

# **Research Local High-Performance Building Supply for New Low-Rise Homes**

## EXECUTIVE SUMMARY

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August, 2018

This report was produced as part of the Greenest City Scholars (GCS) Program, a partnership between the City of Vancouver and The University of British Columbia, in support of the Greenest City Action Plan.

This GCS project was conducted under the mentorship of City staff. The opinions and recommendations in this report, and any errors, are those of the author, and do not necessarily reflect the views of the City of Vancouver or The University of British Columbia.

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## Acknowledgements

This report is the culmination of a long but enjoyable journey. I could not express enough the gratitude I feel towards all those who supported me.

First and foremost, I am grateful to my parents for their support throughout this project. I would not have been able to do it without them.

I would also like to thank Mr. Chris Higgins who was my mentor for the project. This project would not have been successful without his continuous support and mentorship. Also, I would like to thank Mr. Brady Faught whose feedbacks throughout the project were crucial to its success.

I owe a special thank you to every individual in the Sustainability group for providing me with such a great atmosphere to work and learn in. Specifically, I would like to thank Mr. Lloyd Lee and Mr. Jason Hsieh whose feedbacks on my data visualizations helped me a lot. Additionally, I would like to thank Ms. Jaclyn Jimenez who helped me smoothly transition into the role. I would also like to thank Ms. Amanda Mitchell from the Corporate Communications department at the City of Vancouver for her feedback on the surveys.

Last but definitely not least, I would like to thank Ms. Tina Barisky and Ms. Karen Taylor for their continuous support for not only me but all of the scholars. Their support helped all of the scholars including myself to successfully finish the projects.

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## Introduction

Vancouver has a target to become the greenest city in the world. This target was established in 2011 and the Greenest City Action Plan<sup>1</sup> (GCAP) was created as a road map to help with navigating the long journey ahead of the city. GCAP has 10 main goal areas which touch on various aspects of a green city. The goals include but are not limited to green transportation, zero waste, green economy, etc. Goal 2 on the GCAP called Green Buildings sets the target for all buildings constructed from 2020 onward to be carbon neutral in operation and also to reduce energy use and greenhouse gas emissions in existing buildings by 20% over the 2007 levels. The City adopted a Zero Emissions Building Plan<sup>2</sup> in 2016 that directly supports this goal. The target of the plan is to have no operational greenhouse gas (GHG) emissions from all new buildings by 2030.

To support these targets, the City of Vancouver Building Bylaw<sup>3</sup> (VBBL) has required higher performing windows, the installation of heat recovery ventilators (HRV's) and high efficiency heating systems. The next VBBL update is going to take place in the next two years and it aims to take the biggest step the City can to maximize reductions in greenhouse gases while making sure the local market is able to supply the required products.

The objective of this project was to investigate the local supply market of three key components in buildings, namely windows, Heat Recovery Ventilators (HRV's), and Heat Pump (HP) systems in terms of capacity and gaps of higher efficiency models. The output of this work will assist the City of Vancouver in implementing an effective update to the VBBL to lower greenhouse gases.

## Research Methodology

The objectives of the project were achieved by analyzing two streams of data. The first source of information was the existing datasets for each category and the second source was the data collected through interviews and surveys.

The project was broken down into 5 phases.

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<sup>1</sup> Refer to Appendix

<sup>2</sup> <https://vancouver.ca/green-vancouver/zero-emissions-buildings.aspx>

<sup>3</sup> <https://vancouver.ca/your-government/vancouver-building-bylaw.aspx>

**Phase I. Literature review:** A literature review was conducted to better understand different characteristics of the three components. Also, the existing datasets having performance metrics data for each of them were analyzed.

**Phase II. Interviews:** 14 interviews with industry experts and thought leaders were conducted both in person and via phone calls to understand their perspectives and collect their input.

**Phase III. Survey design and distribution:** Three surveys were designed and developed through an iterative process of making revisions based on the feedback received so that it serves its purpose in the best way possible and also adheres to the City outreach policies. The fenestration survey was distributed through Fenestration Association of BC<sup>4</sup> (FEN-BC) and the HRV survey through the Heating, Refrigeration and Air Conditioning Institute of Canada<sup>5</sup> (HRAI). Both cases were followed by follow-up emails. Regarding heat pumps, the survey was sent to individual manufacturers.

**Phase IV. Data analysis and visualization:** The existing data sets that contained the performance metrics data were combined with the survey results and three visualization dashboards were created to investigate the results. This was accompanied by three infographics to easily convey the results to a larger audience.

