



To: Mayor and Councillors
From: James Cooper, Architect AIBC
Director, Building Approvals
Date: February 18, 2021
File: 10-6125-07-02/2021-Vol 01
Re: **Additional information – Incentivizing Single Family Passive Houses in the City of Richmond**

The purpose of this memorandum is to provide additional information, as directed at the General Purposes Committee on February 16, 2021, that outlines the regulatory process should construction not meet the certified Passive House standard after having been approved for the additional density incentive.

This addition appears in revised Attachment 4 of the Report to Committee, with new text shown in yellow highlight, and is included with this memorandum.

Additionally, a minor clerical change has been made to Building Regulation Bylaw No. 7230, Amendment Bylaw No. 10238 (Permit Fee Incentives for High Performance Single Family and Duplex Housing), which now includes a new clause 5.6.5(d), as part of the conditions that must be met to qualify for the permit fee refund.

The updated Amendment Bylaw No. 10238 is included with this memorandum, with new clause 5.6.5(d) added.

For additional information or clarification please contact the author at (604) 247 4606 or via email at jcooper2@richmond.ca.

James Cooper, Architect AIBC
Director, Building Approvals

JC:jc

Proposed Application Procedure for High-Performance Building Incentive Program

In order to receive the proposed high-performance incentives, the following steps must be taken prior to the submission of the building permit application:

- **Energy Step Code 4 or 5:** the applicant must submit a request letter to the Director of Building Approvals, along with the Pre-Construction Energy Step Code Compliance Report and supporting documents as per the City of Richmond bulletin (Building-38). The request letter must detail the requested floor area exemptions, and provide a rationale for each item. Upon verification of compliance of the Proposed House with Step 4 or 5, the Manager of Plan Review will provide an *Incentive Authorization Letter* outlining the granted incentives. A copy of this letter must be included in the full building permit application package.
- **Certified Passive House:** A request letter must be submitted to the Director of Building Approvals, along with a letter from a Certified Passive House Designer attesting to the Passive House performance of the proposed design, and a letter from a Passive House Certifier, assuring that if built as designed, the proposed house will achieve Passive House Certification. The request letter must detail all the requested floor area exemptions, and the rationale for each item. Upon review of the request letter and supporting documents, a meeting will be arranged by the Manager of Plan Review to discuss the exemption request with the applicant. Other staff from Building Approvals and other departments may be present at the meeting, at the discretion of the Manager of Plan Review. After the meeting, and pending any justification or clarification requested during the meeting, the Manager of Plan Review will provide an *Incentive Authorization Letter* outlining the granted incentives. A copy of this letter must be included in the full building permit application package.

Projects that receive any of the high-performance incentives, must meet the following criteria before Final Building Inspection is scheduled:

- 1) As-built Energy Step Code Compliance Report confirming compliance with Step 4 or Step 5, as applicable, and supporting documents as per the City of Richmond bulletin Building-38; *or*
- 2) Confirmation of Passive House Certification.

Penalty for Non-Compliance with Conditions of the Incentive Authorization Letter

If the conditions outlined in the *Incentive Authorization Letter* are not met by the time of Final Building Inspection, the applicant will have to pay the waived permit fee, plus 50% processing fee, in order to schedule Final Inspection.

Passive House certification requires achieving performance standards at progressive stages of construction in order to demonstrate properly constructed elements. In order to ensure that overall Certification is achieved at completion, building inspections at each stage will be withheld until the appropriate levels of performance can be demonstrated. Request for Final

Building Inspection granting approval for occupancy is contingent on prior presentation of Passive House certification.

Should construction for proposed Passive House after having been granted a density incentive be discontinued, or the required performance levels (in the Incentive Authorization Letter) be abandoned, the building permit shall be cancelled and the construction stopped. Construction at that point may continue only after a new building permit compliant to existing Zoning Bylaw regulations is approved. This will require removal of any density beyond that permitted in the Zoning Bylaw in order to comply.



**Building Regulation Bylaw No. 7230,
Amendment Bylaw No. 10238
(Permit Fee Incentives for High-Performance Single Family and
Duplex Housing)**

The Council of the City of Richmond enacts as follows:

1. Building Regulation Bylaw No. 7230, as amended, is further amended at section 5.5 by adding the following after subsection 5.5.4:

“5.5.5 Where the **building inspector** is satisfied that a **building permit** application is for a **Certified Passive House**, the **building permit** fee payable by the **owner** pursuant section 5.5.1(a) above is waived.”

2. Building Regulation Bylaw No. 7230, as amended, is further amended at section 5.6 by:

- (a) deleting the words “5.6.2 and 5.6.3” in subsection 5.6.1, and replacing them with the words “5.6.2, 5.6.3, 5.6.5 and 5.6.6”;
- (b) deleting the word “only” in subsection 5.6.2;
- (c) adding the words “in accordance with subsection 5.6.2” after the words “partially refunded” in subsection 5.6.4;
- (d) adding the following after subsection 5.6.4:

“5.6.5 A **building permit** fee may be refunded, in whole or in part, when:

- (a) the **owner** has submitted a written request for such refund;
- (b) the **building permit** is for a **single family** home or **duplex**;
- (c) either:
 - (i) the building inspector is satisfied that the completed (as-built) **building** achieves Step 4 of the **Energy Step Code**, and such **building permit** application was submitted prior to January 1, 2022; or
 - (ii) the building inspector is satisfied that the completed (as-built) **building** achieves Step 5 of the **Energy Step Code**, and such **building permit** application was submitted prior to January 1, 2025; and

(d) the applicable **building permit** has not expired.

5.6.6 Where a refund of a **building permit** fee is approved in accordance with subsection 5.6.5, such refund is to be calculated at:

(a) 50% of the nearest dollar the amount of the **building permit** fee, less the non-refundable plan processing fee, in the case of a refund in accordance with subsection 5.6.5(c)(i); or

(b) 100% of the nearest dollar the amount of the **building permit** fee, less the non-refundable plan processing fee, in the case of a refund in accordance with subsection 5.6.5(c)(ii).”

3. Building Regulation Bylaw No. 7230, as amended, is further amended at section 16.1 by adding the following definition in alphabetical order:

“**CERTIFIED PASSIVE HOUSE** has the meaning given to that term in the **Zoning bylaw.**”

4. This Bylaw is cited as **Building Regulation Bylaw No. 7230, Amendment Bylaw No. 10238**”.

FIRST READING

SECOND READING

THIRD READING

ADOPTED

MAYOR

CORPORATE OFFICER

CITY OF RICHMOND
APPROVED for content by originating Division
JC
APPROVED for legality by Solicitor
BRB



City of Richmond

Report to Committee

To: General Purposes Committee

Date: January 8, 2021

From: James Cooper
Director, Building Approvals

File: 10-6125-07-02/2020-
Vol 01

Peter Russell
Director, Sustainability and District Energy

Re: **Incentivizing Single-Family Passive Houses in the City of Richmond**

Staff Recommendations

1. That Richmond Zoning Bylaw 8500, Amendment Bylaw 10237, which proposes a density increase to single family houses built to certified Passive House standards, identified in the report titled "Incentivizing Single-Family Passive Houses in the City of Richmond" dated January 8, 2021, from the Director, Building Approvals, and the Director, Sustainability and District Energy, be introduced and given first reading;
2. That Richmond Building Regulation Bylaw 7230, Amendment Bylaw 10238, which proposes a waiver of Building Permit fees, identified in the report titled "Incentivizing Single-Family Passive Houses in the City of Richmond" dated January 8, 2021, from the Director, Building Approvals, and the Director, Sustainability and District Energy, be introduced and given first, second and third readings; and
3. That Council direct staff to prepare an outreach and education program to familiarize the community with the benefits of constructing new homes to achieve the top levels of the BC Energy Step Code and the Passive House standard.

James Cooper
Director, Building Approvals
(604-247-4606)

Peter Russell
Director, Sustainability and District Energy
(604-276-4130)

Att. 7

REPORT CONCURRENCE		
ROUTED TO: Development Applications Policy Planning Finance Legal	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
SENIOR STAFF REPORT REVIEW	INITIALS: MO	APPROVED BY CAO

Staff Report

Origin

At the July 3, 2019 Planning Committee meeting, staff received the following referral in reference to the staff report titled “Early Adoption of BC Building Code Provisions for 12 Storey Mass Timber Construction”:

“That staff examine options to encourage the development of Passive [House] single-family homes and report back.”

