAGER'S/GENERAL MANAGER'S COMMENTS

The City Manager supports these recommendations to reduce energy costs and emissions, improve indoor air quality, comfort, and water efficiency, and align with provincial standards for energy efficiency being adopted by other local governments in the Lower Mainland.

REPORT

Background/Context

BC Energy Step Code

The BC Energy Step Code is a voluntary provincial standard for energy-efficient buildings that go beyond the requirements of the base BC Building Code. It grew out of the same research and collaborations that created the ZEBP, establishing stepped, performance-based limits on energy use and heat loss by building type that communities may voluntarily choose to adopt in bylaws and policies. Lower steps are intended to be adopted sooner and into by-law, with upper steps intended for rezoning, density bonus programs, or future adoption into by-law.

Figure 1: Structure of the BC Energy Step Code



To create, support, and advise on implementation of the BC Energy Step Code, the Province established the multi-stakeholder Energy Step Code Council. The Energy Step Code Council is made up of local governments, industry associations, utilities, and representatives from the provincial and federal government. Members include UDI, UBC, GVHBA, BC Hydro, Fortis BC, BC Housing, AIBC, EGBC, Natural Resources Canada, and many others.

Across BC over 23 local governments have already indicated they will consult on adoption of the BC Energy Step Code. Of those, the District of West Vancouver, the District of North Vancouver, and the City of North Vancouver have formally adopted Step 2 for large residential buildings, forming an alignment of energy requirements across the North Shore. The City of Richmond is actively consulting on adopting Step 3 immediately for large buildings, and the City of Victoria and District of Saanich are consulting on adopting Step 3 by 2020.

Zero Emissions Building Plan

The BC Energy Step Code was developed at the same time, with many of the same stakeholders, and with a very similar approach as the Zero Emissions Building Plan (“ZEBP”). Both set stepped limits on total energy use and heat loss by building type, are calculated using the City of Vancouver Energy Modelling Guidelines, include measures for airtightness and improved ventilation, and set goals of zero emissions or net-zero ready new buildings by 2030 (Vancouver) or 2032 (BC) respectively.

In addition, Policy and By-Law amendments to implement the ZEBP establish GHG limits for new buildings, and the plan establishes a timeline for these limits to step down at regular intervals. Including a GHG limit requires new buildings to use fossil fuels efficiently or only if they are needed. As higher steps of the Step Code are adopted a GHG limit also enables a choice of two pathways for compliance, both with the same GHG limits, each prioritizing either envelope efficiency or professionally maintained technology (a “LCES pathway”).

To step down limits over time, the ZEBP establishes a strategy of using the rezoning process to set new levels of energy performance, to be followed by similar building code requirements five years later. This allows industry leaders to normalize best practices and suppliers to prepare for future code changes. The outcomes of the preceding Green Buildings Policy for Rezoning, which was in place from 2011, are roughly equivalent to Step 2 of the BC Energy Step Code, priming them for adoption into the building code immediately. In 2016 the first performance limits under the ZEBP were established in the rezoning policy and roughly align with Step 3, and industry is already expecting these limits to enter the building code by 2021.

Water Efficiency

In 2017, the City of Vancouver used less total drinking water than in 1986, despite having a 50% larger population. The City's objective for water efficiency and conservation is to promote the sustainable use of the current water supply, aspiring to completely offset population and economic growth and defer, limit or avoid the financial, environmental and social costs associated with expanding water and sewer infrastructure to increase capacity. While our "per person" overall consumption has dropped 18% since 2006, we still use 66 litres more per person per day compared to drier, hotter Los Angeles.

This report proposes to update plumbing fixture, appliance and equipment standards in new construction and substantial renovations of all building types to increase water efficiency.

Strategic Analysis

The BC Energy Step Code

a) Benefits

According to the BC Energy Step Code Best Practices Guide for Local Governments, published by the Energy Step Code Council and the Building Safety Standards Branch, buildings built to higher energy efficiency standards provide multiple benefits – to homeowners and occupants, to industry, and to the community.

For home-owners and residents, these buildings:

- Better manage temperature, improving comfort.
- Better manage fresh air throughout the building, improving health.
- Better manage soundproofing, reducing exterior noise.
- Require less energy, reducing utility bills.

For industry, a standard set of metrics and requirements creates a new level of consistency and predictability across local governments. And by providing clear timelines for future updates, the industry can invest in developing products, services, and best practices to deliver competitive and cost-effective services and products for high-performance buildings.

For communities, clear direction and leadership in energy policy can strengthen the local green economy, while also reducing contributions to climate change.

b) Cost Analysis

The impacts of the BC Energy Step Code were comprehensively studied and published in the BC Housing 2017 Metrics Research Report. The study was produced for BC Housing and the BC Building and Safety Standards Branch, with the support of Natural Resources Canada. The BC Housing Metrics Study used dozens of energy conservation measures and millions of energy models, with costs sourced from multiple projects and vetted by industry members, to find the lowest cost options to achieve each step. Table 3 shows the lowest incremental costs for Vancouver.

A second costing report created by UBC for their own buildings supports the conclusions of the BC Housing Metrics Study. This study focused in even greater detail on residential buildings in Vancouver. The study found the lowest cost options to be the same or lower than the BC Housing report, while the average costs may be slightly higher. The average costs for each step are shown in Table 3.

Historically, updates the Building By-law have aimed to keep cost increases below 2%, and the available studies show Step 2 and 3 are generally achievable at cost increases of 1% or less.

Table 3: Incremental Costs for Vancouver

<u>Building Type</u>	<u>Step</u>	<u>Lowest Incremental Cost</u> <u>(BC Housing Report)</u>	<u>Average Incremental Costs</u> <u>(UBC Report)</u>
High-Rise Multifamily	2	0.4%	0.6%
	3	0.8%	1%
Commercial Office	2	0.2%	Not in Scope
	3	0.2%	
Retail	2	0.8%	
	3	1.2%	

Both the BC Housing Metrics Study and the UBC Study found significantly positive net present values and internal rates of return for Step 2 and 3. In an additional analysis by staff, both Step 2 and 3 were found to save money on a monthly basis for residents, with any incremental costs to a monthly mortgage being offset by energy savings. This remains true for Step 3 even when achieving the GHG limits of the Zero Emissions Building Plan, and even when considering the higher average incremental cost from the UBC Report (refer to Appendix D for detailed calculations).

As a result of the long-term value of energy efficiency, BC Housing requires any new BC Housing projects in the Lower Mainland to be built to at least Step 3.

Energy Efficiency Updates

a) Large Residential and Commercial Buildings – Align with BC Energy Step Code

The proposed changes continue the implementation of the Zero Emissions Building Plan by creating performance-based GHG, heat loss, energy use limits, and new requirements for airtightness and ventilation, for large residential and commercial buildings. These changes will align the Building By-law with the BC Energy Step Code

being used by neighbouring local governments, with the addition of a GHG and an airtightness limit. These changes are summarized in Table 1 below, and the full text of the proposed changes are included in Appendix A.

Table 1: Summary of Proposed Changes for Large Residential and Commercial

<u>Change</u>	<u>Description</u>
Energy Performance	<ul style="list-style-type: none"> • Set greenhouse gas, heat loss, and energy limits for large residential and commercial buildings, while aligning with the heat loss and energy use limits of the BC Energy Step Code. • No prescriptive path; buildings must have an energy model.
Direct Ventilation	<ul style="list-style-type: none"> • Outdoor air must be supplied directly to each suite by mechanical ventilation through ducting.
Whole-Building Airtightness	<ul style="list-style-type: none"> • All buildings and major occupancies must be tested for airtightness. • All buildings must meet an airtightness target of 2.0 L/s/m² @ 75Pa, or be sealed to the satisfaction of the Chief Building Official.
Suite Airtightness	<ul style="list-style-type: none"> • Residential suites must meet be tested and achieve an airtightness target of 1.2 L/s/m² @50Pa

The proposed changes align with the heat loss and energy use limits of Step 2 of the BC Energy Step Code, and the outcomes of the 2011 Green Buildings Policy for Rezoning, beginning in June, 2019. Beginning in June, 2021, these limits will change to align with Step 3 of the BC Energy Step Code, and the greenhouse gas limits of the 2016 Green Buildings Policy for Rezoning.

As an alternative to the greenhouse gas limits, the proposed changes also include a compliance pathway that allows the heat loss and energy use limits of a higher step to be followed. This alternative allows some flexibility for projects that may require it, while still having a likely similar greenhouse gas outcome, and demonstrating techniques to achieve the next step in performance.

