

# Guide to the Vancouver Building By-law 2022 Update

Understanding Energy Compliance Paths for Homes

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Updated March 2022





# Contents

Introduction..... 2

A. Update to Part 10 of VBBL ..... 3

B. Navigating Compliance for Homes in VBBL 2022 Update ..... 4

C. Compliance Path #1: Prescriptive ..... 5

D. Compliance Path #2: Performance ..... 6

E. Compliance Path #3: Passive House ..... 7

Appendix: VBBL 2019 to 2022 Update Summary..... 9

Endnotes .....11

## Introduction

The City of Vancouver has introduced changes to the Vancouver Building By-law (VBBL) that includes updates to the energy compliance requirements<sup>1</sup> for new construction of single-family and multi-family residential buildings 3-storeys and under<sup>2</sup>. These changes will go into effect on **January 1, 2022** and will apply to all new permits after that date.

This guide has been assembled to assist you in identifying the specific code changes from this update and how to navigate the new energy compliance options for new 1-3 storey residential buildings within the City of Vancouver. For the official wording of the 2022 VBBL Update and further background on its development, refer to Report 13606 – *Climate Emergency Requirements for New Housing 3-Storeys and Under* dated March 10, 2020<sup>3</sup>.

The update introduces:

- incrementally greater performance requirements for various building components
- stricter limits on the use of gas-fired equipment, and additional paths for demonstrating energy compliance
- to provide more flexibility in meeting specific targets.

These changes will have an impact on what types of building systems are specified, and how a low-rise residential building is designed and documented. As a builder, developer or individual involved in a new 1-3 storey residential building, you need to be aware of these change and how to apply them to any project’s permit application submitted after January 1, 2022.

# A. Update to Part 10 of VBBL

The following items are a summary of the 2022 updates for energy compliance in VBBL and their potential implications on new construction projects.

This is not intended to be an exhaustive list. For a complete list, please see the Appendix on page 9.

## New Energy Compliance Paths

The 2022 VBBL update introduces three paths for meeting energy compliance:

2022 VBBL Update Energy Compliance Paths	
Prescriptive Path	Ensure each building component meets or exceeds than the code prescribed targets
Performance Path	Conduct energy modelling of the design to ensure both the energy demand and energy use is lower than the code targets
Passive House Path	Achieve third party Passive House Certification <sup>5</sup>

The addition of these paths is intended to provide more flexibility for building designs to meet energy compliance targets. To understand each Compliance Path and what may be the most appropriate for your project, see the dedicated sections later in this guide.



## Electrification and Gas-Fired Equipment

If following the Prescriptive Path, all mechanical systems used for space heating and hot water are required to be electrically operated<sup>6</sup> (i.e. electric hot water heaters, boilers, and heat pumps). Natural gas systems are allowed only if following the Performance or Passive House paths, but must be efficient (90%+ thermal efficiency for hot water heaters, 92%+ AFUE for furnaces/makeup air units/boilers).

Note, while gas systems are allowed in the Performance Path, there are still GHGI targets that must be met that could limit the total use of gas-fired equipment.



## Solar Ready Pipe-Runs

Requirements to pre-install pipe chases to accommodate future solar hot water or photovoltaic systems, as per 10.2.2.18-19, have been removed for all pathways.

## Building Definitions

Requirements for Residential Buildings of 1-3 storeys and Residential Buildings With Not More Than Two Principle Dwelling Units have been consolidated. Most building requirements are consistent for all residential building types or may be based on a m<sup>2</sup> of floor space area. References to laneway homes, subsidiary homes, or other specific residential types have been removed.

## Prescriptive Performance Updates

Prescriptive performance values and mandatory requirements for numerous building components have been updated to achieve greater levels of efficiency. This includes items such as windows, roof assemblies, hot water systems, fireplaces and more.

Many of these increases only apply if using the Prescriptive Path. Many values (but not all) remain the same from the 2019 VBBL if using the Performance Path.

For specific value changes, please see the Appendix on page 9.

# B. Navigating Compliance for Homes in VBBL 2022 Update

Each Compliance Path for the 2022 VBBL Update – Prescriptive, Performance and Passive House, have their own special requirements and considerations, which are outlined in the following section. The information presented here is not a complete tally of all requirements and should be read alongside the 2022 VBBL Update, however specific clauses have been provided for reference.