Passive House is a well-established international standard for energy efficient buildings. For single-family residential construction, it has prescribed energy performance slightly higher than the Step 5 (highest level) of the BC Energy Step Code. The Province has signalled that the BC Building Code will require all new buildings to achieve Step 5 by 2032. The City of Richmond is committed to requiring all new construction to reach the top level of the Step Code by 2025, subject to future Council approvals, as defined in a schedule within the Official Community Plan (OCP).

This report proposes a suite of incentives to encourage single-family and two-family houses to be designed and constructed to the Certified Passive House standard and the top levels of the BC Energy Step Code. It has been prepared in consultation with Passive House Canada and leading high-performance design and construction firms in the region.

This report supports Council’s Strategic Plan 2018-2022 Strategy #2 A Sustainable and Environmentally Conscious City:

Environmentally conscious decision-making that demonstrates leadership in implementing innovative, sustainable practices and supports the City’s unique biodiversity and island ecology.

2.1 Continued leadership in addressing climate change and promoting circular economic principles.

Analysis

A ‘Passive House’ is a highly energy efficient building that requires minimal energy for space heating and cooling. To meet Passive House requirements, the energy use of a building is minimized by designing and constructing a high-performance envelope, and by utilizing passive heating gains (such as energy from solar radiation and internal activity). Details regarding the Passive House approach to design, meeting the standard, its history and benefits, are outlined in Attachment 1.

Constructing a home to meet Passive House certification not only provides benefits to the occupants of the home, it also helps advance skills and competencies in design and construction to meet the progressively more stringent requirements of the BC Building Code, providing momentum towards excellence and innovation in the building sector.

Passive House and BC Energy Step Code

The BC Energy Step Code (Step Code) has been implemented in Richmond since 2018, designed to transition the design and construction industry ahead of the eventual Code requirement of 'net zero energy ready' buildings. City staff have previously reported on excellent progress to date by Richmond homebuilders in achieving current Step Code requirements, and are now interested in seeing builders reach the top levels of energy performance on their next project, as part of transitioning toward low energy and near-zero emission outcomes.

The Step Code sections of the BC Building Code recognize that buildings built to the Passive House standard are at the energy performance requirements of the top level of the Step Code.¹ The additional advantage of Passive House is the rigorous certification process that assures high performance targets set at the design stage are translated into construction and commissioning.

Research on Best Practice

Along with adoption of the BC Energy Step Code, Richmond already has incentives for higher energy performance in single and two-family construction. Richmond Zoning Bylaw No. 8500 currently exempts from Floor Area Ratio calculation:

1. The area in exterior walls that provide extra insulation up to 0.15 meter thickness beyond the exterior wall sheathing; and
2. The floor space housing the heat recovery ventilation system, up to 2.35 m².

Adding to these measures, staff conducted research amongst leading design professionals, homebuilders and other municipalities to establish the most appropriate approach for an incentive package to promote higher performance levels at Step Code levels 4 and 5, and ultimately Passive House. (See Attachment 2 for Municipal Scan of Passive House Incentives).

Research indicates that for incentives to be effective, they must at least partially offset the financial cost of designing and constructing to a high performance standard. Passive House certification requires the following measures beyond standard construction:

1. Designs produced by certified Passive House designers;
2. Consultation from high performance energy specialists;
3. Construction materials and high performance measures that at present are more costly than conventional construction;
4. Construction phase third party inspections and certifications by consultants; and
5. Final testing and certification by Passive House certified consultants, and post-construction commissioning.

¹ Section 9.36.6.2 (3) of the BC Building Code: *Buildings designed and constructed to conform to Step 5 of any of the Tables referred to in Sentence (1) and to the Passive House Planning Package, version 9 or newer, are deemed to comply with this Subsection if the energy model according to which the building is designed and constructed is prepared by a Certified Passive House Designer, or Certified Passive House Consultant, who is approved by the Passive House Institute.*

High performance design, testing and certification represent a higher financial outlay, which is an economic risk that has been identified as the main factor preventing wide adoption of high performance construction within the development community beyond the specialty builder.

Other attributes of an effective incentive program include simplicity of measures that can be easily quantified and verified at the design stage, and during construction. Staff are also cognizant of the need for increased technical knowledge and competency for homebuilders, and will continue to engage our local development community through Richmond's *Builder Breakfast* series, as well as partnering with Passive House Canada and Zero Emissions Building Exchange on webinars and courses on ultra-low energy and zero emission construction.

Staff also reviewed recently adopted bylaws in the City of Vancouver (Vancouver) as well as City of North Vancouver and City of New Westminster that provide incentives for constructing single-family, duplex and triplex houses to the Passive House standard.

Notably, Vancouver's recent Zoning Bylaw and Building Bylaw amendments offer incentives in the form of permitted increased (saleable) floor area to encourage Passive House construction. Projects designed to the Passive House standard qualify for an increase in maximum floor area up to 16% for single-family houses, and up to 18% for duplexes and triplexes.

All the above factors were considered in developing the proposed incentives, as well as consideration of potential design ramifications that in some cases will favour simplified forms to affect improved energy design. The overarching intent is to increase the number of single-detached homes targeting the highest levels of energy efficiency while preserving the form and character of existing residential neighborhoods.

Proposed Incentives

Staff have identified four measures that together shape a comprehensive incentive framework for new, high-performance single-detached houses in Richmond:

1. **Floor Area Exemptions** to address increased wall thicknesses to accommodate additional insulation in exterior walls, and requirement for enhanced mechanical systems.
2. **Facilitated Permitting and Inspection** processes to address technical design and inspection of high performance building envelope and mechanical system measures.
3. **Outreach, Engagement and Education** that continues to support local residential builders and designers to successfully meet enhanced energy and emissions performance.
4. **Passive House Density Bonus** to help offset the higher cost of achieving ultra-low energy design, construction, testing and review required by Passive House certification.

The above incentives are discussed in detail in Attachment 3, with measures one through three supporting new houses built to Step 4 and Step 5 of the Step Code and to Passive House. Measure four will be available solely to houses built to the Passive House standard, as shown in Table 1. These incentives would be accessed through an application procedure integrated into the Building Permit process (see Attachment 4 for proposed documentation and verification requirements, and Attachment 5 for new incentives available for Step 4 and 5 and Passive House residential buildings from the CleanBC Better Homes New Construction Program).

Table 1: Proposed Zoning and Fee Incentives for High-Performance Single-Family Houses

Performance Level	Incentives	Comments
Energy Step Code Step 4 ⁽¹⁾	Area Exemption equivalent to 5% of maximum permitted Floor Space for additional wall insulation only and up to 2.35 m ² for mechanical equipment, (HRV); 50% permit fee reduction.	50% permit fee reduction only available until Step 4 becomes the minimum requirement (~2022).
Energy Step Code Step 5 ⁽¹⁾	Area Exemption equivalent to 5% of maximum permitted Floor Space for additional wall insulation only and up to 5.0 m ² for mechanical equipment (HRV); 100% permit fee waiver.	100% permit fee reduction only available until Step 5 becomes the minimum requirement (~2025).
Certified Passive House	Area Exemption equivalent to 10% of maximum permitted Floor Space for additional wall insulation only and up to 5.0 m ² for mechanical equipment (HRV: Heat Recovery Ventilators); 100% permit fee waiver; additional floor area allowance as percentage increase over current maximum.	See Attachment 3

(1) Note: For Step Code 4 and 5 houses seeking the above incentives, and using the EnerGuide rating system for Step Code compliance, the City of Richmond requires applicants to use absolute TEDI targets for Climate Zone 4 to meet the thermal envelop requirement, as described in December 2019, Revision 2, of BC Building Code.

This incentive framework is designed to accelerate movement toward the top level of the Energy Step Code by 2025, as signalled in the OCP. Houses built to Step Code 5 approach the energy performance of Passive House. When Step 4 and 5 become the minimum requirement in Richmond’s Building Regulation Bylaw, the above permit fee waivers would be discontinued. However, the exemptions for increased insulation in exterior walls and the mechanical room are proposed to continue.

Appropriate Density Increase for Passive House Incentive

Staff reviewed additional floor area as a financial means to offset the cost of designing and constructing to the Certified Passive House standard. After consulting with leading industry experts and other municipal governments, it has been identified that the additional cost of building to this highest performance standard represents financial uncertainty that discourages broad industry acceptance.