As the performance requirements increase to align with Step 3 and the Green Buildings Policy for Rezoning, a Low Carbon Energy System pathway will also be included in the Building By-law. This provides developments the opportunity to balance their investment in envelope and ventilation improvements with the use of professionally maintained and operated energy systems, whether at the site or district scale.

b) Mixed-use Residential Up to 6 Stories – Align With Recent Changes for 4-6 Storey Residential

This report proposes changes to align the energy efficiency requirements for mixed-use buildings up to 6 storeys with those approved in February 2017 for 4-6 storey purely residential buildings, including preservation of both the prescriptive and performance pathways. This means that mixed-use residential buildings up to 6 stories, such as those with commercial space at grade, will have access to the same compliance options and requirements as a purely residential building of the same height. To accommodate

commercial uses, a less stringent requirement is included for storefront glazing and doors, where high-performance glazing options can be limited or more costly. As previously reported to Council, these changes were specifically developed to result in cost savings on a monthly basis for residents.

c) All Other Building Types – Align with Upcoming Base BC Building Code

The BC Energy Step Code currently only has performance targets for residential, office, and commercial. For all other building types, the BC Building Code is proposing to reference the most up-to-date versions of North American energy standards. The Building By-law is required to meet or exceed the requirements of the BC Building Code, and so the references to ASHRAE 90.1-2010 and the National Energy Code for Buildings (NECB) 2011 will be updated to 2016 and 2015 respectively.

Water Efficiency Updates

The proposed updates will reduce water consumption and sanitary sewer flows from new homes by an average of 3%. The cost implications are as follows:

- 80% of new homes: no additional capital cost as these already include Energy Star appliances.
- 20% of new homes: about \$50 - \$200 additional capital cost to upgrade to Energy Star, with ongoing savings in utility bills and a recovery of the price differential within a maximum of four years.
- City of Vancouver: no additional capital cost and ongoing operations and maintenance savings.

These updates apply to new construction and substantial renovations of buildings of all types. The proposed amendments harmonize with the 2018 British Columbia Plumbing Code revisions. For fixtures, appliances and equipment not addressed by the 2018 British Columbia Plumbing Code, amendments were developed by considering regulatory requirements of other jurisdictions, international green construction codes, market research, stakeholder input, and economic and environmental costs.

a) Fixtures

For residential kitchen faucets, a maximum flow rate of 6.8 litres per minute (L/min) is proposed (non-residential kitchen faucets would remain unchanged at 8.3 L/min). To align with the revised 2018 British Columbia Plumbing Code, public use lavatory faucets and public use shower heads will be required to turn off automatically after use.

b) Mechanical Systems and Equipment

Single pass systems such as once through cooling are prohibited by the Water Works By-law (Section 3.9). An administrative amendment is proposed to include this language in the more visible Building By-law. It is also proposed to prohibit the use of drinking water to temper steam condensate and other discharges.

c) Appliances

The following appliances are proposed to be Energy Star certified or an acceptable equivalent: clothes washers (residential and commercial), dishwashers (residential and commercial), ice makers, commercial steam cookers and combination ovens. In 2015,

79% of residential clothes washers and 96% of residential dishwashers shipped to British Columbia and the Territories were already Energy Star certified.

For all of the residential appliances addressed in this proposal, there is a net savings over the appliance's life cycle. When there is a price differential for an Energy Star appliance compared to a non-certified appliance, this is recovered by the owner in less than four years, which is under the typical ownership cycle of seven years for a condominium and ten years for a single family home. For the commercial appliances covered by this proposal, any purchase price differential for the Energy Star appliance is recovered for nearly all of the categories (Appendix E).

Changes to the Green Buildings Policy for Rezoning

This report proposes minor changes to the Green Buildings Policy for Rezoning, summarized in Table 2.

These changes have negligible cost, with multiple benefits. The addition of energy metering and reporting to Option A allows the City to understand the real world outcomes of Passive House projects once they are completed. Low VOC materials are often specified but not explicitly required in Option A, and these requirements extend improvements to indoor air quality to all rezoning buildings. Changing the heat loss limit to align with the BC Energy Step Code creates one number province-wide for this level of performance, and can make these projects eligible for utility incentives that align with the Step Code.

Table 2: Summary of Proposed Changes for Rezoning

<u>Compliance Option</u>	<u>Description</u>
Option A – Near Zero Emissions Buildings (i.e. Passive House Certified)	<ul style="list-style-type: none"> • Add requirements for energy metering and reporting to match those already in Path B. • Add requirements for low VOC materials to match those already in Path B.
Option B – Low Emissions Green Buildings	<ul style="list-style-type: none"> • Change the heat loss limit (TEDI) for 7+ storey MURBs to 30 from 32 to align with Step 3 of the BC Energy Step Code. • Add an additional compliance path that aligns with a higher step of the Energy Step Code, without a GHGI limit.

As noted for the Building By-law, an alternative compliance pathway allows some flexibility for projects that require it, while still having a likely similar greenhouse gas outcome, and demonstrating techniques to achieve the next step in performance.

Consultations

Energy efficiency updates to the building by-law that reflect previous rezoning outcomes, and future updates based on a new rezoning policy, were first signalled to industry in the ZEBP in July 2016. Consultations with industry on the proposed energy efficiency changes to the building by-law and rezoning policy began with the development industry in June 2017, and proceeded throughout the summer and fall.

This initial notification period culminated in a written consultation letter that summarized all proposed changes that was issued widely to industry at the beginning of January, with recipients including AIBC, APEGBC, UDI, GVHBA, Building Safety Standards Branch and the Province of BC, HPBAC, Fortis BC, BC Hydro, BC Housing, Greater Vancouver Board of Trade, and many others. In January and February of 2018, staff hosted three 2.5-hour townhall consultation sessions, where detailed information on the proposed changes was presented and participants could ask questions and discuss with staff.

Feedback from participants was collected through discussions in the townhall sessions, through direct discussions with key stakeholders, and through written feedback sent to green.buildings@vancouver.ca. Following the townhall sessions and response period, a final consultation letter was sent to stakeholders in March describing what we heard, and how proposals would be adjusted before presentation to Council.

Responses were generally quite supportive of the direction and of the specific changes proposed. Staff heard that Step 3 is achievable, that some projects are already pursuing Step 3 levels of performance, and those projects are finding solutions that work for them. Staff also heard that there are still some uncertainties around the most cost-effective ways to achieve Step 3, and it was recommended that more time be allowed for industry to gain experience with applying these solutions in more cases.

In response to these recommendations, the proposed changes have been adjusted from the original proposals to allow more time before implementation. A year is provided between presentation of these changes to Council and their effective date of June 3, 2019. This allows time for development applications that are already in-stream or about to be submitted to either proceed unchanged, or to have adequate time to adjust their design. The effective date for Step 3 with a greenhouse gas limit was changed to June 1, 2021, to allow time for industry to learn from the current Green Buildings Policy for Rezoning. This timing is also consistent with the Zero Emissions Building Plan, which seeks to have the rezoning policy lead the building by-law by five years.

Consultation on water efficiency proposals has been conducted since 2016, and was included in the March final consultation letter to stakeholders, with implementation proposed for January 1, 2019. A small number of household appliance manufacturers objected to the Energy Star requirement for residential clothes washers and residential dishwashers. Their primary appeal is to default to the minimum energy-performance standards (MEPS). The use of Energy Star appliances is already common practice in new developments throughout the City, and there is wide selection and market availability of these appliances. Numerous developers consulted indicated that they did not perceive any significant price difference for Energy Star appliances.

Implementation Support

Implementation of the BC Energy Step Code has been heavily supported to date and will continue to be for the foreseeable future by the Energy Step Code Council and its many members. BC Housing has led this effort to date, producing four hour-long recorded education sessions on the Energy Step Code, coordinated the Build Smart Speaker Series of talks throughout the province to educate industry on the Energy Step Code, published the Design Guide to the BC Energy Step Code, the Illustrated Guide to Achieving Airtight Buildings, the Builders Guide to the BC Energy Step Code, and many other resources. With the upcoming 2018 BC Building Code, the Province is also expected to carry out information sessions and training on all changes included in the next code.

If the proposed updates are approved, City staff will coordinate with provincial efforts to educate the industry in Vancouver on the changes well in advance of their becoming effective next year, beginning with outreach this summer. Sustainability staff will also work internally across the City to coordinate with and support planning and by-law review staff on what changes are coming, what materials to provide to prospective or in-stream applicants, and how to process and review future submissions.

Sustainability staff will continue to monitor and support the energy review process beyond the implementation period, and work to ensure the proper tools and resources are in place for effective compliance. For example, sustainability has recently developed webpages pertaining specifically to all new energy requirements, with the intention to support all aspects of design and permitting. Sustainability supports energy review and compliance efforts, and as energy and emissions requirements are increasingly integrated into the by-law this support may need to be expanded. Sustained support for enforcement will help to secure the full benefits of these proposed changes are achieved.