For 1-3 storey Residential Buildings, or those with no more than two principle dwellings, all the following aspects of a building are subject to requirements of Part 10 – Energy Efficiency of the 2022 VBBL Update:

- 10.2.1.5** Overall Requirements
- 10.2.2.5** Building Energy and Emissions (Performance and PH Path Only)
- 10.2.2.6** Opaque Envelope
- 10.2.2.7** Fenestration
- 10.2.2.8** Vestibules
- 10.2.2.9** Sub-metering Provisions
- 10.2.2.10** Lighting Provisions
- 10.2.2.11** Hot Water Tank Piping
- 10.2.2.12** Domestic Hot Water Heaters
- 10.2.2.13** Domestic Boilers
- 10.2.2.14** Domestic Heat Pumps, Furnaces, or Make Up Air Units
- 10.2.2.15** Gas Fireplaces
- 10.2.2.16** Wood Fireplaces
- 10.2.2.17** Heat Recovery Ventilators
- 10.2.2.20** Documentation
- 10.2.2.21** Airtightness Testing
- 10.2.2.22** Exterior Heated Spaces

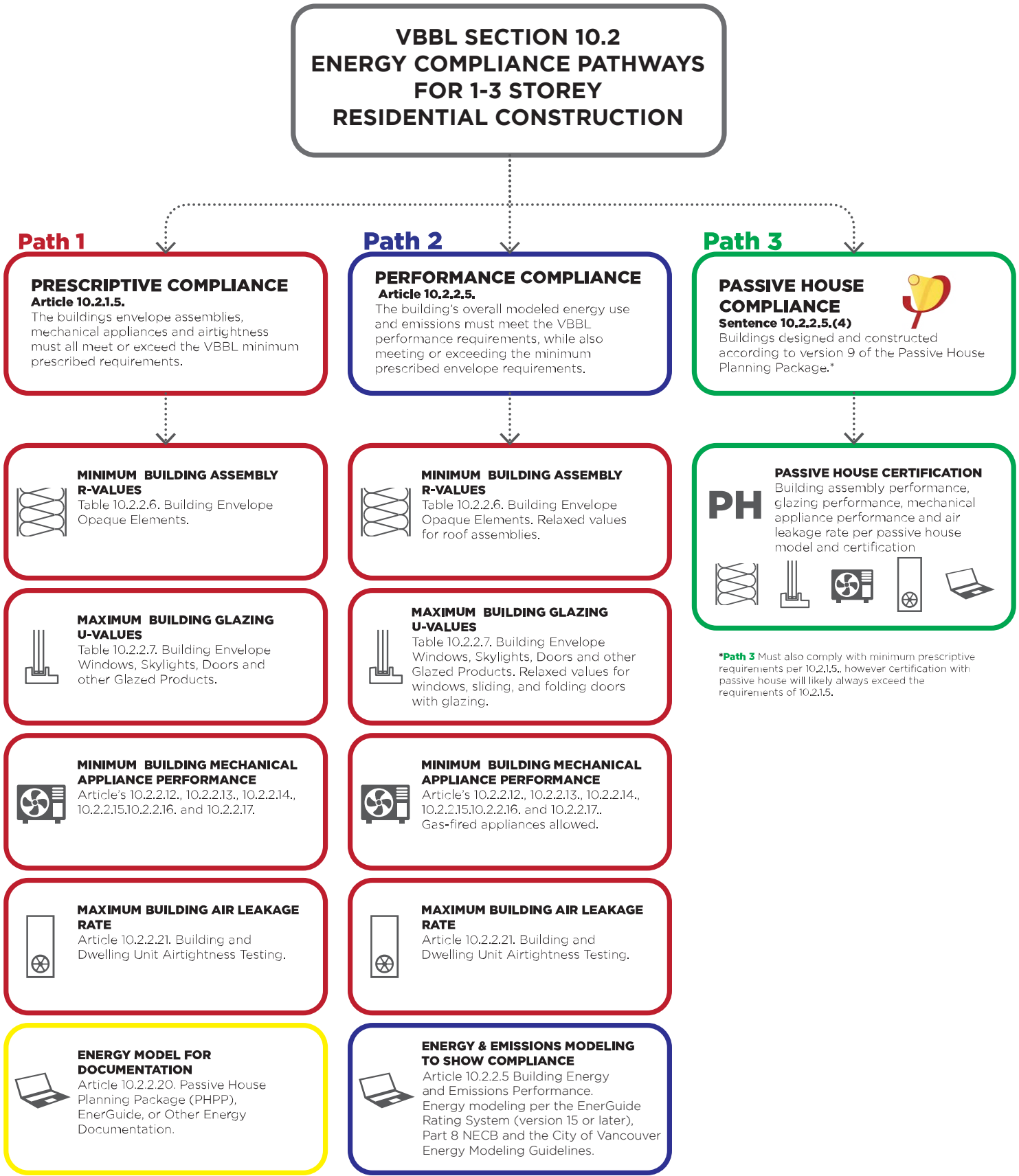
## Mandatory Provisions

Each of these articles may set out different requirements for these systems depending on the path chosen, and on the system being used (ie. type of heat pump). There are still mandatory provisions within many of these articles that must be followed, regardless of the Compliance Path chosen.

This includes, but not limited to:

- Provide heat recovery ventilators
- Provide control systems for HRV and heat pump systems
- Provide sub-metering of building hot water and gas usage for heating/hot water
- Conduct air leakage testing

The chart to the right highlights the primary differences between each Compliance Path with regards to the different sections of the 2022 VBBL Update. This chart can be used for reference when reading each of the following Compliance Path overview sections.