Although significant increases to the maximum buildable area offered by Vancouver have been effective in increasing interest in constructing to the Passive House standard, they require bylaw relaxations to established setbacks, height limits and projections into the maximum building volumes. It is staff’s opinion that in Richmond, extending the maximum floor area to levels set by Vancouver would be damaging to neighborhood character, giving rise to problems of building

massing and potential privacy issues, as relaxations to established yard setbacks, massing and height would be needed to accommodate large amounts of additional floor area.

After studying the benefits of appropriate incentives balanced with the need to preserve the existing massing and character of Richmond residential neighborhoods, staff proposes a 10% increase to the maximum floor area of a house built to the certified Passive House standard, capped at 46 m² (500 square feet) regardless of lot size. The increase in density represents a balanced approach that offers incentives that are proportional to additional expense of high while ensuring an overall form that does not detract from existing neighborhoods. Rationale for proposed density as incentives are:

1. A 5% area increase is expressly provided for the increased area of required insulation in exterior walls in order to achieve the high performance standards. Through staffs' research, a typically required 6" increase to the thickness of exterior walls throughout consistently represents a 5% contribution to the floor area of a house built to the maximum permissible area. This area increase is an incentive to compensate for the loss of habitable space used to accommodate the required insulation. This increase is available to houses built to Step Code 4 and 5 as well as to Passive House.
2. A further 5% area increase is proposed to address the financial risk stemming from increased cost of constructing to the Passive House standard, and additional consultant design, inspection and certification required. The research to determine the adequacy and appropriateness for the amount of density increase is discussed in Attachment 3.

In addition to the 10% density increase described above, the amount of exemption currently available in the Zoning Bylaw to house energy efficient ventilation equipment is proposed to be increased from 2.35 m² to a maximum of 5.0 m². This modest exemption for technical space is solely to accommodate additional equipment that ensures sufficient fresh air for a healthy, thermally comfortable interior environment, while managing heat loss from exhausting stale air.

Research by staff into the effects of an additional area to building massing taken across a wide range of standard residential lot sizes, confirms that a 10% increase in maximum floor area will comfortably fit within current building massing regulations for single-detached houses, provided in the Zoning Bylaw without adding substantially to the building massing. Attachment 6 includes a table showing incremental increases to size of houses under a 7, 10 and 12% scenario for comparison. Attachment 7 shows illustrated examples of modest volume increases on typical single-detached lots that would result from a 10% increase in floor area.

With Council's endorsement, a floor area exemption would be introduced through Amendments to Richmond Zoning Bylaw 8500 and Building Regulation Bylaw 7230.

Assurances and Monitoring – Passive House Certification

Should Council direct staff to implement the proposed floor area incentive, staff have devised an application process that sets the following conditions:

1. Passive House design (from a certified Passive House professional) with all required technical documentation;

2. Commitment for iterative testing by a Passive House Certifier (third party consultant) during prescribed stages of construction as required by Passive House Canada;
3. Agreement from the applicant that no final inspection may occur prior to passing all required Passive House testing during construction; and,
4. Agreement from the applicant that no occupancy will be granted prior to Certification by Passive Canada at project completion.

Official Certification, as opposed to achieving performance “equivalent to Passive House standards,” is needed to qualify for the increase in maximum floor area. Certification and the aforementioned conditions assure the City that the completed project will meet the required performance level when qualifying for the incentives granted at the permit application stage. Should Council approve the proposed incentives staff will monitor the number of applications, impact of high energy performance on architectural design, and permit revenue.

Financial Impact

The financial impact of waiving building permit fees is expected to be minimal. Since the proposed incentive program is designed to encourage more homes built to the top levels of the Energy Step Code, and Certified Passive House standard, it is anticipated that participation in the incentive program will initially be modest. Permit fee revenue will be monitored as part of the ongoing review of this program, with adjustments made as needed to the amount of fees waived.

Conclusion

High-performance single-detached houses can play an important role in achieving the City’s energy efficiency and greenhouse gas reduction targets, and provide thermal comfort and healthy indoor air quality for occupants. To achieve this, staff propose a comprehensive suite of incentives to encourage more houses designed and built to the top levels of the Step Code, and the Certified Passive House standard. These incentives act as a stimulus for builders to utilize enhanced thermal envelopes and advanced mechanical systems in their next project. The incentive framework proposes floor area exemptions, facilitated plan review and building inspections, reduced permitting fees and educational programs that together encourage development of low-energy buildings, including Passive Houses.

This incentive program will be monitored for its effectiveness, with annual progress updates.



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- Att. 1: Introduction to the Passive House Standard
2: Municipal Scan of Passive House Incentives
3: Additional Information Regarding Proposed High Performance Incentives
4: Proposed Application Procedure for High Performance Building Incentive Program
5: CleanBC Better Homes New Construction Program: Step 4, Step 5 and Passive House
6: Floor Area Exemption Table
7: Examples of Modest Floor Area Increased on Typical Single Family Lots

Introduction to the Passive House Standard

Development of the Standard

The standard was originally developed in Germany in the 1990s, with physicists from the University of Darmstadt analyzing the characteristics of ‘passive solar’ homes and other experimental low-energy buildings around the world, with the goal of developing a performance standard that could be broadly applicable to a variety of buildings. A key objective of this academic research was to determine if a verifiable energy performance standard could be developed that would achieve a level of affordability and constructability, with potential universal application for all building archetypes and climate zones.

For this report, the term ‘Passive House’ refers to the official definition and standard as set by the Passive House Institute (PHI), and administered in Canada by Passive House Canada.

The performance pathway for a building to meet the Passive House standard is by achieving an annual specific heating energy demand of no more than 15 kWh per m² of floor area per year. As an ‘envelope first’ performance standard, Passive House buildings must be designed to nearly eliminate all thermal bridging through the envelope, and achieve building air tightness of no more than 0.6 air changes (ACH) per hour at 50 Pascals of air pressure at project completion.

What is a “Passive House”?

Buildings built to the Passive House standard are so thermally efficient that heating, cooling and dehumidification are delivered almost entirely by the supply of ventilation air, with only a small amount of incremental energy needed to maintain indoor air temperatures at 20 degrees Celsius on the coldest day of the year. In order to minimize “active” heating and cooling demand, enhanced insulation, elimination of thermal bridges (energy transfer through materials), maximum utilization of solar and internal heat gains, and a highly airtight envelope are given great attention. Passive House design emphasizes ultra-low energy demand while delivering high levels of thermal comfort. The concept of passive and active energy supply is shown in Figure 1.



Figure 1 – Passive vs Active: Good thermal insulation reduces the need for active heating; likewise, a properly insulated building envelope can minimize the need for active heating. The thermograph on the right shows hot spots in the “active” system, where heat loss occurs at the greatest rate. [Source: Passive House Institute]

Passive House comes back to Canada

For the German researchers, the Saskatchewan Conservation House (1977) in Regina, SK, was an early inspiration for the development of the Passive House standard (see Figure 2). Tested 30 years after construction, the building's airtightness had not changed significantly and the walls showed no sign of moisture accumulation. Research on ultra-low energy houses elsewhere in North America and Europe led to the first pilot Passive House (a six-unit townhouse), built in 1990 in Darmstadt, Germany. Systematic measurement of the building's energy use in 2016 proved that the estimated energy savings were achieved in practice, and 25 years later the actual energy use was still consistent with energy modeling predictions.

There are now over 40,000 Passive House certified buildings worldwide, covering a wide range of archetypes (e.g., all sizes of residential buildings, schools, kindergartens, recreation centres, supermarkets, commercial and institutional offices). A growing number of Passive House projects are underway across Canada, with British Columbia being the leading province in terms of number of projects and trained Passive House professionals.



Figure 2 – LEFT: Saskatchewan Conservation House (Regina, SK, 1977) [Source: passipedia.org]
RIGHT: Bernhardt Passive House (Victoria, BC, 2013) [Source: Passive House Canada (courtesy of D. Ford)]

According to Passive House Canada, there are 34 certified Passive House projects that have been completed in BC, 20 of which are single-family homes. Several others are completed, but have not yet been certified. These projects range from ground-oriented residential through to mid-rise, as well as high-rise multi-unit residential buildings, but also extends to fire halls, kindergartens, mid-rise offices and community centres.

An enthusiastic segment of the building design and construction industry in British Columbia has embraced the Passive House standard, with early examples consisting mainly of single-detached and two-family homes. A catalyst for this was the 2010 Winter Olympics, and the construction of the all-wood Austria House in Whistler (near Lost Lake), as the temporary home of Team Austria, but also with the objective of introducing the international standard into Canada, including Passive House building components and systems. This was BC's first Passive House, which now functions as a warming hut for Nordic skiing in the winter, as well as mountain bike rentals in the summer. Early projects such as these have been drivers for subsequent projects, and

establishment of local professional training and practitioner certification (Passive House Canada). There is strong evidence that most of the early, flagship Passive House projects in North America have been small residential buildings. Smaller buildings are an appropriate archetype for local builders, architects and contractors to apply the Passive House standard, with knowledge gained making it easier to apply to larger, more complex buildings (see Figure 3).