Implications/Related Issues/Risk

Financial

There are no financial implications.

Human Resources/Labour Relations

There are no human resources / labour relations implications.

Environmental

The recommended Policy updates will reduce GHG emissions in new buildings by up to 25% in 2019, increasing to up to 70% in 2021. Residential water consumption in new homes will be reduced by 3%.

Legal

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

CONCLUSION

This report proposes energy efficiency improvements to the Building By-law that complete the initial implementation of the Zero Emissions Building Plan (ZEBP) and enhance water efficiency requirements, as well as rezoning policy changes. If approved, these proposed changes will simplify compliance for industry in region, reduce costs, greenhouse gas emissions and water use, and further enable the future adoption of zero emissions and net zero energy ready buildings in Vancouver and across BC.

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**Draft By-law to amend Building By-law No. 10908
Regarding Energy Efficiency**

Note: A by-law will be prepared generally in accordance with the provisions listed below.

1. This by-law amends the indicated provisions of Building By-law 10908.
2. In Book I, Division B, Part 1, Article 1.3.1.2., in Table 1.3.1.2.(1) Council:

(a) adds, in correct alphanumeric order:

"

ASTM	E 779-10	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization	10.2.2.21.(1)
USACE	USACE	Air Leakage Test Protocol for Building Envelopes, Version 3	10.2.2.21.(1)

"

; and

(b) strikes:

"

CoV	2017	City of Vancouver Energy Modelling Guidelines	10.2.2.3.
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"

and substitutes:

"

CoV	2017	City of Vancouver Energy Modelling Guidelines	10.2.2.5.
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"

; and

(c) strikes:

"

CSA	CSA B55.1-15	Test Method for Measuring Efficiency and Pressure Loss of Drain Water Heat Recovery Units	10.2.2.11.(3)
CSA	CSA B55.2-15	Drain water heat recovery units	10.2.2.11.(3)

"

3. In Book I, Division B, Part 10, Article 10.2.1.3. Council:

(a) strikes out Sentence (1)(b)(ii), and substitutes:

"ii. Energy standards as per Articles 10.2.2.2. or 10.2.2.3., and thermal insulation conforming with 10.2.2.6., windows and doors conforming with 10.2.2.7., and be provided with heat recovery ventilators conforming with 10.2.2.17.,"; and

(b) strikes out Sentences (1)(i), (j) and (k) and substitutes:

"i) conform with Article 10.2.2.15. where domestic gas fireplaces are provided,
j) provide documentation in conformance with Article 10.2.2.20, and
k) provide airtightness testing in accordance with Article 10.2.2.21."

4. In Book I, Division B, Part 10, Article 10.2.1.4. Council:

(a) strikes out Sentence (1)(i), and substitutes:

"i) be provided with and heat recovery ventilators in conformance with Article 10.2.2.17.,";

(b) strikes the word "and" from Sentence (1)(j);

(c) strikes the words "and a rating system audit" from Sentence (1)(k) and adds the word ", and" after "10.2.2.20.,"; and

(d) adds a new Sentence (1)(l) as follows:

"l) provide airtightness testing in accordance with Article 10.2.2.21."

5. In Book I, Division B, Part 10, Article 10.2.1.5. Council:

(a) strikes out Sentence (1)(h), and substitutes:

"h) be provided with heat recovery ventilators in conformance with Article 10.2.2.17.,";

(b) strikes the word "and" from Sentence (1)(i);

(c) strikes the words "and a rating system audit" from Sentence (1)(j) and adds the word ", and" after "10.2.2.20.,"; and

(d) adds a new Sentence (1)(l) as follows:

"l) provide airtightness testing in accordance with Article 10.2.2.21."

6. In Book I, Division B, Part 10, Article 10.2.2.5., Council strikes the title "**Building Envelope Opaque Elements and Simulation Performance**", and replaces it with "**Building Energy and Emissions Performance**".

7. In Book I, Division B, Part 10, Article 10.2.2.7., Table 10.2.2.7.(1), Council adds the following in a new cell located immediately above the cell for "Skylights, roof window and sloped glazing systems":

"

Skylights larger then 1220mm in two directions	2.95
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8. In Book I, Division B, Part 10, Article 10.2.2.8.(2), Council:
- (a) strikes the word "and" at the end of Sentence (2)(d);
 - (b) strikes the "." at the end of Sentence (2)(e) and substitutes ", and"; and
 - (c) adds a new Sentence (2)(l) as follows:
"f) a building pursuing certification with the Passive House (PHI) standard."
9. In Book I, Division B, Part 10, Article 10.2.2.11., Council:
- (a) in Sentence (1), strikes out the words "except *row housing* that have no natural gas appliances";
 - (b) strikes Sentence (2); and
 - (c) strikes Sentence (3).
10. In Book I, Division B, Part 10, Article 10.2.2.12., Council strikes the words "shall have an energy factor of not less than 78 per cent, except that existing homes may have an energy factor of not less than 62 per cent", and replaces them with "shall have a uniform energy factor of not less than 0.78 or alternatively a thermal efficiency of not less than 90%, except that existing homes may have a uniform energy factor of not less than 0.62".
11. In Book I, Division B, Part 10, Article 10.2.2.15., Council:
- (a) in Sentence (1)(a), strikes out "or";
 - (b) in Sentence (1)(b)(ii), strikes "." and substitutes ", or" to the end of the sentence; and
 - (c) adds "c) match ignition."
12. In Book I, Division B, Part 10, Article 10.2.2.17., Council adds the words "except for mechanical ducts cast into concrete structure," at the beginning of Sentence (3)(g).
13. In Book I, Division B, Part 10, Article 10.2.2.20, Council:
- a. strikes the title "EnerGuide Rating System Audit or Passive House Planning Package File (PHPP)", and replaces it with "Passive House Planning Package (PHPP), EnerGuide, or Other Energy Documentation"; and

b. strikes Sentence (1), and replaces it with

"1) In a *building* required to comply with this Article, at the time of building permit application, and at the time of final inspection, the owner shall provide to the Chief Building Official *acceptable* documentation, in the form of

- a) a PHPP file from a Certified Passive House Consultant or Designer, or
- b) an EnerGuide Rating System Audit, or
- c) for *buildings* ineligible for an EnerGuide Rating System Audit, a Hot2000 file modelled in general mode and using the same baseload assumptions as Energuide for New Homes mode, or equivalent energy modelling documentation, *acceptable* to the Chief Building Official."

14. In Book I, Division B, Part 10, Subsection 10.2.2., Council adds:

"10.2.2.21. **Building and Dwelling Unit Airtightness Testing**

- 1) In a *building* required to comply with this Article, the *building* and *dwelling units* shall be tested for airtightness in accordance with
 - a) ASTM E 779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization,
 - b) USACE Version 3, Air Leakage Test Protocol for Building Envelopes, or
 - c) airtightness protocol recognized by Natural Resources Canada for use in homes and buildings labeled under the EnerGuide for New Homes program.
- 2) A *building* required to comply with this Article shall have maximum tested air leakage rates in conformance with Table 10.2.2.21., or sealed to the satisfaction of the Chief Building Official.

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 1 or 2 Family Dwellings and 1 to 3 Storey Residential</i>	2.03 L/s/m ² at 75 pascals
Ground-oriented <i>dwelling units</i>	3.5 air changes per hour at 50 pascals

15. In Book I, Division B, Article 10.5.1.1., Council strikes Table 10.5.1.1., and replaces it with:

Table 10.5.1.1. Objectives and Functional Statements Attributed to the Acceptable Solutions in Part 10 Forming part of Sentence 10.5.1.1.(1)	
Acceptable	Functional Statements and Objectives ⁽¹⁾

Solutions	
10.2.2.2. ANSI/ASHRAE/IESNA 90.1	
(1)	[F85, F86-OE1]
10.2.2.3. National Energy Code of Canada for Buildings	
(1)	[F85, F86-OE1]
10.2.2.5. Building Energy and Emissions Performance	
(1)	[F85, F86-OE1]
(2)	[F85, F86-OE1]
10.2.2.6. Building Envelope Opaque Elements	
(1)	[F85-OE1]
(2)	[F85-OE1]
10.2.2.7. Windows, Glass Doors and Skylights	
(1)	[F85-OE1]
10.2.2.8. Building Envelope Vestibules	
(1)	[F85-OE1]
10.2.2.9. Sub-metering in Buildings	
(1)	[F86, OE1]
(2)	[F86, OE1]
10.2.2.10. Lighting Controls in Residential Buildings	
(1)	[F86, OE1]
10.2.2.11. Hot Water Tank Piping	
(1)	[F85-OE1]
(2)	[F85, F86-OE1]
(3)	[F100-OE1]
10.2.2.12. Domestic Gas-Heated Hot Water Heaters	
(1)	[F86-OE1]
10.2.2.13. Domestic Gas-Heated Boilers	
(1)	[F86-OE1]
10.2.2.14. Domestic Gas-Heated Furnaces	
(1)	[F86-OE1]
10.2.2.15. Domestic Gas-Fired Fireplaces	
(1)	[F86-OE1]
	[F41, F44-OS3.4]
	[F44-OH1.1]
10.2.2.16. Domestic Wood Burning Heating Appliances	
(1)	[F86-OE1]
	[F44-OS3.4]
	[F44-OH1.1]
10.2.2.17. Domestic Heat Recovery Ventilators	
(1)	[F85-OE1]