# C. Compliance Path #1: Prescriptive

The Prescriptive Path lays out performance requirements for various building components, including different envelope assemblies, mechanical appliances, and building airtightness. These prescriptive requirements include minimum or maximum performance values, such as equipment efficiency or thermal transmittance, as well as specific conditions under which these values would apply. For instance, there are stricter prescriptive window U-value performance requirements for a single-family home over 325m<sup>2</sup> of floor space or when the window to wall ratio is greater than 30%.

The Prescriptive Path assumes that if all components meet or exceed the code prescribed values, the building is deemed to comply with the energy efficiency intent of Section 10.2 of the VBBL Update. If one or more components do not meet the prescriptive target, the whole building does not comply, even if there are other components that are significantly better.

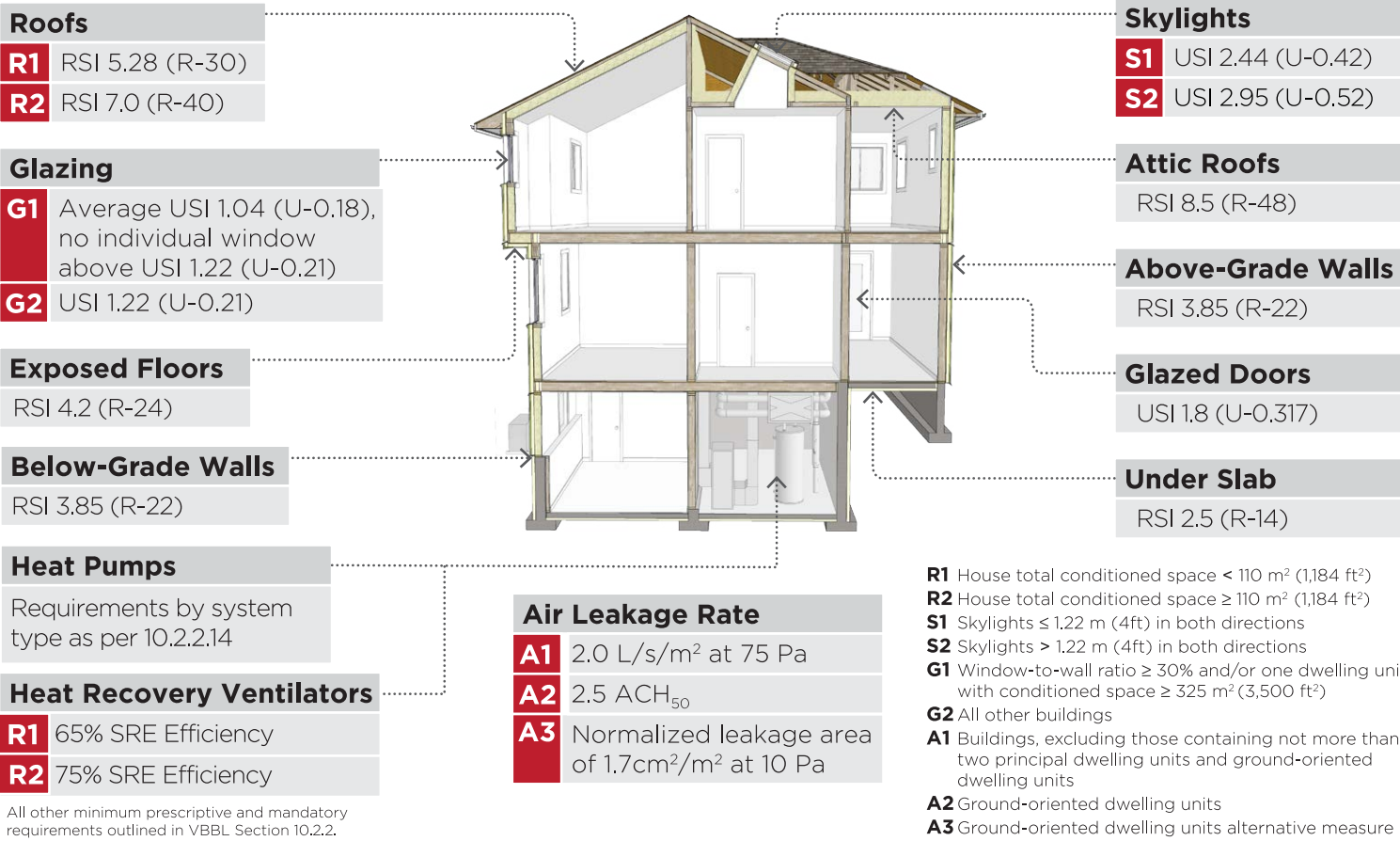


**Appliances for Space Heating and Hot Water** – For the 2022 VBBL Update, this pathway does not allow for the use of gas-fired appliances for hot water or space heating systems, except for gas fireplaces which have a limit on combined total rated input of < 60,000 BTU/hr from all gas fireplaces within a building. Otherwise, all systems must use electricity, such as an electric hot water tank or electric heat pump.

**EnerGuide Rating** – Projects following the Prescriptive Path are still required to provide documentation as per article 10.2.2.20. This includes an EnerGuide Rating System Audit or Hot2000 General Mode modelling report. This means that a building energy model is still required for the Prescriptive Path, along with the reported energy metrics results, but they are not used for compliance. See the Performance Path for more information and considerations regarding energy modelling.