Figure 3 – Passive House Single-Detached Homes
Four, single-detached Passive House homes (completed and under construction) in Vancouver. [Source: photos courtesy of J. Cooper and N. Connolly]

An Envelope First Approach

Passive House design focuses first on the building envelope, and then on the efficiency of the building's mechanical systems. This is important because the building envelope should last the entire life of the building, while mechanical systems can be more easily replaced as better technologies become available. Once in place, building envelopes are more tolerant to delayed maintenance, unlike mechanical systems that can be more complex to maintain. Passive Houses rely on highly insulated and ultra-airtight envelopes and high-efficiency heat recovery ventilators. This means thicker than usual wall and/or roof assemblies as well as ventilation systems that may have a larger footprint than typical mechanical systems.

Benefits of Passive House

The Passive House approach facilitates zero-energy and carbon-neutral operation of buildings, which is key in achieving community greenhouse gas emission reduction targets. It is difficult for less efficient buildings to be operated at net-zero energy, at least not without unfeasibly oversized renewable energy generation. On the other hand, Passive House buildings can be more readily supplied from on-site renewables or local low-carbon energy sources, due to very low thermal energy demand. Passive House buildings can be considered ‘net zero energy ready’ on the pathway to net-zero energy operation of buildings, which will be required by the BC Building Code in 2032. By significantly reducing the energy demand of new buildings through high-performance building standards like Passive House, it frees up BC’s low carbon grid electricity for use in retrofitting of older buildings as well as use by zero emission vehicles. Passive House also offers benefits such as high levels of thermal comfort, indoor air quality, acoustic isolation, durability, and increased resilience to extreme weather events.

Passive House Standard and Certification

A key element of the Passive House Standard is a rigorous quality assurance process that ensures what is built matches what was designed. Buildings built to the Passive House standard should in all cases meet or come very close to the energy demand predictions from design stage modelling. That is not the case for most buildings, as it has been documented that the energy consumption of residential buildings can be up to 40% more than design-stage predictions, with heating demand sometimes up to three times greater.

Certification to Passive House Standard is administered by Passive House Canada and can be pursued through two streams. In “design review and certification” an initial design review of the project including all drawings, specifications, calculations and other documentation is conducted. A short report is then issued, highlighting any issues that may put certification at risk, enabling the project team to address the issues before specifications are fixed for building permit application. After the building is fully constructed and commissioned, a post-construction review is conducted. If the project meets the all requirements, a certificate is issued. If the project does not meet all the requirements, a short report describing the shortcomings will be issued. If the shortcomings are resolved, the project can be resubmitted for a second assessment. In the second stream, “streamlined certification”, only a post-construction review is conducted. Passive House Canada recommends the first approach, especially for practitioners working on a Passive House project for the first time, as a design stage review helps mitigate risk by identifying issues early. Certifying a typical single-family home costs between \$3000 and \$5000, depending on size and complexity. Design stage review typically takes one to three months with the post-construction taking a minimum of two weeks.

Incremental Cost of Building to the Passive House Standard

Building to the Passive House Standard in the Lower Mainland of BC does not necessarily entail significantly higher costs. While there are additional costs associated with the need for high-quality components, increased insulation and additional detailing, savings can be recouped from smaller and simpler heating systems. Figure 4 summarizes several costing studies comparing the construction cost of single-family homes in BC. In the Lower Mainland, the incremental cost of

building to the Passive Houses Standard is less than 10%. Note that the incremental cost of Passive House construction is likely to decrease as the industry knowledge increases, the supply chain for high-performance components improves, and regulatory barriers are removed. The incremental cost of building to the Passive House Standard, rather than the minimum Building Code requirements, will further decrease as higher levels of the Energy Step Code are gradually rolled out by 2032. Incremental costs and risk of cost over-runs to the developer typically decrease after the first project. Economic life cycle analyses have shown that depending on location, residential Passive Houses can yield a positive net present value to builders (e.g. increased sales) and buyers (e.g. energy and maintenance cost savings).

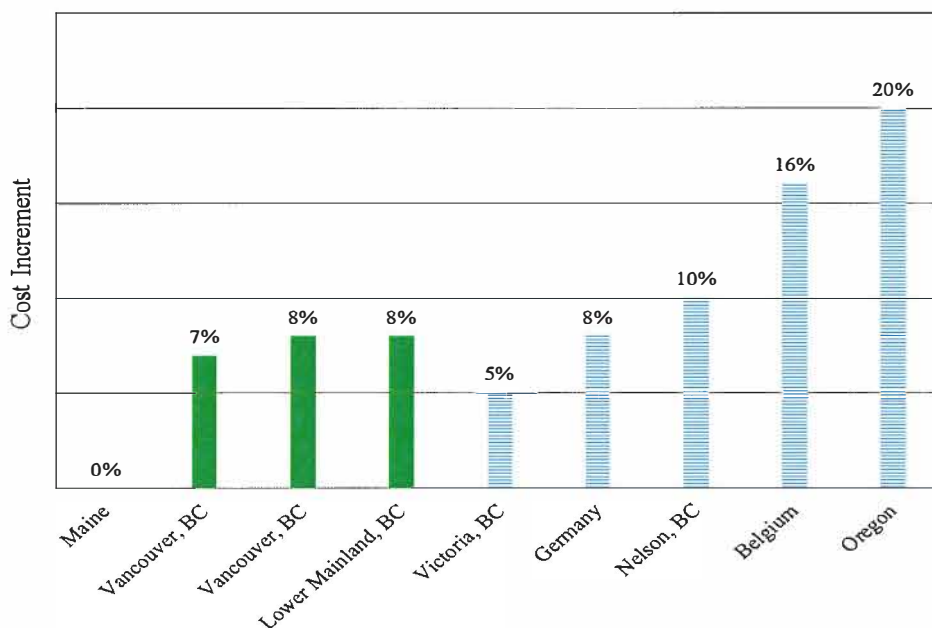


Figure 4 – Incremental cost of building to the Passive House Standard ²

² Data from: Frappé-Sénéclauze, Tom-Pierre et. al. Accelerating Market Transformation for High-Performance Building Enclosures: State of market, policy developments, and lessons learned from the Passive House movement. The Pembina Institute (2016).

Municipal Scan of Passive House Incentives (Spring 2020)

Municipality	Green Building/ Energy Reduction Initiatives including Incentives for Passive House Certification	Incentives for Passive House Certification of Single Family Homes	Permit Expediting for Passive House Certification	Fee Reductions for Passive House Certification	Non-compliance Penalties
Richmond Current	<ul style="list-style-type: none"> Passive House Certification accepted as a part of meeting Energy Step Code requirements 	<ul style="list-style-type: none"> Floor area exemptions for increased insulation 			
Richmond Proposed	<ul style="list-style-type: none"> Stepped incentives for projects exceeding minimum Code compliance through energy efficiency measures including Passive House Certification 	<ul style="list-style-type: none"> Current incentives plus floor area exemptions for heat recovery ventilator and related equipment floor area increases up to 10% for the first 5,000 ft² to achieve Passive House Certification 	<ul style="list-style-type: none"> Expedite permit review 	<ul style="list-style-type: none"> 50% – 100% fee reduction to offset costs of energy efficient measures and certification 	<ul style="list-style-type: none"> forfeit of fee reductions and remove area exemptions.
New Westminster	<ul style="list-style-type: none"> Climate Action Revenue Incentive Program High Performance Building Envelope Training (by Passive House Canada) is available to industry and staff Zoning Bylaw Includes relaxations for upper levels of BC Energy Step Code / Passive House certification 	<ul style="list-style-type: none"> Floor area exemptions for increased insulation (Steps 3 to 5, and Passive House) Increased building height for deeper insulation (up to 1.2m for Step 5 / Passive House) Passive Houses are given allowances on floor space ratios, building height, and detached accessory area 			
Vancouver	<ul style="list-style-type: none"> Passive House Relaxation – Guidelines for Larger Projects Applicants must demonstrate how their development meets Passive House standards in order to seek relaxations Relaxations may apply to floor area and height Renewable City Strategy Reducing building energy demand via Passive House Zero Emissions Building Plan Proposes for rezoning policies for green buildings to require Passive House performance Zero Emissions Building Exchange (ZebX) Created with the help of the City Collaborative platform that strengthens the public, private and civic capacities for zero emission buildings Provides case studies and materials on Passive House 	<ul style="list-style-type: none"> Floor area exemptions for increased insulation and heat recovery ventilator Increased building height for deeper insulation Passive Houses are given allowances on floor space ratios, building height, and rear yard setbacks 16% floor area increase for single family dwellings and 18% for duplexes achieving certification Director of Planning may grant additional variances to accommodate building features designed to reduce energy consumption in a Passive House Variation may be granted with height, floor area, yards, building depth, and computation of floor space ratio 	<ul style="list-style-type: none"> Expedite permit review* Plan acknowledges challenge of expediting 	<ul style="list-style-type: none"> Reducing or waiving City charges such as permit fees, development cost levies, or even property taxes 	<ul style="list-style-type: none"> forfeit incentives including additional area