**Phase V. Recommendation:** Recommendations were made for each of the components based on the findings.

## Summary of Findings

After careful examination of the literature, interviews, and the surveys, the summary of the findings in the respective three categories are as follows:

### Fenestration market:

The Natural Resources Canada<sup>6</sup> (NRCan) product directory for windows was analyzed to investigate the number of models that window manufacturers in British Columbia offer in terms of U values and operator type.

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<sup>4</sup> <http://www.fen-bc.org/>

<sup>5</sup> <https://www.hrai.ca/>

<sup>6</sup> <http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=WINDOWS>

Figure 1 shows the number of models that window manufacturers in British Columbia produce at different U values. It is evident that as we move to lower U values the number of double glazed products decrease while triple glazed products become predominant.

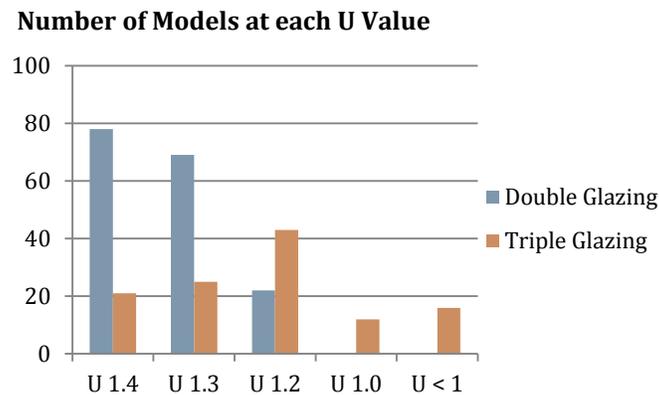


Figure 1. Number of window models at each U value

A wide range of window manufacturers participated in the survey. They identified themselves along the spectrum of value leader producers to upper market brands. In terms of the existing practices, double glazed products take up an average of 86% of their products. Also, on average they use 4<sup>th</sup> surface coating on 30% of their products.

Looking forward, the participants expressed readiness to produce windows at U 1.2 with an average of two and a half months lead time needed to adjust their product line and indicated an average price increase of 20% going from U 1.4 to U 1.2 products. (For a 24" wide \* 36" high window with a casement operator)

Lastly, a number of points were raised concerning the market in Vancouver which is not big considering the number of manufacturers which makes it financially difficult for them to adjust to small, frequent and incremental U value targets.

#### HRV market:

The Home Ventilating Institute (HVI) <sup>7</sup> dataset called the Certified Home Ventilating Products Directory (CPD) <sup>8</sup> was used to analyze the existing residential HRV market. The data is updated monthly.

<sup>7</sup> <https://www.hvi.org/index.cfm>

The analysis shows that as the Sensible Recovery Efficiency<sup>9</sup> (SRE) goes into the 76% to 84% range, number of brands in the market is cut by half and the number of models available is also cut drastically. Figure 2 shows the decline in the number of products as we move to higher efficiency ranges.

**Models and Brands at different SRE's**

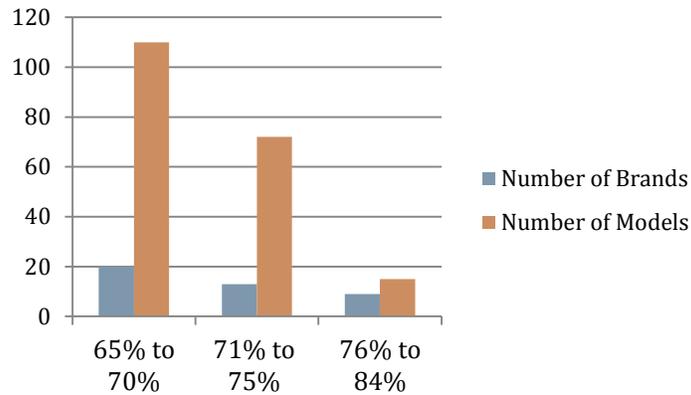


Figure 2. Number of models and brands at different SRE values

According to the same dataset, Venmar/VanEE has the most variety of HRV/ERV products.