Additionally, for buildings over 325m<sup>2</sup> of conditioned space, you must provide calculations as per the EnerGuide rating system to show the greenhouse gas footprint is no greater than a similar building of 325m<sup>2</sup> conditioned space using code minimum performance values.

## PATH 1 VBBL ARTICLE 10.2.1.5. PRESCRIPTIVE COMPLIANCE PATHWAY REQUIREMENTS



### Path Summary

- Need to meet prescriptive performance targets for envelope and mechanical components
- Most straight forward path to follow
- Can be inflexible as there are no tradeoffs allowed
- Does not allow gas-fired appliances for space heating and hot water heating<sup>6</sup>
- Requires an air leakage test
- Still requires an energy model for documentation, but not for compliance
- Requires a greenhouse gas calculation for buildings over 325m<sup>2</sup> of conditioned space

# D. Compliance Path #2: Performance

If the Prescriptive targets cannot be met, the next option is the Performance Path. This path takes a different approach by looking at the overall energy use and emissions intensity from the whole building using an energy model, rather than evaluating each component on its own.

This simulated version of the building inputs the rated performance of all the building components (including mechanical, enclosure and electrical systems) and analyzes the building energy use over a typical year. This is then compared to the energy performance metrics targets within the code<sup>7</sup>. For 1-3 storey residential buildings, these metrics are:

**Thermal Energy Demand Intensity (TEDI, kWh/m<sup>2</sup>/a)** – The amount of energy required by the building spaces to maintain comfortable conditions, per m<sup>2</sup> of conditioned floor area per year. This is mainly a function of the envelope performance and heat recovery of the ventilation system. The better your envelope and heat recovery efficiency, the lower your TEDI. This is irrespective of the heating system used.

**Mechanical Energy Use Intensity (MEUI, kWh/m<sup>2</sup>/a)** – The amount of energy used by the mechanical systems to deliver the appropriate conditioning to the building spaces, along with domestic hot water systems, per m<sup>2</sup> of conditioned floor area per year. This considers all the efficiencies of the mechanical equipment.

**Greenhouse Gas Intensity (GHGI, kg eCO<sub>2e</sub>/m<sup>2</sup>/a)** – The amount of greenhouse gas emissions associated with the operation of all energy utilities on site, per m<sup>2</sup> of conditioned floor area per year. This is determined by multiplying the site energy use by provided emissions factors for different types of fuel (natural gas or electricity), divided by the floor area.

## Other Considerations

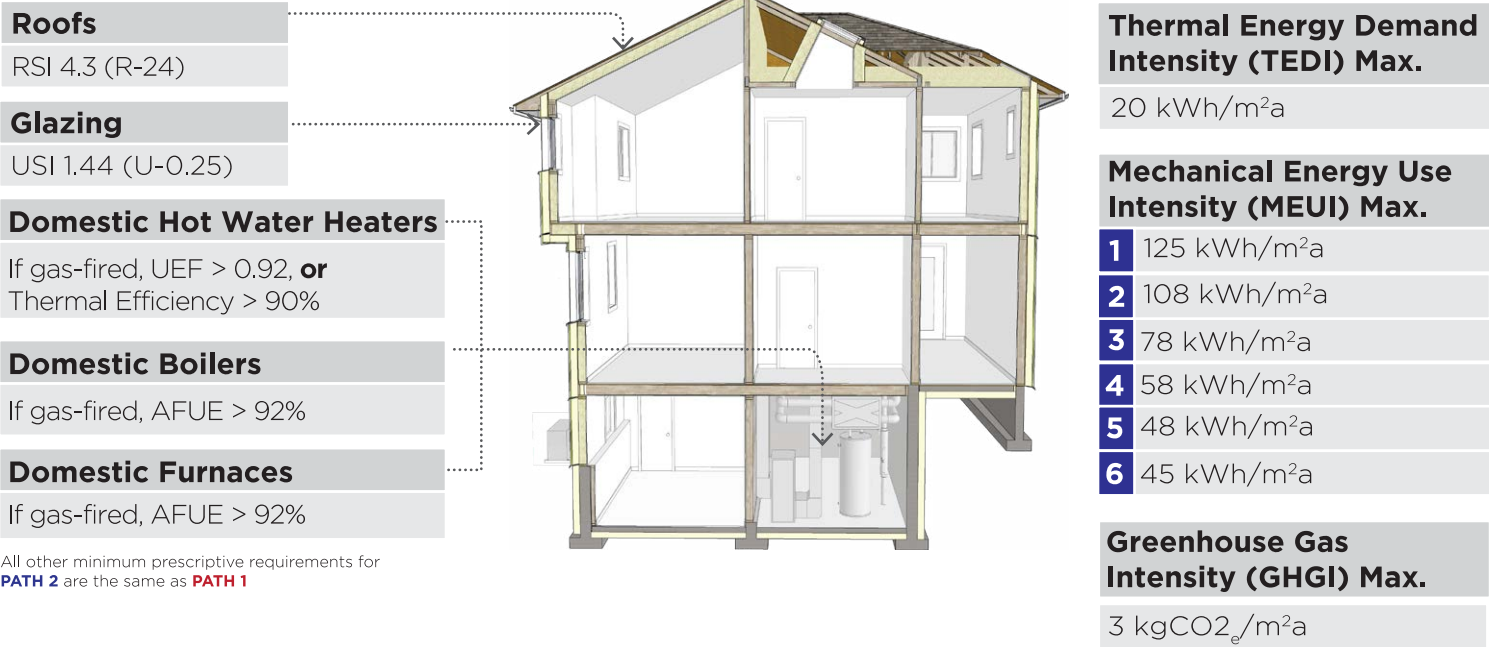
**BC Step Code and GHGIs** – The targets for TEDI and MEUI in the 2022 VBBL Update are aligned with the BC Step Code – Step 4. However, the City of Vancouver also requires calculation of GHGI, which is not a requirement for Step Code. Latest versions of HOT2000 will report TEDI and MEUI, but not GHGI's. GHGI's can be calculated following Section 1.3 of the *Vancouver Modelling Guidelines*<sup>8</sup>. For older versions of HOT2000, see the *BC Step Code Part 9 Instructional Manual* for more information on how to extract TEDI and MEUI values from the program<sup>9</sup>.