Municipal Scan of Passive House Incentives (Spring 2020) continued

Municipality	Green Building/ Energy Reduction Initiatives including Incentives for Passive House Certification	Incentives for Passive House Certification of Single Family Homes	Permit Expediting for Passive House Certification	Fee Reductions for Passive House Certification	Non-compliance Penalties
City of North Vancouver		<ul style="list-style-type: none"> Floor area exemptions Increased building height 			
Delta	<p>Community Energy and Emissions Plan</p> <ul style="list-style-type: none"> List of medium term actions include promoting energy efficient and Passive House design Considering the adaptation of passive design or other high efficiency guidelines <p>Energy and Emissions Inventory</p> <ul style="list-style-type: none"> Summarizes all of the energy used and emissions produces within Delta Accepts Passive House certification <p>Community Energy & Emissions Plan</p> <ul style="list-style-type: none"> Seeks to build efficient new buildings and promote energy retrofits in existing ones Development permit areas having the potential to advance passive design strategies including: landscaping, insulation, window design, and shading 	<ul style="list-style-type: none"> Incentives for home energy audits and retrofits are being investigated 			
PH Surrey		<p>Climate Change Leadership Plan</p> <ul style="list-style-type: none"> Targets all buildings to be highly efficient, defining and listing Passive House as an example <p>Greater Victoria Regional Green Economy Initiative</p> <ul style="list-style-type: none"> Highlights passive housing as a possible “green economy sector” 			
Victoria		<p>Green Building (not limited to Passive House)</p> <ul style="list-style-type: none"> Rebates are available for green buildings and developments that reduce energy use Green loan program. Payments to buyer will be equal to energy savings 			Attachment 2

Additional Information Regarding Proposed High Performance Incentives

(1) Floor Area Exemptions to address Technical Aspects

These exemptions are designed to offset the loss of habitable space when permitted floor area has to be used for thicker exterior walls in order to achieve the level of required insulation, and for enhanced, heat recovery ventilation systems. This will address the concern that building to high performance standards comes with having less useable space.

It is anticipated that at Step Code Levels 4 and 5, the thickness of exterior walls may be up to 12 inches. Staff conducted research to determine the area of perimeter walls as a percentage of total floor area in houses that are typically constructed to maximum permitted area. The results show that a 6 inch thick, minimum Building Code wall assembly consistently utilizes area equivalent to slightly less than 5% of total floor area. Therefore, a proposed 5% exemption would offset the additional 6 inches of added insulation required for a high performance wall assembly.

Although provisions in the current Zoning Bylaw similarly exempt from floor area calculation, additional wall insulation up to 6 inches, in practice, they may be used only for front and rear facing walls since building code considerations will not permit thicker walls encroaching into a 1.2 m side yard setback. Formalizing the additional floor area equivalent to the required additional exterior wall thickness for the entire perimeter of the house encourages a design approach that takes advantage of additional allowable space to uniformly add the required insulation to all exterior walls.

As higher levels of energy efficiency are sought, the requirement to minimize air leakage also increases. This makes the provision of fresh air tempered with the heat from exhausted air critical not only for managing heat loss, but also essential for health and comfort. The existing “green building energy systems” exemption for interior space dedicated for mechanical equipment capped at 2.35 m², (Richmond Zoning Bylaw No. 8500, Amendment Bylaw No. 9845), will continue for houses constructed to Step Code Level 4 and will be increased to 5 m² for those achieving Step Code Level 5 and certified Passive House standards, since the requirement for technical space increases with higher performance level. These are spaces for facilitating more robust heat or energy recovery ventilation systems, associated energy systems, ducting, and easier servicing of mechanical systems to ensure proper operation.

With Council’s endorsement, these allowances would be introduced through an Amendment to Richmond Zoning Bylaw No. 8500 for Council consideration.

(2) Facilitated Permitting and Inspection

Reduced permitting fees and facilitated technical review for high performance measures as well as specialized building inspection processes offer additional incentive for builders to consider achieving the top levels of the Energy Step Code or Passive House standard. Staff propose a program of expert consultative facilitation during pre-application meetings and integrating technical requirements for high performance construction with the City’s Zoning Bylaw and BC Building Code compliance, as outlined in Attachment 3. Facilitated permitting and inspections reduce complications and potential conflicts between requirements of high performance design

and typical building and zoning codes, providing applicants with greater confidence that approvals will be granted in a time frame equivalent to normal construction. Staff will also introduce an integrated inspection procedure to align with the special inspection process provided by the Passive House regime. Given the cost of independent third-party review and certification of Passive Houses, reduced permit fees will also act as an incentive to developers and builders. Furthermore, by implementing the post-construction review phase of the Passive House Certification process into the City's building inspection process, we anticipate reduced inspection and certification times, creating extra incentives for builders and homebuyers.

With Council's endorsement, these enhanced process incentives would be introduced through an Amendment to Building Regulation Bylaw No. 7230. The fee waiver incentives would be introduced through an Amendment to Consolidated Fees Bylaw No. 8636.

(3) Outreach, Engagement and Education

Since 2017, the City of Richmond has conducted significant engagement and capacity building with the residential builder community on implementation of the Energy Step Code, enhanced air barrier techniques, as well as high performance mechanical systems. Through these interactions, staff have identified keen interest from our local design and construction community in applying innovative approaches and introducing excellence into their practice. Through ongoing engagement with industry and facilitating participation in training opportunities, including those provided by Passive House Canada, the City plays an important leadership role in advancing the cause of high-performance buildings in Richmond and the Province.

Staff believe a complementary strategy should involve making homebuyers aware of the benefits of living in a high-performance home. This can be facilitated through events such as virtual or in-person tours of Passive Houses in the region, as well as part of building science seminars conducted by city staff with experts in energy efficient construction that have been engaging the building community, other levels of government, and soon the public.

As a part of the outreach component, staff will incorporate incentives under the Province's CleanBC Better Homes New Construction Program (Energy Step Code Pathway) that provides up to \$15,000 for the construction of new, high-performance, electric homes (see Attachment 5). Part 9 residential buildings achieving the top levels of the BC Energy Step Code, or the Passive House standard, can qualify for the CleanBC incentives.

(4) Density Bonus for Passive House Construction

Staff reviewed additional floor area as a financial means to offset the cost of designing and constructing to the Certified Passive House standard. After consulting with leading industry experts and other municipal governments, it has been identified that the additional cost of building to this highest performance standard represents financial uncertainty that discourages broad industry acceptance.

Staff conducted analysis that considers the potential increase in a house's sale price from additional floor area while factoring in cost of construction and additional cost for high performance elements in order to determine a reasonable floor area increase providing a

balanced financial incentive. The objective is to establish a meaningful incentive that could be realized within existing required setbacks, built form and height limits set in the Zoning Bylaw. Our analysis shows that the perimeter walls, if built at fully 305 mm (12 inches) thick throughout, consistently represent approximately 9.5% of the floor area of a house built to maximum floor area ratio irrespective of the lot size. This becomes the basis considering a density increase as an incentive linked to a primary requirement of high performance design. A proposed 10% floor area increase is equivalent to exempting the entire area contributed (to the total permitted) by a 12 inch thick perimeter wall.

Staff also determined that increased costs attributed to high performance construction adds approximately 10% to the overall cost. After performing the calculation taking into account the selling price of a 10% larger house and a 10% higher construction cost, the difference represents the financial incentive. For example, a house normally built to a maximum 2,200 ft² (204.4 m²) that is increased 10% will yield 2,420 ft² (224.1 m²), and increased revenue of \$14,000 as based on a \$650/ ft² rate (from real estate research that includes the additional garage area) and base construction cost of \$250/ ft².