(2)	[F85-OE1]
10.2.2.20. Passive House Planning Package (PHPP), EnerGuide, or Other Energy Documentation	
(1)	[F85-OE1]
10.2.2.21. Building and Dwelling Unit Airtightness Testing	
(1)	[F85-OE1]
(2)	[F85-OE1]
10.3.1.1. Fixture Fitting Maximum Flow Rates	
(1)	[F84-OE2]
10.3.1.2. Fixture Efficiency	
(1)	[F83-OE2]
(2)	[F83-OE2]

Notes to Table 10.5.1.1.:

⁽¹⁾ See Parts 2 and 3 of Division A."

16. In Book I, Appendix A of Division B, Council strikes appendix note A-10.2.2.12.(2).

17. In Book I, Division B, Part 1, Article 1.3.1.2., Table 1.3.1.2.(1) Council strikes:

"

ANSI/ ASHRAE/ IESNA	90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings	10.2.1.1.(1)(a)
CCBFC	NRCC 54435- 2011	National Energy Code of Canada for Buildings	10.2.2.3.

"

and substitutes:

"

ANSI/ ASHRAE/ IESNA	90.1-2016	Energy Standard for Buildings Except Low-Rise Residential Buildings	10.2.2.2
CCBFC	NRCC 56191	National Energy Code of Canada for Buildings 2015	10.2.2.3.

"

18. In Book I, Division B, Part 10, Council strikes Article 10.2.2.2. and Article 10.2.2.3., and substitutes:

"10.2.2.2. **ANSI/ASHRAE/IESNA 90.1**

- 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”, and with
 - a) a climate zone of 4,
 - b) ventilation in conformance with ASHRAE 62 (except addendum n),
 - c) the 5 per cent in Table 11.5.1.5. Building Envelope, Exception a., being replaced by 2 per cent, if designed in accordance with ASHRAE 90.1, Section 11,
 - d) the 5 per cent in Table G3.1.5.a. Building Envelope, Exception 1., being replaced by 2 per cent, if designed in accordance with ASHRAE 90.1, Appendix G,
 - e) no requirement to comply with the Fenestration Orientation provisions of ASHRAE 90.1, Article 5.5.4.5.,
 - f) no requirement to comply with Automatic Receptacle Control, per ASHRAE 90.1, Article 8.4.2.

10.2.2.3. National Energy Code of Canada for Buildings

- 1) A *building* designed in accordance with this Article shall be designed and constructed in accordance with the National Energy Code of Canada for Buildings (NECB), except that the provisions of this By-law shall apply where the NECB refers to the National Building Code of Canada (NBCC), and shall be designed with
 - a) a climate zone of 4,
 - b) ventilation in conformance with ASHRAE 62 (except addendum n),
 - c) window-to-wall and skylight-to-roof area ratios of the reference building identical to area ratios of the proposed building,
 - d) a vertical glazing Solar Heat Gain Coefficient which does not exceed an assembly maximum of 0.36,
 - e) a skylight Solar Heat Gain Coefficient for all types, which does not exceed an assembly maximum of 0.40, where the ratio of the aggregate skylight area to roof area is less than or equal to 3.0 per cent.”.

19. In Book I, Division B, Part 6, Sentence 6.2.2.1.(4), Council strikes the words “ of 6 storeys or less in building height and”.

20. In Book I, Division B, Part 10, Council strikes Article 10.2.1.2. through 10.2.1.5., and substitutes:

“10.2.1.2. Buildings Without Residential or Commercial Components

- 1) All *buildings*, except those included in 10.2.1.3 through 10.2.1.6, shall
 - a) be designed in accordance with ASHRAE 90.1 as per Article 10.2.2.2. or the NECB as per Article 10.2.2.3.,
 - b) Reserved,
 - c) Reserved,

- d) Reserved,
- e) be provided with vestibules for all doors in accordance with Article 10.2.2.8.,
- f) be provided with metering equipment in compliance with Article 10.2.2.9,
- g) be provided with lighting controls in conformance with Article 10.2.2.10.,
- h) Reserved.
- i) conform with Article 10.2.2.15. where fire places are provided.

10.2.1.3. Residential Buildings of 7 Stories or More, and Commercial Buildings (with or without residential components)

- 1) *All buildings* containing Group C, D, or E *Major Occupancies*, except those included in 10.2.1.4 through 10.2.1.6., shall
 - a) be designed in compliance with energy and emissions performance as per Article 10.2.2.5,
 - b) Reserved,
 - c) Reserved,
 - d) Reserved,
 - e) be provided with vestibules for all doors in accordance with Article 10.2.2.8.,
 - f) be provided with metering equipment in compliance with Article 10.2.2.9,
 - g) be provided with lighting controls in conformance with Article 10.2.2.10.,
 - h) Reserved,
 - i) conform with Article 10.2.2.15., where domestic gas fireplaces are provided, and
 - j) provide airtightness testing in accordance with Article 10.2.2.21.

10.2.1.4. Residential Buildings of 4 to 6 Storeys, and Mixed-Use Residential Buildings of 1 to 6 Storeys

- 1) Except for *buildings* included in 10.2.1.5 or 10.2.1.6, a *building* which is less than 7 *storeys* in *building height*, and which is classified as a Group C *major occupancy*, and containing no other *occupancies* (excluding Group D or E *major occupancy* on the first or second *storeys*, or Group F Division 3 (Storage Garage) *occupancy* subsidiary to the Group C *major occupancy*), shall
 - a) Be designed in compliance with
 - i. energy and emissions performance as per Article 10.2.2.5, or
 - ii. ASHRAE 90.1 as per Articles 10.2.2.2. or the NECB as per 10.2.2.3., and thermal insulation conforming with 10.2.2.6., windows and doors conforming with 10.2.2.7., and be provided with heat recovery ventilators conforming with 10.2.2.17.
 - b) be provided with vestibules for all doors conforming with Article 10.2.2.8.,
 - c) be provided with metering equipment conforming with Article 10.2.2.9.,
 - d) be provided with lighting controls conforming with Article 10.2.2.10.,

- e) be provided with mechanical equipment conforming with Articles 10.2.2.11. through 10.2.2.14. ,
- f) , conform with Article 10.2.2.15. , where domestic gas fireplaces are provided, and
- g) provide airtightness testing in accordance with Article 10.2.2.21.

10.2.1.5. Residential Buildings of 1 to 3 Storeys (other than 1 or 2 Family Dwellings)

- 1) Except as otherwise required in this Subsection, a *building*, other than a *1 or 2 Family Dwelling*, which is less than 4 *storeys* in *building height*, and which is entirely classified as Group C *major occupancy*, excluding Group F Division 3 (Storage Garage) *occupancy* subsidiary to the Group C *major occupancy*, shall

- a) be provided with thermal insulation conforming with Article 10.2.2.6. ,
- b) be provided with windows and doors conforming with Article 10.2.2.7. ,
- c) be provided with vestibules for all doors conforming with Article 10.2.2.8. ,
- d) be provided with metering equipment conforming with Article 10.2.2.9. ,
- e) be provided with lighting controls conforming with Article 10.2.2.10. ,
- f) where provided, domestic hot water heating shall conforming with Article 10.2.2.11. through 10.2.2.13. as applicable,
- g) comply with Article 10.2.2.14. where domestic gas heated furnaces or make-up air units are provided,
- h) comply with Article 10.2.2.15. where domestic gas fireplaces are provided,
- i) be provided with and Heat recovery ventilators in conformance with Article 10.2.2.17. ,
- j) be designed with a solar photovoltaic ready pipe run in accordance with Article 10.2.2.19. ,
- k) provide documentation in accordance with Article 10.2.2.20. , and
- l) provide airtightness testing in accordance with Article 10.2.2.21.