**Prescriptive Requirements** – While this path is performance based, the building is still subject to prescriptive requirements. This includes the performance of building components. However, for the envelope these requirements are less stringent. This can provide more flexibility for using different building envelope systems on projects.

**Appliances for Space Heating and Hot Water** – In the 2022 VBBL Update, following the Performance Path allows for the use of natural gas heating and hot water systems. However, note that using a natural gas system may impact meeting the GHGI targets and would need to be confirmed through the energy model.

**Energy Advisors** – For Part 9 single-family and low-rise buildings, an Energy Advisor typically creates a HOT2000 model. Energy Advisors are certified to conduct energy assessments and modelling, and will determine these metrics for the project. They are also required to complete energy compliance checklists and other permitting documentation for the City of Vancouver.

## PATH 2 VBBL ARTICLE 10.2.2.5. PERFORMANCE COMPLIANCE PATHWAY REQUIREMENTS



All other minimum prescriptive requirements for PATH 2 are the same as PATH 1

- 1 For dwellings ≤ 50m<sup>2</sup> (538 ft) of conditioned floorspace
- 2 For dwellings ≤ 75m<sup>2</sup> (807 ft) of conditioned floorspace
- 3 For dwellings ≤ 120m<sup>2</sup> (1292 ft) of conditioned floorspace
- 4 For dwellings ≤ 165m<sup>2</sup> (1776 ft) of conditioned floorspace
- 5 For dwellings ≤ 210m<sup>2</sup> (2260 ft) of conditioned floorspace
- 6 For dwellings > 210m<sup>2</sup> (2260 ft) of conditioned floorspace

## Path Summary

- Compliance is based on meeting TEDI, MEUI and GHGI targets
- Needs to be demonstrated through an energy model, typically completed by using an Energy Advisor
- Still need to be better than prescriptive targets, but these targets are relaxed compared to the Prescriptive Path
- Can provide more flexibility for envelope building components
- Allows gas-fired appliances
- Requires an air leakage test

# E. Compliance Path #3: Passive House

The final option for compliance is to pursue Passive House Certification. The Passive House Standard is an international program that aims to create net-zero ready buildings through efficient building design, high-performance envelopes and mechanical systems, heat recovery ventilation, and airtight construction.

This approach is comparable to the Performance Path, in that the building is modelled and must meet specific performance metrics that are similar to TEDI and MEUI, however they are much more stringent<sup>11</sup>. A building is deemed to comply with Part 10 of the VBBL if the project achieves Passive House Certification.

The certification process involves using a Passive House Consultant<sup>12</sup> who will model the building using specific Passive House Planning Package (PHPP) software and will help design the building around meeting the Passive House targets. The project design and PHPP is submitted to a third party Passive House Certifier, who will further verify the project has been designed in accordance with the Passive House standard. At the end of the project the project is reviewed by the Certifier again, including site photos and commissioning testing, to provide the final confirmation for the project.

Pursing Passive House Certification can be onerous if you are not familiar with the performance expectations and should not be approached like typical construction. There are no specific minimum performance for building systems, per se, as long as the overall Passive House energy targets for certification are met. However it is unlikely to achieve these targets unless very high performance systems are used.