Proposed Application Procedure for High-Performance Building Incentive Program

In order to receive the proposed high-performance incentives, the following steps must be taken prior to the submission of the building permit application:

- **Energy Step Code 4 or 5:** the applicant must submit a request letter to the Director of Building Approvals, along with the Pre-Construction Energy Step Code Compliance Report and supporting documents as per the City of Richmond bulletin (Building-38). The request letter must detail the requested floor area exemptions, and provide a rationale for each item. Upon verification of compliance of the Proposed House with Step 4 or 5, the Manager of Plan Review will provide an *Incentive Authorization Letter* outlining the granted incentives. A copy of this letter must be included in the full building permit application package.
- **Certified Passive House:** A request letter must be submitted to the Director of Building Approvals, along with a letter from a Certified Passive House Designer attesting to the Passive House performance of the proposed design, and a letter from a Passive House Certifier, assuring that if built as designed, the proposed house will achieve Passive House Certification. The request letter must detail all the requested floor area exemptions, and the rationale for each item. Upon review of the request letter and supporting documents, a meeting will be arranged by the Manager of Plan Review to discuss the exemption request with the applicant. Other staff from Building Approvals and other departments may be present at the meeting, at the discretion of the Manager of Plan Review. After the meeting, and pending any justification or clarification requested during the meeting, the Manager of Plan Review will provide an *Incentive Authorization Letter* outlining the granted incentives. A copy of this letter must be included in the full building permit application package.

Projects that receive any of the high-performance incentives, must meet the following criteria before Final Building Inspection is scheduled:

- 1) As-built Energy Step Code Compliance Report confirming compliance with Step 4 or Step 5, as applicable, and supporting documents as per the City of Richmond bulletin Building-38; *or*
- 2) Confirmation of Passive House Certification.

Penalty for Non-Compliance with Conditions of the Incentive Authorization Letter

If the conditions outlined in the *Incentive Authorization Letter* are not met by the time of Final Building Inspection, the applicant will have to pay the waived permit fee, plus 50% processing fee, in order to schedule Final Inspection.

CleanBC Incentives for Low-Carbon Part 9 Residential: Step 4, Step 5 and Passive House

The CleanBC *Better Homes New Construction Program* provides rebates of up to \$15,000 for the construction of new, high-performance, electric homes. Through the CleanBC Plan, the Province is supporting adoption of the BC Energy Step Code, including Part 9 residential buildings built to the Passive House standard. The following table shows incentives available from December 2020 to Q1 2022 from CleanBC, and specifically through the **Energy Step Code rebate pathway** in the following table:

CleanBC Better Homes – Energy Step Code Pathway

Part 9 residential buildings built to BC Energy Step Code 3 or higher using electric space and water heating systems qualify. [Incentives for qualifying homes at Step 4 and 5 are highlighted in blue]

Energy Step Code Level	Rebate	Energy Advisor Support Rebate	All-Electric Bonus (optional)
Step 3	\$4,000		
Step 4	\$6,000	\$1,000 per modelled home or unit (\$800 to homebuilder; \$200 to Energy Advisor)	\$4,000 per home or unit (electric space heat and hot water)
Step 5 ⁽¹⁾	\$10,000		

(1) NOTE: Passive House certified homes receive an equivalent rebate to Step Code 5 homes.