10.2.1.6. One and Two Family Dwellings

- 1) Except as otherwise required in this Subsection, a *one-family dwelling* and *two-family dwelling*, with or without *secondary suites* or *lock-off units*, and including *laneway houses*, shall
- a) be designed with thermal insulation conforming with Article 10.2.2.6. ,
 - b) be designed with windows and doors conforming with Article 10.2.2.7. ,
 - c) be provided with metering equipment conforming with Article 10.2.2.9. ,
 - d) be provided with lighting controls conforming with Article 10.2.2.10. ,
 - e) where provided, domestic hot water heating shall comply with Article 10.2.2.11. through 10.2.2.13. as applicable,
 - f) where provided, domestic gas heated furnaces or make-up air units shall comply with Article 10.2.2.14. ,
 - g) where provided, domestic fireplaces shall comply with Article 10.2.2.15. and 10.2.2.16. as applicable,
 - h) except for laneway houses, conform with Article 10.2.2.17. ,

- i) be designed with a solar ready pipe run in accordance with Article 10.2.2.18., and
- j) provide documentation in accordance with Article 10.2.2.20.
- k) provide airtightness testing in accordance with Article 10.2.2.21. ". "

21. In Book I, Division B, Part 10, Council strikes Article 10.2.2.5 and substitutes:

"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 Sentence (3), 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.A.
- 3) Compliance with the GHGI limits in Table 10.2.2.5.A 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.

Table 10.2.2.5.A Maximum Energy Use and Emissions Intensities Forming part of Sentence 10.2.2.5.(2)			
Occupancy Classification ⁽¹⁾	Total Energy Use Intensity (kWh/m ² a)	Thermal Energy Demand Intensity (kWh/m ² a)	Greenhouse Gas Intensity (kgCO _{2e} /m ² a)
Group C <i>occupancies</i> in <i>buildings</i> up to 6 <i>Storeys</i>	110	25	5.5
Group C <i>occupancies</i> in <i>buildings</i> over 6 <i>Storeys</i> , except Hotel and Motel	130	45	14
Hotel and Motel <i>occupancies</i>	170	30	14
Group D and E <i>occupancies</i> , except Office	170	30	5
Office <i>occupancies</i>	130	30	7
All other <i>occupancies</i>	Comply with ASHRAE 90.1 ECB in accordance with Article 10.2.2.2, or NECB Part 8 in accordance with the Article 10.2.2.3		

Notes to Table 10.2.2.5.A.:

- (1) For buildings containing multiple *occupancies*, refer to the procedures on mixed-use buildings in Section 5 of the City of Vancouver Energy Modelling Guidelines.

Table 10.2.2.5.B Maximum Energy Use and Emissions Intensities Forming part of Sentence 10.2.2.5.(3)			
Occupancy Classification	Total Energy Use Intensity (kWh/m ² a)	Thermal Energy Demand Intensity (kWh/m ² a)	Greenhouse Gas Intensity (kgCO _{2e} /m ² a)
Group C <i>occupancies</i> in <i>buildings</i> over 6 <i>Storeys</i> , except Hotel and Motel	120	30	6
Hotel and Motel <i>occupancies</i>	140	20	8
Group D and E <i>occupancies</i> , except Office	120	20	3
Office <i>occupancies</i>	100	20	3

”.

22. In Book I, Division B, Part 10, Table 10.2.2.6, Council strikes from the title the text “Containing No Other *Major Occupancies*”.

23. In Book I, Division B, Part 10, Table 10.2.2.7, Council adds to the end of the Table:

”

Storefront curtainwall, window, and door assemblies	2.27
---	------

”.

24. In Book I, Division B, Part 10, Table 10.2.2.21, Council adds to the end of the Table:

”

<i>Suites</i> in <i>multi-family</i> buildings	1.23 L/s/m ² at 50 pascals
--	---------------------------------------

”.

25. In Book I, Division A, Sentence 1.4.1.2.(1) Defined Terms, Council adds the following in correct alphabetical order:

“*Low Carbon Energy System* means a professionally operated and maintained district-scale or on-site system that supplies heat energy, primarily derived from highly-efficient and renewable sources, in order to provide space heating and conditioned ventilation air for buildings, and may also provide domestic hot water and cooling service.”.

26. In Book I, Division B, Part 10, Council strikes Article 10.2.2.5 and substitutes:

“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.A.
- 3) Compliance with the GHGI limits in Table 10.2.2.5.A 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) Compliance with the TEUI and TEDI limits in Table 10.2.2.5.A 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.

Table 10.2.2.5.A Maximum Energy Use and Emissions Intensities Forming part of Sentence 10.2.2.5.(2)			
<i>Occupancy Classification</i> ⁽¹⁾	Total Energy Use Intensity (kWh/m ² a)	Thermal Energy Demand Intensity (kWh/m ² a)	Greenhouse Gas Intensity (kgCO _{2e} /m ² a)
Group C <i>occupancies</i> in <i>buildings</i> up to 6 <i>Storeys</i> , except Hotel and Motel	110	25	5.5
Group C <i>occupancies</i> in <i>buildings</i> over 6 <i>Storeys</i> , except Hotel and Motel	120	30	6
Hotel and Motel <i>occupancies</i>	140	20	8
Group D and E <i>occupancies</i> , except Office	120	20	3
Office <i>occupancies</i>	100	20	3
All other <i>occupancies</i>	Comply with ASHRAE 90.1 ECB in accordance with Article 10.2.2.2, or NECB Part 8 in accordance with the Article 10.2.2.3		

Notes to Table 10.2.2.5.A.:

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

Table 10.2.2.5.B Maximum Energy Use and Emissions Intensities Forming part of Sentence 10.2.2.5.(3)			
<i>Occupancy Classification</i>	Total Energy Use Intensity (kWh/m²a)	Thermal Energy Demand Intensity (kWh/m²a)	Greenhouse Gas Intensity (kgCO_{2e}/m²a)
Group C <i>occupancies</i>	100	15	N/A

Table 10.2.2.5.C Maximum Energy Use and Emissions Intensities For Buildings Connected to a <i>Low Carbon Energy System</i> Forming part of Sentence 10.2.2.5.(4)			
<i>Occupancy Classification</i>	Total Energy Use Intensity (kWh/m²a)	Thermal Energy Demand Intensity (kWh/m²a)	Greenhouse Gas Intensity (kgCO_{2e}/m²a)
Group C <i>occupancies</i> in <i>buildings</i> up to 6 <i>Storeys</i> , except Hotel and Motel	110	25	5.5
Group C <i>occupancies</i> in <i>buildings</i> over 6 <i>Storeys</i> , except Hotel and Motel	130	40	6
Hotel and Motel <i>occupancies</i>	170	30	8
Office <i>occupancies</i>	170	30	3
Business and Personal Services or Mercantile <i>Occupancies</i> , except Office	170	30	3

”.

27. A decision by a court that any part of this By-law is illegal, void, or unenforceable severs that part from this By-law, and is not to affect the balance of this By-law.

28. This By-law is to come into force and take effect as follows:

- a) sections 2 through 16 come into force and take effect upon enactment;
- b) sections 17 and 18 come into force and effect on January 1, 2019;
- c) sections 19 through 24 come into force and effect on June 3, 2019; and
- d) sections 25 and 26 come into force and effect on June 1, 2021.

EXPLANATION

**Building By-law amending By-law
Re: Energy Efficiency**

The attached By-law will implement Council's resolution of XXX, 2018 to amend the Building By-law regarding energy efficiency measures, effective , 201 .

Director of Legal Services
[date]

Draft By-law to amend Building By-law No. 10908
Regarding water efficiency

Note: A by-law will be prepared generally in accordance with the provisions listed below.

29. This by-law amends the indicated provisions of Building By-law 10908.

30. In Book I, Division A, Part 1, in Article 1.4.1.2., Council adds the following definitions in alphabetical order:

Emergency once through cooling equipment means *once through cooling equipment* that is not normally operated and is only activated in the event of a sudden, unforeseen failure of an otherwise properly designed, operated and maintained primary cooling system.

Maintenance once through cooling equipment means *once through cooling equipment* that is not normally operated and is only activated to temporarily supplement or replace the primary cooling system during scheduled maintenance on the primary cooling system.

Non-recirculating liquid ring pump means a vacuum pump that uses water to cool the pump or to create a seal and recirculates less than 60% of the water that passes through the pump.

Once through cooling equipment means equipment that produces a cooling effect by transfer of heat to water that is only circulated once through the equipment and is then discharged, and includes but is not limited to commercial and industrial air conditioners, refrigerators, freezers, coolers and ice machines.

Self-closing plumbing fixture means a *plumbing fixture* that closes automatically upon the deactivation of a mechanical or electronic control mechanism."