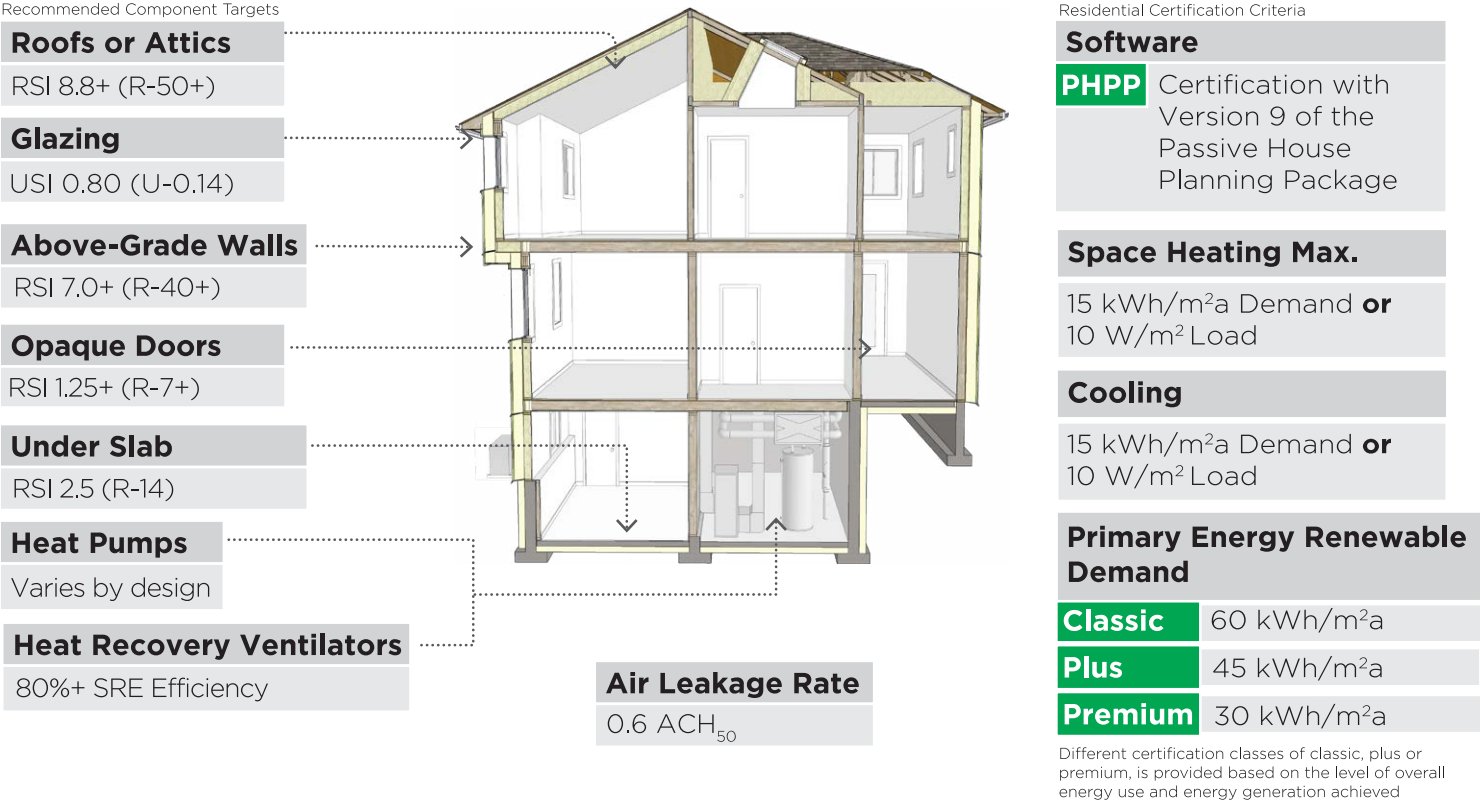
The recommended performance of these systems (R-value of assemblies, U-value of glazing etc.) to meet Passive House targets will likely exceed the prescriptive targets in the VBBL. There are also more requirements for documentation from the project team and quality assurance/control from the builder throughout the design and construction process. This is intended to provide greater assurance that the building will be durable, to provide greater interior comfort and is resilient to future climate conditions.

There are several educational and certification courses available for homeowners, builders, and tradespeople for designing and constructing Passive House buildings available in the Lower Mainland<sup>13</sup>. There are also numerous design and construction companies that specialize in delivering Passive House buildings.

## Other Considerations

**Suitable Products** – Meeting the Passive House standard requires very high-performance materials, components, and systems, as well as suitable documentation required for the certification process. As this is a European based standard, values may be required as per European standards, which can be significantly different than typical North American practice. This includes glazing U-values, thermal bridging calculations, and heat recovery efficiency. While there is a growing number of North American manufacturers that have this information, the availability of products suitable for Passive House is more limited than common construction.

## PATH 3 VBBL SENTENCE 10.2.2.5.(4) PASSIVE HOUSE COMPLIANCE PATHWAY CERTIFICATION PERFORMANCE



## Path Summary

- Subject to achieving Passive House Certification through third party verification
- Quite stringent, systems will likely far exceed the prescriptive values of the 2022 VBBL Update
- Limitations on product availability suitable for Passive House
- Will require additional consultants on the project (Passive House Consultant) and verifiers (Passive House Certifier)
- Gas-fired appliance allowed
- City may provide additional incentives

**Incentives** – As Passive House is considered net-zero ready and a model for achieving targets in the City of Vancouver’s Climate Action Plan, the City provides additional incentives and removes regulatory barriers for projects pursuing Passive House and zero emission buildings. The City of Vancouver’s incentives for Passive House construction are generally in the form of zoning bylaw variances.