Floor Area Exemption Table

Lot Size			Current Max Bldg. Size		45% Lot Coverage		7% Floor Area Increase			10% Floor Area Increase			12% Floor Area Increase		
sq. m	sq. ft.	Acre	sq. m	sq. ft.	sq. m	sq. ft.	sq. m	sq. ft.	delta sq.ft.	sq. m	sq. ft.	delta sq.ft.	sq. m	sq. ft.	delta sq.ft.
270	2,906.28	0.07	148.50	1,598.45	121.50	1,307.83	158.9	1710.3	111.9	163.4	1758.3	159.8	166.3	1790.3	198.7
275	2,960.10	0.07	151.25	1,628.06	123.75	1,332.05	161.8	1742.0	114.0	166.4	1790.9	162.8	169.4	1823.4	195.4
300	3,229.20	0.07	165.00	1,776.06	135.00	1,453.14	176.6	1900.4	124.3	181.5	1953.7	177.6	184.8	1989.2	213.3
325	3,498.30	0.08	178.75	1,924.07	146.25	1,574.24	191.3	2058.7	134.7	196.6	2116.5	192.4	200.2	2155.0	230.9
350	3,767.40	0.09	192.50	2,072.07	157.50	1,695.33	206.0	2217.1	145.0	211.8	2279.3	207.2	215.6	2320.7	248.1
375	4,036.50	0.09	206.25	2,220.08	168.75	1,816.43	220.7	2375.5	155.4	226.9	2442.1	222.0	231.0	2486.5	265.4
400	4,305.60	0.10	220.00	2,368.08	180.00	1,937.52	235.4	2533.8	165.8	242.0	2604.9	236.8	246.4	2652.2	282.3
425	4,574.70	0.11	233.75	2,516.09	191.25	2,058.62	250.1	2692.2	176.1	257.1	2767.7	251.6	261.8	2818.0	299.5
450	4,843.80	0.11	247.50	2,664.09	202.50	2,179.71	264.8	2850.6	186.5	272.3	2930.5	266.4	277.2	2983.8	316.3
475	5,112.90	0.12	258.65	2,784.11	213.75	2,300.81	276.8	2979.0	194.9	284.5	3062.5	278.4	289.7	3118.2	333.1
500	5,382.00	0.12	266.15	2,864.84	225.00	2,421.90	284.8	3065.4	200.5	292.8	3151.3	286.5	298.1	3208.6	350.0
525	5,651.10	0.13	273.65	2,945.57	236.25	2,543.00	292.8	3151.8	206.2	301.0	3240.1	294.6	306.5	3299.0	366.8
550	5,920.20	0.14	281.15	3,026.30	247.50	2,664.09	300.8	3238.1	211.8	309.3	3328.9	302.6	314.9	3389.5	383.7
575	6,189.30	0.14	288.65	3,107.03	258.75	2,785.19	308.9	3324.5	217.5	317.5	3417.7	310.7	323.3	3479.9	400.6
600	6,458.40	0.15	296.15	3,187.76	270.00	2,906.28	316.9	3410.9	223.1	325.8	3506.5	318.8	331.7	3570.3	417.5
625	6,727.50	0.15	303.65	3,268.49	281.25	3,027.38	324.9	3497.3	228.8	334.0	3595.3	326.8	340.1	3660.7	434.4
650	6,996.60	0.16	311.15	3,349.22	292.50	3,148.47	332.9	3583.7	234.4	342.3	3684.1	334.9	348.5	3751.1	451.3
675	7,265.70	0.17	318.65	3,429.95	303.75	3,269.57	341.0	3670.0	240.1	350.5	3772.9	343.0	356.9	3841.5	468.2
700	7,534.80	0.17	326.15	3,510.68	315.00	3,390.66	349.0	3756.4	245.7	358.8	3861.7	351.1	365.3	3932.0	485.1
725	7,803.90	0.18	333.65	3,591.41	326.25	3,511.76	357.0	3842.8	251.4	367.0	3950.5	359.1	373.7	4022.4	502.0
750	8,073.00	0.19	341.15	3,672.14	337.50	3,632.85	365.0	3929.2	257.0	375.3	4039.4	367.2	382.1	4112.8	518.9
775	8,342.10	0.19	348.65	3,752.87	348.75	3,753.95	373.1	4015.6	262.7	383.5	4128.2	375.3	390.5	4203.2	535.8
800	8,611.20	0.20	356.15	3,833.60	360.00	3,875.04	381.1	4102.0	268.4	391.8	4217.0	383.4	398.9	4293.6	552.7
825	8,880.30	0.20	363.65	3,914.33	371.25	3,996.14	389.1	4188.3	274.0	400.0	4305.8	391.4	407.3	4384.0	569.6
850	9,149.40	0.21	371.15	3,995.06	382.50	4,117.23	397.1	4274.7	279.7	408.3	4394.6	399.5	415.7	4474.5	586.5
875	9,418.50	0.22	378.65	4,075.79	393.75	4,238.33	405.2	4361.1	285.3	416.5	4483.4	407.6	424.1	4564.9	603.4
900	9,687.60	0.22	386.15	4,156.52	405.00	4,359.42	413.2	4447.5	291.0	424.8	4572.2	415.7	432.5	4655.3	620.3
925	9,956.70	0.23	393.65	4,237.25	416.25	4,480.52	421.2	4533.9	296.6	433.0	4661.0	423.7	440.9	4745.7	637.2
950	10,225.80	0.23	401.15	4,317.98	427.50	4,601.61	429.2	4620.2	302.3	441.3	4749.8	431.8	449.3	4836.1	654.1
975	10,494.90	0.24	408.65	4,398.71	438.75	4,722.71	437.3	4706.6	307.9	449.5	4838.6	439.9	457.7	4926.6	671.0
1000	10,764.00	0.25	416.15	4,479.44	450.00	4,843.80	445.3	4793.0	313.6	457.8	4927.4	447.9	466.1	5017.0	687.9
1025	11,033.10	0.25	423.65	4,560.17	461.25	4,964.90	453.3	4879.4	319.2	466.0	5016.2	456.0	474.5	5107.4	704.8
1050	11,302.20	0.26	431.15	4,640.90	472.50	5,085.99	461.3	4965.8	324.9	474.3	5105.0	464.1	482.9	5197.8	721.7
1075	11,571.30	0.27	438.65	4,721.63	483.75	5,207.09	469.4	5052.1	330.5	482.5	5193.8	472.2	491.3	5288.2	738.6
1100	11,840.40	0.27	446.15	4,802.36	495.00	5,328.18	477.4	5138.5	336.2	490.8	5282.6	480.2	499.7	5378.6	755.5
1125	12,109.50	0.28	453.65	4,883.09	506.25	5,449.28	485.4	5224.9	341.8	499.0	5371.4	488.3	508.1	5469.1	772.4
1150	12,378.60	0.28	461.15	4,963.82	517.50	5,570.37	493.4	5311.3	347.5	507.3	5460.2	488.3	516.5	5559.5	789.3
1175	12,647.70	0.29	468.65	5,044.55	528.75	5,691.47	501.5	5397.7	353.1	511.0	5500.0	488.3	524.9	5649.9	806.2
1200	12,916.80	0.30	476.15	5,125.28	540.00	5,812.56	509.0	5478.4	353.1	521.5	5613.6	488.3	533.3	5740.3	823.1
1225	13,185.90	0.30	483.65	5,206.01	551.25	5,933.66	516.5	5559.1	353.1	529.0	5694.3	488.3	541.7	5830.7	840.0
1250	13,455.00	0.31	491.15	5,286.74	562.50	6,054.75	524.0	5639.8	353.1	536.5	5775.0	488.3	550.1	5921.1	856.9
1275	13,724.10	0.32	498.65	5,367.47	573.75	6,175.85	531.5	5720.6	353.1	544.0	5855.8	488.3	558.5	6011.6	873.8
1300	13,993.20	0.32	506.15	5,448.20	585.00	6,296.94	539.0	5801.3	353.1	551.5	5936.5	488.3	566.9	6102.0	890.7
1325	14,262.30	0.33	513.65	5,528.93	596.25	6,418.04	546.5	5882.0	353.1	559.0	6017.2	488.3	575.3	6192.4	907.6
1350	14,531.40	0.33	521.15	5,609.66	607.50	6,539.13	554.0	5962.8	353.1	566.5	6098.0	488.3	583.7	6282.8	924.5
1375	14,800.50	0.34	528.65	5,690.39	618.75	6,660.23	561.5	6043.5	353.1	574.0	6178.7	488.3	592.1	6373.2	941.4
1400	15,069.60	0.35	536.15	5,771.12	630.00	6,781.32	569.0	6124.2	353.1	581.5	6259.4	488.3	600.5	6463.7	958.3
1425	15,338.70	0.35	543.65	5,851.85	641.25	6,902.42	576.5	6204.9	353.1	589.0	6340.2	488.3	608.9	6554.1	975.2
1450	15,607.80	0.36	551.15	5,932.58	652.50	7,023.51	584.0	6285.7	353.1	596.5	6420.9	488.3	617.3	6644.5	992.1
1475	15,876.90	0.36	558.65	6,013.31	663.75	7,144.61	591.5	6366.4	353.1	604.0	6501.6	488.3	625.7	6734.9	1009.0
1500	16,146.00	0.37	566.15	6,094.04	675.00	7,265.70	599.0	6447.1	353.1	611.5	6582.3	488.3	634.1	6825.3	1025.9
1525	16,415.10	0.38	573.65	6,174.77	686.25	7,386.80	606.5	6527.9	353.1	619.0	6663.1	488.3	642.5	6915.7	1042.8
1550	16,684.20	0.38	581.15	6,255.50	697.50	7,507.89	614.0	6608.6	353.1	626.5	6743.8	488.3	650.9	7006.2	1059.7
1575	16,953.30	0.39	588.65	6,336.23	708.75	7,628.99	621.5	6689.3	353.1	634.0	6824.5	488.3	659.3	7096.6	1076.6
1600	17,222.40	0.40	596.15	6,416.96	720.00	7,750.08	629.0	6770.1	353.1	641.5	6905.3	488.3	667.7	7187.0	1093.5
1625	17,491.50	0.40	603.65	6,497.69	731.25	7,871.18	636.5	6850.8	353.1	649.0	6986.0	488.3	676.1	7277.4	1110.4
1650	17,760.60	0.41	611.15	6,578.42	742.50	7,992.27	644.0	6931.5	353.1	656.5	7066.7	488.3	684.5	7367.8	1127.3
1675	18,029.70	0.41	618.65	6,659.15	753.75	8,113.37	651.5	7012.2	353.1	664.0	7147.5	488.3	692.9	7458.2	1144.2
1700	18,298.80	0.42	626.15	6,739.88	765.00	8,234.46	659.0	7093.0	353.1	671.5	7228.2	488.3	701.3	7548.7	1161.1
1725	18,567.90	0.43	633.65	6,820.61	776.25	8,355.56	666.5	7173.7	353.1	679.0	7308.9	488.3	709.7	7639.1	1178.0
1750	18,837.00	0.43	641.15	6,901.34	787.50	8,476.65	674.0	7254.4	353.1	686.5	7389.6	488.3	718.1	7729.5	1194.9
1775	19,106.10	0.44	648.65	6,982.07	798.75	8,597.75	681.5	7335.2	353.1	694.0	7470.4	488.3	726.5	7819.9	1211.8
1800	19,375.20	0.44	656.15	7,062.80	810.00	8,718.84	689.0	7415.9	353.1	701.5	7551.1	488.3	734.9	7910.3	1228.7
1825	19,644.30	0.45	663.65	7,143.53	821.25	8,839.94	696.5	7496.6	353.1	709.0	7631.8	488.3	743.3	8000.8	1245.6
1850	19,913.40	0.46	671.15	7,224.26	832.50	8,961.03	704.0	7577.4	353.1	716.5	7712.6	488.3	751.7	8091.2	1262.5
1875	20,182.50	0.46	678.65	7,304.99	843.75	9,082.13	711.5	7658.1	353.1	724.0	7793.3	488.3	760.1	8181.6	1279.4
1900	20,451.60	0.47	686.15	7,385.72	855.00	9,203.22	719.0	7738.8	353.1	731.5	7874.0	488.3	768.5	8272.0	1296.3
1925	20,720.70	0.48	693.65	7,466.45	866.25	9,324.32	726.5	7819.5	353.1	739.0					