31. In Book I, Division B, Part 10, Council strikes out Article 10.3.1.2. and substitutes:

"10.3.1.2. Plumbing Fixture Fitting Maximum Flow Rates

- 1) The flow rates of fittings that supply water to *plumbing fixtures* must not exceed the maximum flow rate at the test pressures listed for that fitting in Table 10.3.1.2.

Table 10.3.1.2. Maximum Flow Rate Forming part of Sentence 10.3.1.2.(1)		
Fitting	Maximum Flow Rate (L/min)	Test Pressure (kPa)
Lavatory Faucet (for <i>private use</i>)	5.7	415
Lavatory Faucet (for <i>public use</i>)	1.9 ⁽¹⁾⁽²⁾	415
Kitchen Faucet (non-residential)	8.3	415
Kitchen Faucet (residential)	6.8 ⁽³⁾	415
<i>Shower Head</i>	7.6 ⁽⁴⁾⁽⁵⁾	550
<i>Pre-Rinse Spray Valve</i>	4.8 ⁽⁶⁾	415
Wash Fountain, per <i>plumbing fixture</i> fitting	6.8 ⁽⁷⁾	415

Notes to Table 10.3.1.2.:

- (1) Must be a *self-closing plumbing fixture*. A *metering fixture* faucet is limited to 1.0 L per cycle.
- (2) A lavatory faucet in a health care facility is permitted a maximum flow rate of 8.3 L/min (at 415 kPa test pressure). The *Chief Building Official* may, for human health reasons, permit exemptions within other facilities, to a maximum flow rate of 8.3 L/min (at 415 kPa test pressure).
- (3) May be temporarily increased to a maximum flow rate of 8.3 L/min (at 415 kPa test pressure) but must default to the lower flow rate upon release of the activation mechanism or closure of the faucet valve.
- (4) Emergency and safety *shower heads* and *shower heads* in health care facilities and correctional facilities are exempted from this requirement.
- (5) Where multiple *shower heads* installed for *public use* are served by one temperature control, each *shower head* shall be a *self-closing plumbing fixture*, except that emergency and safety *shower heads* and *shower heads* in health care facilities and correctional facilities are exempted from this requirement.
- (6) Each *pre-rinse spray valve* must be equipped with an automatic shut-off.
- (7) A maximum flow rate of 6.8 L/min is permitted for each 508 mm of rim space. Must be a *self-closing plumbing fixture*. For a wash fountain with *metering fixture* faucets, a maximum of one *metering fixture* faucet is permitted for each 508 mm of rim space. A *metering fixture* faucet is limited to 1.0 L per cycle."

32. In Book I, Division B, Part 10, Council strikes out Article 10.3.1.3., and substitutes:

"10.3.1.3. Plumbing Fixture Efficiency

- 1) The flush cycle for the installation of a water closet or urinal must not exceed the flush cycle listed for that *plumbing fixture* in Table 10.3.1.3.A

Table 10.3.1.3.A Maximum Flush Cycle Forming part of Sentence 10.3.1.3.(1)	
Plumbing Fixture	Maximum Flush Cycle (L)
Water Closet (Tank Type)	4.8 ⁽¹⁾⁽²⁾
Water Closet (Direct Flush)	4.8 ⁽¹⁾
Urinal (Tank Type)	1.9 ⁽³⁾
Urinal (Direct Flush)	1.9

Notes to Table 10.3.1.3.A:

- (1) A maximum flush cycle of 6.0 L may be permitted where, in the opinion of the **Chief Building Official**, the existing **plumbing system** cannot accommodate and cannot be updated to accommodate the required flush cycle.
- (2) A water closet with a dual flush cycle of 4.1 L or less and 6.0 L complies with this requirement.
- (3) The water supply to flush tanks equipped for automatic flushing shall be controlled with a timing device that limits operation to the period during which the building is normally occupied.

2) Appliances listed in Table 10.3.1.3.B shall comply with the applicable Energy Star program requirements or be of **acceptable equivalency**.

Table 10.3.1.3.B Appliance Energy Star Program Requirements Forming part of Sentence 10.3.1.3.(2)	
Appliance	Energy Star Program Requirements
Residential clothes washer ⁽¹⁾	Product Specification for Clothes Washers
Commercial clothes washer ⁽¹⁾	Product Specification for Clothes Washers
Residential dishwasher ⁽²⁾	Product Specification for Residential Dishwashers
Commercial dishwasher ⁽³⁾	Product Specification for Commercial Dishwashers
Commercial ice maker ⁽⁴⁾	Product Specification for Automatic Commercial Ice Makers
Commercial steam cooker ⁽⁵⁾	Product Specification for Commercial Steam Cookers
Combination oven ⁽⁶⁾	Product Specification for Commercial Ovens

Notes to Table 10.3.1.3.B:

- (1) "Residential clothes washer" and "commercial clothes washer" are as defined by the Energy Star Program Requirements Product Specification for Clothes Washers.
 - (2) "Residential dishwasher" is as per the definition of "dishwasher" by the Energy Star Program Requirements Product Specification for Residential Dishwashers.
 - (3) "Commercial dishwasher" is as per the definition of "dishwashing machine" by the Energy Star Program Requirements Product Specification for Commercial Dishwashers. Dishwashers intended for laboratory applications are exempted.
 - (4) "Commercial ice maker" is as per the definition of "automatic commercial ice maker" by the Energy Star Program Requirements Product Specification for Automatic Commercial Ice Makers.
 - (5) "Commercial steam cooker" is as per the definition of "commercial steam cooker" by the Energy Star Program Requirements Product Specification for Commercial Steam Cookers.
 - (6) "Combination oven" is as per the definition of "combination oven" by the Energy Star Program Requirements Product Specification for Commercial Ovens.
- 3) Clothes washers with a top-loading design that are designed for use in applications in which the occupants of more than one household will be using the clothes washer, such as multi-family housing common areas and coin laundries, shall not be installed."

33. In Book I, Division B, Part 10, Council adds a new Article 10.3.1.7. as follows:

"10.3.1.7. Non-recirculating Applications

- 1) The city's water system shall not be connected to
 - a) *once through cooling equipment*, except where *emergency once through cooling equipment* or *maintenance once through cooling equipment* is operated with permission or authorization in writing from the *City Engineer*,
 - b) venturi-type flow-through vacuum generators or aspirators in which running water is used solely for the venturi effect,
 - c) *non-recirculating liquid ring pumps*, or
 - d) non-recirculating wet-hood scrubbers.
- 2) No systems or equipment shall be installed that allow for the use of treated drinking water supplied directly or indirectly by the city to temper or dilute steam condensate and other discharges to the sanitary or storm system."

34. In Book II, Division A, Part 1, in Article 1.4.1.2., Council adds the following definition in alphabetical order:

"Self-closing plumbing fixture means a *plumbing fixture* that closes automatically upon the deactivation of a mechanical or electronic control mechanism."

35. In Book II, Division A, Part 1, in Article 2.2.2.8., Council strikes 2.2.2.8.(1) and substitutes:

"

1) Every lavatory faucet installed for *public use* shall be a *self-closing plumbing fixture.*"

36. A decision by a court that any part of this By-law is illegal, void, or unenforceable severs that part from this By-law, and is not to affect the balance of this By-law.

37. This By-law is to come into force and take effect on January 1, 2019.

EXPLANATION

**Building By-law amending By-law
Re: Sustainability and water conservation**

The attached By-law will implement Council's resolution of XXX, 2018 to amend the Building By-law regarding water conservation measures, effective January 1, 2019.

Director of Legal Services

[date]

GREEN BUILDINGS POLICY FOR REZONINGS

Authority - Director of Planning

Effective July 22, 2010

*Amended June 25, 2014, June 8, 2015, January 14, 2016, November 29, 2016,
February 7, 2017, and May 2, 2018*

All rezonings must meet the following requirements of either:

- A. Near Zero Emissions Buildings, or
- B. Low Emissions Green Buildings.

This policy is effective immediately, and shall be mandatory for all Rezoning Applications received on or after ~~May 1, 2017~~ **May 2, 2018**, with exceptions permitted at the discretion of the Director of Planning. For rezoning Applications received prior to ~~May 1, 2017~~ **May 2, 2018** that have not yet been approved by Council, applicants may choose to meet this updated version of the Policy or the preceding version.

REQUIREMENTS

A. **Near Zero Emissions Buildings**

(1) Near Zero Emissions Building Standard

Projects shall be designed to meet Passive House requirements and apply for certification, or to an alternate near zero emissions building standard, such as the International Living ~~Building~~ **Future** Institute's ~~Net~~ **Zero** Energy Building Certification, as deemed suitable by the Director of Sustainability.