Passive House projects can apply for variances to floor area, building height, yard and building depth zoning bylaws, provided the project can prove it will achieve Passive House certification. Ultimately it is up to the Director of Planning at the City of Vancouver to decide whether a project is granted a variance. The following are some examples of available variances for Passive House certified zero emission buildings:

- **Floor Area, Fixed Exclusion** – Buildings can get 16% (single-family dwelling) or 18% (two-family dwelling) of their gross floor area excluded from the buildings overall FSR.
- **Floor Area, Calculated Exclusion** – The building floor area used by insulation can be calculated by a certified Passive House designer or a certified Passive House consultant and be excluded from the buildings overall FSR. The floor area used by HRV’s and connected mechanical shafts can also be excluded from the buildings overall FSR to a maximum of 2% of the floor area provided for the HRV system.

- **Building Height** – Building height regulations for primary and secondary envelopes can be conditionally varied by a maximum of 1m.
- **Yard Setbacks** – Front yard setbacks expressed as a dimension can be varied by a maximum of 0.5m. Rear yard setbacks expressed as a dimension can be varied by a maximum of 1.25m. Front and rear yards that are expressed as a percentage can be varied by a maximum of 5%.
- **Building Depth** – Permitted building depth expressed as a percentage can be varied by a maximum of 5%.
- **External Design** – External design regulations that restrict green building solutions can be varied to allow for green building solutions.

Builders seeking to apply for a variance with the City of Vancouver should obtain early advice on meeting VBBL requirements from a registered professional.

For more information on available variances for zero emission buildings in the City of Vancouver refer to the *Guidelines for Administration of Variances for Zero Emission Buildings in RS, RT and RA Districts*, last amended May 12, 2020<sup>14</sup>.



# Appendix: VBBL 2019 to 2022 Update Summary

For readers that are already familiar with the VBBL, the following table outlines the major changes between the 2019 VBBL and 2022 VBBL Update, including specific values and clauses for reference.

The table also notes when a condition or definition of a system has changed where possible.

- **Windows, Skylights, Doors** – Better performance, likely triple glazed
  - **Roofs Assemblies** – Increased insulation thickness for roof types other than ones with attic spaces
  - **Domestic Hot Water Systems** – Must be electrically operated, unless following Performance or Passive House Path
- **Heating System** – Must be electrically operated, unless following Performance or Passive House Path
  - **Heat Pump Efficiency** – New controls and performance requirements, including heating/cooling capacity and SEER/EER/HSPF/COP
  - **Gas Fireplaces** – Combined total rated input limit from all gas fireplaces within a building
- **HRV Heat Recovery** – Increased heat recovery and HRV requirements now apply to all low-rise residential buildings including laneway homes
  - **Airtightness Test Requirements** – Increased airtightness for all ground-oriented dwellings including laneway and subsidiary units

2022 VBBL UPDATE FOR 1-3 STOREY RESIDENTIAL BUILDINGS – QUICK REFERENCE							
Item	2019 VBBL		2022 VBBL Update				Reference Clause(s)
Building Definitions	Separate requirements for Residential Buildings of 1-3 storeys, and Houses and Residential Buildings With Not More Than Two Principle Dwelling Units		Combined requirements				10.2.1.5 10.2.1.6
Compliance Paths	Prescriptive, Performance or Passive House		Prescriptive, Performance or Passive House				10.2.1.5 10.2.2.5
Performance Path Targets	None		Conditioned Floor Area	MEUI (kWh/m²a)	TEDI (kWh/m²a)	GHGI (kgCO <sub>2e</sub> /m²a)	10.2.2.5 (2)
			≤ 50 m²	125	20	3	
			≤ 75 m²	108			
			≤ 120 m²	78			
			≤ 165 m²	58			
			≤ 210 m²	48			
			> 210 m²	45			
Passive House Path Targets	Conform design to the Passive House Standard criteria. Must use PHPP v9 or newer, prepared by a Passive House Designer/Consultant		Conform design to the Passive House Standard criteria. Must use PHPP v9 or newer, prepared by a Passive House Designer/Consultant				10.2.2.5 (4)
Minimum Effective Thermal Resistance of Assemblies	Roof Type		Roof Type	Conditioned Floor Area	Prescriptive Path	Performance/ PH Path	10.2.2.6
	Roof Joist Assemblies	RSI 4.3	Roof Assemblies for Houses (Residential Buildings With Not More Than Two Principal Dwelling Units)	< 110 m²	RSI 5.28	RSI 4.3	
				≥ 110 m²	RSI 7.0	RSI 4.3	
	Roof Assemblies Other	RSI 5.28	Roof Assemblies Other	All	RSI 7.0	RSI 5.28	