Examples of Modest Floor Area Increases on Typical Single Family Lots

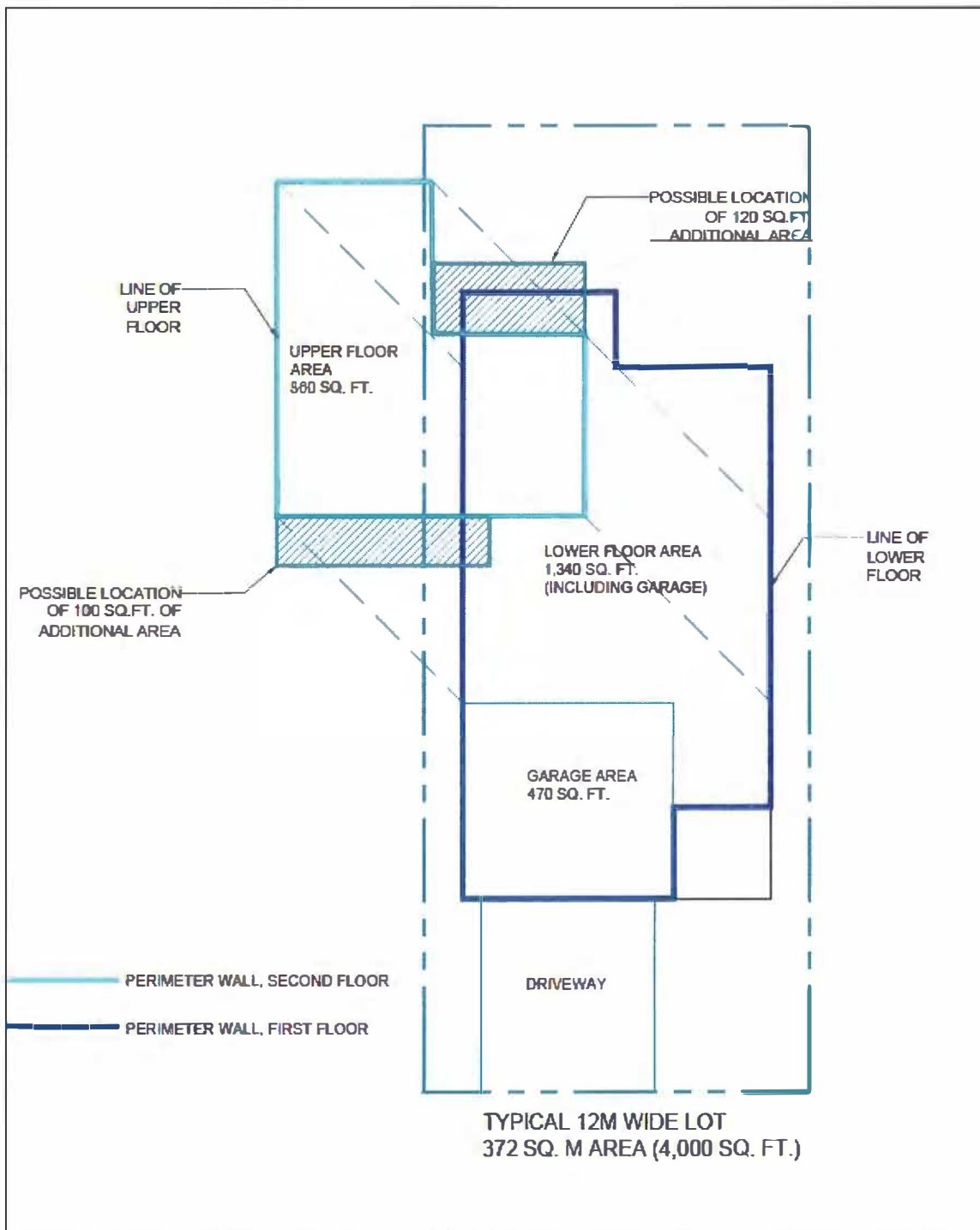


DIAGRAM SHOWING POSSIBLE LOCATIONS OF 10% INCREASED FLOOR AREA FOR PASSIVE HOUSE CONSTRUCTION ON SECOND FLOOR

**Richmond Zoning Bylaw No. 8500,
Amendment Bylaw No. 10237
(Floor Area Exclusions for High-Performance Single Family and
Duplex Housing)**

The Council of the City of Richmond, in open meeting assembled, enacts as follows:

1. Richmond Zoning Bylaw 8500, as amended, is further amended at Section 3.4 [Use and Terms Definitions] by adding the following definitions in alphabetical order:

“Certified Passive House means a **building** that has completed initial design review (prior to Building Permit submittal), where all drawings, specifications and calculations are reviewed by a Certified Passive House Designer or Certified Passive House Consultant registered with Passive House Canada, to verify that the proposed design should achieve the Passive House Standard. At completion, a Passive House Certifier, registered with Passive House Canada, must be engaged to review post-construction documentation and verify the project meets all certification requirements, whereby a certificate is issued.”

“Passive House has the meaning given to that term in the **Passive House Standard.**”

“Passive House Standard has the meaning given to it by the *International Passive House Institute* and *Passive House Canada*, which set the following energy performance requirements for a new **building**:

- (a) Maximum annual space heating demand of 15 kWh per m² of conditioned floor area per year, or 10 Watts per m² of peak heating demand;
- (b) Building air leakage of no more than 0.6 air changes per hour at 50 Pascals of pressure difference (ACH50), as verified by an onsite blower-door test (in both pressurized and depressurized states); and,
- (c) Maximum Primary Energy (PE) demand of 120 kWh per m² annually.”

2. Richmond Zoning Bylaw 8500, as amended, is further amended at Section 4.3 [Calculation of Density in Single Detached Housing, Agriculture and Two-Unit Housing Zones] by deleting subsection 4.3.3b) and replacing it with the following:

“b) either:

- i) up to a maximum of 2.35 m² per dwelling unit for floor area occupied by those components of a green building system constructed or installed within the principal building; or
- ii) 5% of the maximum permitted floor area ratio for additional wall insulation for a **building** designed and built in accordance with Step 4 of the **BC**

Energy Step Code, and additional floor area up to 2.35 m² for mechanical equipment; or

- iii) 5% of the maximum permitted floor area ratio for additional wall insulation for a **building** designed and built in accordance with Step 5 of the **BC Energy Step Code**, and additional floor area up to 5.0 m² for mechanical equipment; or
- iv) 10% of the maximum permitted floor area ratio, up to a maximum of 46m², for a **Certified Passive House** and additional floor area up to 5.0 m² for mechanical equipment related to the **Certified Passive House**.”

3. This Bylaw is cited as “**Richmond Zoning Bylaw No. 8500, Amendment Bylaw No. 10237**”.

FIRST READING

PUBLIC HEARING

SECOND READING

THIRD READING

ADOPTED

CITY OF RICHMOND
APPROVED by JC
APPROVED by Manager or Solicitor
BRB

MAYOR

CORPORATE OFFICER



**Building Regulation Bylaw No. 7230,
Amendment Bylaw No. 10238
(Permit Fee Incentives for High-Performance Single Family and
Duplex Housing)**

The Council of the City of Richmond enacts as follows:

1. Building Regulation Bylaw No. 7230, as amended, is further amended at section 5.5 by adding the following after subsection 5.5.4:

“5.5.5 Where the **building inspector** is satisfied that a **building permit** application is for a **Certified Passive House**, the **building permit** fee payable by the **owner** pursuant section 5.5.1(a) above is waived.”

2. Building Regulation Bylaw No. 7230, as amended, is further amended at section 5.6 by:

- (a) deleting the words “5.6.2 and 5.6.3” in subsection 5.6.1, and replacing them with the words “5.6.2, 5.6.3, 5.6.5 and 5.6.6”;
- (b) deleting the word “only” in subsection 5.6.2;
- (c) adding the words “in accordance with subsection 5.6.2” after the words “partially refunded” in subsection 5.6.4;
- (d) adding the following after subsection 5.6.4:

“5.6.5 A **building permit** fee may be refunded, in whole or in part, when:

- (a) the **owner** has submitted a written request for such refund;
- (b) the **building permit** is for a **single family** home or **duplex**;
- (c) either:
 - (i) the building inspector is satisfied that the completed (as-built) **building** achieves Step 4 of the **Energy Step Code**, and such **building permit** application was submitted prior to January 1, 2022; or
 - (ii) the building inspector is satisfied that the completed (as-built) **building** achieves Step 5 of the **Energy Step Code**, and such **building permit** application was submitted prior to January 1, 2025; and

5.6.6 Where a refund of a **building permit** fee is approved in accordance with subsection 5.6.5, such refund is to be calculated at:

- (a) 50% of the nearest dollar the amount of the **building permit** fee, less the non-refundable plan processing fee, in the case of a refund in accordance with subsection 5.6.5(c)(i); or
- (b) 100% of the nearest dollar the amount of the **building permit** fee, less the non-refundable plan processing fee, in the case of a refund in accordance with subsection 5.6.5(c)(ii)."

3. Building Regulation Bylaw No. 7230, as amended, is further amended at section 16.1 by adding the following definition in alphabetical order:

“CERTIFIED PASSIVE HOUSE has the meaning given to that term in the **Zoning bylaw.**”

4. This Bylaw is cited as **Building Regulation Bylaw No. 7230, Amendment Bylaw No. 10238**”.

FIRST READING

SECOND READING

THIRD READING

ADOPTED

MAYOR

CORPORATE OFFICER

CITY OF RICHMOND
APPROVED for content by originating Division
JC
APPROVED for legality by Solicitor
BRB