AND

(2) Energy System Sub-Metering and Reporting

Projects shall meet the requirements for Energy System Sub-Metering and Reporting, as described in B.5 of this policy.

AND

(3) Low-Emitting Materials

Projects shall be designed to minimize emissions from interior materials containing volatile organic compounds (VOCs) or added urea formaldehyde, as described in B.8 of this policy.

OR

B. Low Emissions Green Buildings

(1) LEED Gold - Building Design and Construction

All projects – with the exception of residential buildings - shall register with the Canadian Green Building Council (CaGBC) and be designed to achieve LEED Gold certification for Building Design + Construction (BD+C), or an alternate holistic green building rating system. A residential building is defined as a building in which at least 50% of the gross floor area is residential space. Where a project has multiple buildings, each building shall be evaluated separately.

The BD+C project type applies to buildings that are being newly constructed or going through a major renovation, and includes many rating systems designed for various building types. The applicant is responsible for choosing the rating system (within BD+C) that is most applicable to the project.

AND

(2) Performance Limits

All buildings shall meet or exceed performance limits according to their building type summarized in the tables below, as modelled according to the City of Vancouver Energy Modelling Guidelines. The Energy Modelling Guidelines set standard assumptions and requirements for energy models when assessing compliance with the limits, including accounting for thermal bridging, consideration of summertime thermal comfort, and the treatment of mixed-use buildings.

Performance Limits Buildings Not Connected to a City-recognized Low Carbon Energy System			
Building Type	TEUI (kWh/m ²)	TEDI (kWh/m ²)	GHGI (kgCO ₂ /m ²)
Residential Low-Rise (< 7 storeys)	100	15	5
Residential High-Rise (7+ storeys)	120	32 30	6
Office	100	27	3
Retail	170	21	3
Hotel	170	25	8
All Other Buildings	EUI 35% below 90.1-2010 better than Building By-law energy efficiency requirements, Section 10.2, in effect at the time of rezoning application		

Performance Limits Buildings Connected to a City-recognized Low Carbon Energy System			
Building Type	TEUI (kWh/m ²)	TEDI (kWh/m ²)	GHGI (kgCO ₂ /m ²)
Residential Low-Rise (< 7 storeys)	110	25	5
Residential High-Rise (7+ storeys)	130	40	6
Office	110	27	3
Retail	170	21	3
Hotel	210 170	25	8
All Other Buildings	EUI 35% below 90.1-2010 better than Building By-law energy efficiency requirements, Section 10.2, in effect at the time of rezoning application		

TEUI: Total Energy Use Intensity
TEDI: Thermal Energy Demand Intensity
GHGI: Greenhouse Gas Intensity

Alternate Compliance Pathway for Energy and GHG Reductions: In lieu of compliance with the GHGI limits required by the table above, Residential High-Rises (7+ storeys) and Hotels may achieve a TEUI of 100 and 120 respectively, and a TEDI of 15. In addition, any building type seeking an alternative compliance path may use A.1, Near Zero Emissions Building Standard.

Small Buildings: for Part 9 buildings, in lieu of the TEUI and TEDI limits required by this policy, projects may meet an alternate set of performance or prescriptive requirements, such as an equivalent step of the Part 9 BC Energy Step Code, as deemed acceptable by the Director of Sustainability.

AND

(3) Airtightness Testing

Whole-building airtightness for each building is to be tested and reported, and all buildings are to be designed and constructed with the intention of meeting an air-leakage target of 2.0 L/s*m² @75 Pa (0.40 cfm/ft² @ 0.3”w.c.), or sealed according to good engineering practice.

Airtightness of suites is to be tested and reported for residential buildings and must demonstrate compliance with a suite-level air-leakage target of 1.2 L/s*m² @50 Pa (0.23 cfm/ft² @ 0.2”w.c.), as tested to ASTM E779 or an equivalent standard.

AND

(4) Enhanced Commissioning

An enhanced commissioning process for all building energy systems is to be completed in accordance with, [CSA Z5000-18](#), or ASHRAE Guideline 0-2005 and 1.1-2007, or an alternate commissioning standard [acceptable by the Director of Sustainability](#).

AND

(5) Energy System Sub-Metering and Reporting

Separate master metering for each energy utility (e.g. Electricity, Gas, etc.) and each building is to be provided as well as sub-metering of all major energy end-uses and major space uses within each building.

An Energy Star Portfolio Manager account is to be setup for each building and must include all basic property information for each building as designed, including setup of meters for all energy utilities servicing the building.

A rezoning applicant will enter into an agreement with the City, on terms and conditions acceptable to the City, that requires the future owner of the building to report energy use data, on an aggregated basis, for the building as a whole and certain common areas and building systems. Such an agreement will further provide for the hiring of an approved professional service provider to assist the building owner for a minimum of three years in collecting and submitting energy use data to the City.

AND

(6) Refrigerant Emissions and Embodied Emissions

All projects shall calculate and report the life-cycle equivalent annual carbon dioxide emissions of each building, in kgCO₂e/m², from the emission of refrigerants. This requirement does not apply to projects where the total installed heating and cooling capacity of equipment containing refrigerants is less than 35kW.

All projects shall report the life-cycle equivalent carbon dioxide emissions (i.e. global warming potential impact, or 'embodied carbon') of each building, in kgCO₂e/m², as calculated by a whole-building life-cycle assessment (LCA).

AND

(7) Verified Direct Ventilation

All buildings shall be designed and constructed with a ventilation system that provides outdoor air directly to all occupiable spaces, in the quantities defined by code. This includes bedrooms, living rooms, and dens in residential units. The ventilation system shall allow for the designed flow rates to be tested and verified at the occupiable space level as part of the enhanced commissioning process.

AND

(8) Low-Emitting Materials

Emissions from interior materials containing volatile organic compounds (VOCs) or added urea formaldehyde are to be minimized by meeting the content requirements of Green Seal, Green Label, Green Label Plus, FloorScore, South Coast Air Quality Management District (SCAQMD) Rules, or alternate low VOC criteria as applicable to each material or product, and shall contain no added urea formaldehyde resins.

AND

(9) Indoor Air Quality Testing

Indoor air quality testing is to be conducted for formaldehyde, particulates, ozone, total volatile organic compounds, and carbon monoxide prior to occupancy, and report results to the City as compared to acceptable target concentration levels and standards.

AND

(10) Integrated Rainwater Management and Green Infrastructure

Explore and describe measures for the management of the site's rainfall through integrated rainwater management and Green Infrastructure (GI) as described in the City-Wide Integrated Rainwater Management Plan. Project teams can refer to the Citywide Integrated Rainwater Management Plan Volume I: Vision, Principles and Actions and Volume II: Best Management Practice Toolkit, for specific targets and examples of green infrastructure for rainwater management.

AND

(11) Resilient Drinking Water Access

A water fountain, bottle-filling station, or other fixture capable of operating on city water pressure alone and without electricity is to be provided in a location easily accessible to all building occupants.

REQUIREMENT ADMINISTRATION

Projects demonstrating that the building is extremely ill-suited to achieving a specific requirement may request that the requirement be modified, or deemed not applicable, at the discretion of the Director of Sustainability.

HERITAGE BUILDINGS

Where a project includes heritage retention, heritage components can be exempted from one or all of the requirements of this policy at the discretion of the Director of Planning.

BCBC (Gas)						
		Code (gas)	gas	elec	total	
Base Cost (\$/ft ²)	250	EUI - Note 1	102	67.5	170	
Base Monthly Mortgage	\$ 2,415.24	ECI - Note 3	3.2	7.0	10.1	
		GHGI	18.9	0.7	19.7	

STEP 2 (Gas)						
		Step 2 (gas)	gas	elec	total	savings from Gas Code
Incremental Cost (%)	0.4%	EUI	63.6	64.8	128	24%
Incremental Cost (\$/ft ²)	1.0	ECI	2.0	6.7	8.6	15%
Incremental Cost (\$/m ²)	10.8	GHGI	11.8	0.7	12.5	37%
Energy Savings (\$/m ²)	1.5					
Simple Payback (yrs)	7					
Incremental Cost in 800ft ² suite	\$ 861					
Monthly Mortgage Cost - Note 2	\$ 2,419.40					
Incremental Monthly Mortgage	\$ 4.16					
Energy Savings in 800ft ² suite	\$ 118					
Monthly Energy Savings	\$ 10					
TOTAL Monthly Savings	\$ 6					