# 2022 VBBL UPDATE FOR 1-3 STOREY RESIDENTIAL BUILDINGS – QUICK REFERENCE

Item	2019 VBBL		2022 VBBL Update				Reference Clause(s)
Thermal Transmittance of Exterior Closures and Fenestration	Windows and sliding doors OR folding doors with glazing OR Curtain Wall or Window Wall	USI 1.4	Type	Condition	Prescriptive Path	Performance/ PH Path	10.2.2.7
			Windows and sliding doors or folding doors with glazing or Curtain Wall or Window Wall	Window to wall ratio is ≥ 30% and/ or single-family dwelling ≥ 325 m²	Average USI 1.04 (no single window greater than USI 1.22)	USI 1.44	
				All other	USI 1.22	USI 1.44	
Domestic Hot Water Heaters	Gas-heated Hot Water Heaters shall have a uniform energy factor not less than 0.78 or thermal efficiency of not less than 90%		Prescriptive		Performance/PH Path		10.2.2.12
			Electrically operated		Gas-heated Hot Water Heaters shall have a thermal efficiency of not less than 90%		
Domestic Boilers	Annual Fuel Utilization efficiency (AFUE) of 92%+		Prescriptive		Performance/PH Path		10.2.2.13
			Electrically operated		Annual Fuel Utilization efficiency (AFUE) of 92%+		
Domestic Heat Pumps, Furnaces or Makeup Air Units	Annual Fuel Utilization efficiency (AFUE) of 92%+		Prescriptive		Performance/PH Path		10.2.2.14
			Electrically operated Controls for Heat pumps with supplemental heating and programmable set back thermostats Minimum system performance as per Table 10.2.2.14		Same as Prescriptive, but Gas-fired systems are allowed with Annual Fuel Utilization efficiency (AFUE) of 92%+		
Heat Recovery Ventilators	65% sensible heat recovery at 0°C		Conditioned Floor Area		Sensible Heat Recovery at 0°C		10.2.2.17
			≤ 110 m²		65%		
			> 110 m²		75%		
Building and Dwelling Unit Airtightness Testing	Ground Oriented Dwelling Units	3.5 air changes per hour at 50 Pa	Ground Oriented Dwelling Units		2.5 Air changes per hour at 50 Pa		10.2.2.21
	Laneway houses and subsidiary conditioned suites less than 110 m² floor area	Normalized leakage area of 2.1 cm²/m² at 10 Pa	Ground Oriented Dwelling Units, Alternative Measure		Normalized leakage area of 1.7 cm²/m² at 10 Pa		

Note: Gross floor area measured from inside exterior walls of the largest single dwelling located on the site

# Endnotes

- 1 As per Section 10.2 – Energy Efficiency of the VBBL
- 2 Under the definitions in Part 9 – Housing and Small Buildings of the VBBL
- 3 <https://council.vancouver.ca/20200429/documents/pspc3.pdf>
- 4 While the focus of this guide is for new construction, note that many of these items will also apply to upgrades and alterations to existing buildings, along with other requirements or stipulations
- 5 <https://www.passivehousecanada.com/passive-house-building-certification>
- 6 The 2022 VBBL allows the use of gas fireplaces and does not regulate the use of gas-fired cooking appliances and clothes dryers
- 7 For more information on energy performance metrics and energy modelling refer to the *BC Energy Step Code* and the *BC Energy Step Code Builder Guide*, available at <https://energystepcode.ca> and <https://www.bchousing.org/home>
- 8 <https://vancouver.ca/files/cov/guidelines-energy-modelling.pdf>
- 9 <http://energystepcode.ca/app/uploads/sites/257/2019/09/BCESC-Updated-Compliance-Reports-Instruction-Manual.pdf>
- 10 <https://betterhomesbc.ca/ea>
- 11 Space Heating Demand and Primary Energy Renewable targets in Passive House exceed the performance targets of Step 5 of the BC Energy Step Code
- 12 In many cases an architect or builder can also be certified as a Passive House Consultant
- 13 <https://www.passivehousecanada.com>
- 14 <https://guidelines.vancouver.ca/guidelines-variance-rs-rt-ra-zero-emission-buildings.pdf?ga=2.190521954.876390183.1609870842-1211716906.1588179799>



## Disclaimer

If there are any discrepancies between what this document indicates and the Vancouver Building By-law, what is indicated in the VBBL takes precedence and is correct.

### IMPORTANT INFORMATION

Please have this translated

### RENSEIGNEMENTS IMPORTANTS

Prière de les faire traduire

重要資訊 請找人為你翻譯

重要资讯 请找人为你翻译

### MAHALAGANG IMPORMASYON

Mangyaring isalin ito

### ਜ਼ਰੂਰੀ ਜਾਣਕਾਰੀ

ਕਿਰਪਾ ਕਰਕੇ ਇਸਦਾ ਅਨੁਵਾਦ ਕਰਵਾਓ

### TIN TỨC QUAN TRỌNG

Xin hãy dịch sang tiếng Việt

### INFORMACIÓN IMPORTANTE

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### 중요정보 번역해주세요

اطلاعات مهم  
لطفا درخواست کنید که این  
اطلاعات را برای شما ترجمه کنند

معلومات مهمة  
البحث على الترجمة



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