STEP 3 (Gas)						
Incremental Cost (%)	0.8%	Step 3 (gas)	gas	elec	total	savings from Gas Code
Incremental Cost (\$/ft ²)	2.0	EUI	51.5	65.2	117	31%
Incremental Cost (\$/m ²)	21.5	ECl	1.6	6.7	8.3	18%
Energy Savings (\$/m ²)	1.8	GHGI	9.5	0.7	10.2	48%
Simple Payback (yrs)	12					
Incremental Cost in 800ft ² suite	\$ 1,722					
Monthly Mortgage Cost	\$ 2,423.56					
Incremental Monthly Mortgage	\$ 8.32					
Energy Savings in 800ft ² suite	\$ 145					
Monthly Energy Savings	\$ 12					
TOTAL Monthly Savings	\$ 4					

BCBC (Electric)						
		Code (elec)	gas	elec	total	
Base Cost (\$/ft ²)	250	EUI	45.7	93	138.7	
Base Monthly Mortgage	\$ 2,415.24	ECl	1.4	9.6	11.0	
		GHGI	8.5	1.0	9.5	

STEP 2 (Electric)						
Incremental Cost (%)	0.4%	Step 2 (elec)	gas	elec	total	savings from Elec Code
Incremental Cost (\$/ft ²)	1.0	EUI	31.4	83.3	114.7	17%
Incremental Cost (\$/m ²)	10.8	ECl	1.0	8.6	9.6	13%
Energy Savings (\$/m ²)	1.4	GHGI	5.8	0.9	6.7	29%
Simple Payback (yrs)	7					
Incremental Cost in 800ft ² suite	\$ 861					
Monthly Mortgage Cost	\$ 2,419.40					
Incremental Monthly Mortgage	\$ 4.16					
Energy Savings in 800ft ² suite	\$ 115					
Monthly Energy Savings	\$ 10					
TOTAL Monthly Savings	\$ 5					

STEP 3 (Electric)						
Incremental Cost (%)	0.8%	Step 3 (elec)	gas	elec	total	savings from Elec Code
Incremental Cost (\$/ft ²)	2.0	EUI	31.4	72.4	103.8	25%
Incremental Cost (\$/m ²)	21.5	ECl	1.0	7.5	8.4	23%
Energy Savings (\$/m ²)	2.6	GHGI	5.8	0.8	6.6	30%
Simple Payback (yrs)	8					
Incremental Cost in 800ft ² suite	\$ 1,722					
Monthly Mortgage Cost	\$ 2,423.56					
Incremental Monthly Mortgage	\$ 8.32					
Energy Savings in 800ft ² suite	\$ 205					
Monthly Energy Savings	\$ 17					
TOTAL Monthly Savings	\$ 9					

STEP 3 (Electric, compared to BCBC gas)						
Incremental Cost (%)	0.8%	Step 3 (elec)	gas	elec	total	savings from Gas Code
Incremental Cost (\$/ft ²)	2.0	EUI	31.4	72.4	103.8	39%
Incremental Cost (\$/m ²)	21.5	ECl	1.0	7.5	8.4	17%
Energy Savings (\$/m ²)	1.7	GHGI	5.8	0.8	6.6	66%
Simple Payback (yrs)	13					
Incremental Cost in 800ft ² suite	\$ 1,722					
Monthly Mortgage Cost	\$ 2,423.56					
Incremental Monthly Mortgage	\$ 8.32					
Energy Savings in 800ft ² suite	\$ 135					
Monthly Energy Savings	\$ 11					
TOTAL Monthly Savings	\$ 3					

NOTES:

- 1) EUIs and costs based on models from the BC Housing Metrics Study
- 2) All mortgage costs are via VanCity Online Mortgage Calculator
 \$500,000 baseline mortgage
 25yr mortgage
 Monthly payments
 3.190% - 5yr Closed Mortgage
<https://www.vancity.com/Mortgages/MortgageCalculators/>
- 3) Utility rates are 3.1¢/kWh for gas, 10.3¢/kWh for electricity
- 4) Comparisons repeated using more conservative UBC Study and 2016 ZEBP models, with similar results; in Step 3 compared to gas, lower energy cost savings (2-4%), and break-even (\$0) monthly savings, but higher GHG savings (68-72%).

Appliance Efficiency Requirements: Economic and Environmental Data

This table summarizes the water, energy and operating cost savings for an Energy Star appliance compared to a non-certified model. The simple payback period for the Energy Star appliance is also provided for any purchase price differential.

Appliance	Sector	Hot water heating	Subset	Simple payback (years)	Net savings (over product life of one appliance)	Lifetime savings (for one appliance)			
						Water (L)	Energy (GJ)	Energy (kWh)	
Dishwasher	Residential	Electric	Standard	Immediate	\$46	13,429	—	407	
			Compact	Immediate	\$19	3,581	—	209	
		Natural Gas	Standard	Immediate	\$80	13,429	1.1	179	
			Compact	Immediate	\$47	3,581	0.6	92	
	Commercial (low temperature)	Electric	Under counter	0.7	\$2,168	559,578	—	25,395	
			Door type	0.3	\$18,829	5,338,791	—	242,288	
			Single tank conveyor	Immediate	\$18,607	5,747,767	—	272,529	
			Multi tank conveyor	0.4	\$25,067	8,290,048	—	376,224	
		Natural Gas	Under counter	1.2	\$1,063	559,578	112.0	—	
			Door type	0.5	\$9,861	5,338,791	1,068.5	—	
			Single tank conveyor	Immediate	\$10,301	5,747,767	1,150.3	11,680	
			Multi tank conveyor	0.7	\$13,087	8,290,048	1,659.1	—	
		Commercial (high temperature)	Electric	Under counter	5.7	\$353	238,339	—	31,707
				Door type	0.7	\$11,485	2,321,213	—	177,949
				Single tank conveyor	1.9	\$8,548	1,879,078	—	184,231
				Multi tank conveyor	0.3	\$32,082	7,129,441	—	548,152
	Natural Gas		Pot, pan and utensil	4.1	\$1,064	464,243	—	33,108	
			Under counter	—	(\$386)	238,339	75.0	14,710	
			Door type	1.3	\$5,358	2,321,213	730.0	12,410	
			Single tank conveyor	3.2	\$4,281	1,879,078	591.0	50,224	
		Multi tank conveyor	0.6	\$15,893	7,129,441	2,242.2	39,712		
		Pot, pan and utensil	—	(\$377)	464,243	146.0	—		

Appliance	Sector	Hot water heating	Subset	Simple payback (years)	Net savings (over product life of one appliance)	Lifetime savings (for one appliance)			
						Water (L)	Energy (GJ)	Energy (kWh)	
Clothes washer	Residential	Electric	Front loading	2.6	\$90	88,512	—	348	
			Top loading	3.4	\$213	241,934	—	1,250	
		Natural Gas	Front loading	2.8	\$78	88,512	1.3	70	
			Top loading	3.8	\$169	241,934	4.8	250	
	Commercial (multifamily)	Electric	Front loading	1.6	\$695	260,647	—	7,226	
			Natural Gas	Front loading	2.5	\$372	260,647	28.2	1,003
		Commercial (laundromat)	Electric	Front loading	1.0	\$1,200	459,964	—	12,753
			Natural Gas	Front loading	1.5	\$744	459,964	49.7	1,770
Ice machine	Commercial (batch)	—	Ice making head	Immediate	\$1,029	188,599	—	9,975	
			Remote condensing unit	Immediate	\$1,005	200,205	—	9,445	
			Self-contained unit	Immediate	\$449	149,387	—	3,075	
	Commercial (continuous)	—	Ice making head	1.1	\$907	—	—	14,892	
			Remote condensing unit	0.9	\$1,138	—	—	17,936	
			Self-contained unit	5.3	\$17	—	—	3,154	
Steam cooker	Commercial (3 pan)	Electric	—	5.9	\$909	615,707	—	58,174	
		Natural Gas	—	4.9	\$1,239	615,707	602.8	—	
	Commercial (4 pan)	Electric	—	5.2	\$1,511	514,735	—	70,180	
		Natural Gas	—	5.4	\$902	514,735	556.5	—	
	Commercial (5 pan)	Electric	—	4.6	\$2,207	444,037	—	83,105	
		Natural Gas	—	6.0	\$598	444,037	509.1	—	
	Commercial (6 pan)	Electric	—	4.1	\$2,874	386,790	—	95,285	
		Natural Gas	—	6.7	\$289	386,790	456.9	—	
Combination oven	Commercial	Electric	—	Immediate	\$4,640	No data	—	76,415	
		Natural Gas	—	Immediate	\$1,926	No data	425.0	—	

Data Source and Assumptions: These data are from the Natural Resources Canada spreadsheet “Canada’s Energy Star® Simple Savings Calculator.” Data are for a single unit of the applicable appliance. Default calculator values for British Columbia were applied. Version 12.2 was used for all appliances with the exception of ice machines, for which calculator version 11.3 was used.