SRE @ 0 deg C	65% to 70%	71% to 75%	76% to 84%
<b>Brands</b>	<ul style="list-style-type: none"> <li>• Venmar/VanEE</li> <li>• Broan</li> <li>• Aldes &amp; Inspirair</li> </ul>	<ul style="list-style-type: none"> <li>• Venmar/VanEE</li> <li>• Lifebreath</li> <li>• Greentek &amp; Imperial</li> </ul>	<ul style="list-style-type: none"> <li>• Venmar/VanEE</li> <li>• Broan</li> <li>• Lifebreath</li> </ul>

The participants in the survey reported an average of 7%, 16%, and 43% increase in the price of their products going from 65% SRE at 0 deg C to 70%, 75%, and 80% respectively.

<sup>8</sup> <https://www.hvi.org/proddirectory/>

<sup>9</sup> Refer to Appendix

### Air-source heat pump market:

The results of the interviews show that three brands represent around 60% of Vancouver’s heat pump market. It is worth noting that all of the products are imported to BC and Vancouver.

Analyzing the NRCan product directory<sup>10</sup> and the interviews show there are a great variety of products across high COP values.

Figure 3 shows the distribution of the number of different heat pump models (outside models) across COP values broken down to single-phase or three-phase systems. Single-phase systems are predominant at all values. COP 2.6 shows the highest number of models.

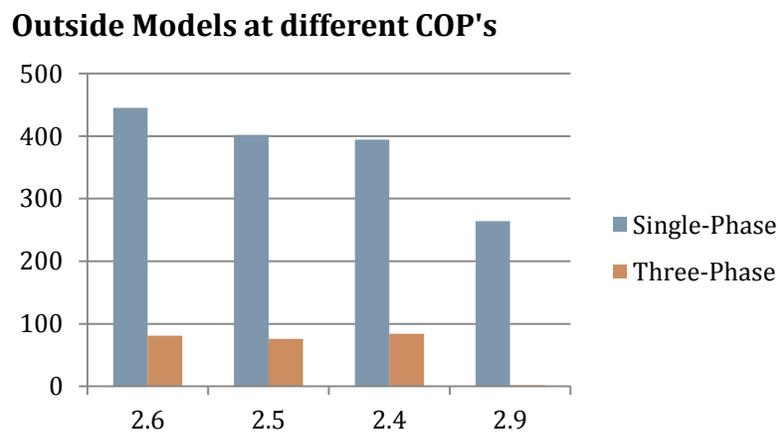


Figure 3. Number of outside models at different COP values

Some of the points raised in the survey include the difficulty of completely eliminating gas fired boilers from buildings due to the fact that the performance of air to water heat pumps drop during the cold days of winter. That said with the development of cold climate heat pumps that work down to -25C they may in the future allow a transition off of fossil fuels entirely for space heating. Also simplifying the permit process and allowing changes to the FSR were mentioned as some of the incentives to use higher efficiency equipment.

## Recommendations

### Fenestration:

It would be a reasonable yet effective move to require U 1.2 for windows in the next VBBL update. With that said, it is crucial to bear in mind that aligning the improvements with future

<sup>10</sup> [http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=HP\\_SP](http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=HP_SP)

North American standards and avoiding taking small, incremental steps as opposed to bigger but less often improvements would be most beneficial to Vancouver's market.

Also putting in a performance-based path to meeting the code requirements would help cover some of the shortcomings of the existing prescriptive path in which the only factor in play is the U value.

There needs to be more research in the area of energy savings of higher efficiency products in Vancouver's climate vs. the cost implications for home owners.

#### HRV:

The literature and the survey show that requiring 70% SRE at 0 deg C as the minimum level of efficiency for HRV's is a sound and effective measure to take to reduce the operational greenhouse gases in buildings.

There needs to be more research in the area of energy savings of higher efficiency products in Vancouver's climate vs. the cost implications for home owners.

#### HP:

Despite the fact that the results of the survey and literature are evident of availability of heat pumps at high COP value, requiring a minimum level of COP in the VBBL should be subject to more research.

# Appendix:

## Greenest City Action Plan 2020:

GOAL AND TARGETS	INDICATOR	BASELINE	2014	CHANGE OVER BASELINE	IMPROVED OVER BASELINE	2020 TARGET
<b>CLIMATE AND RENEWABLES</b>						
<b>Target:</b> Reduce community-based greenhouse gas emissions by 33% from 2007 levels.	Total tonnes of community CO <sub>2</sub> e emissions from Vancouver	2,805,000 tCO <sub>2</sub> e (2007) <sup>2</sup>	2,610,000 tCO <sub>2</sub> e <sup>2</sup>	-7%	Yes	1,895,000 tCO <sub>2</sub> e
<b>GREEN BUILDINGS</b>						
<b>Target 1:</b> Reduce energy use and GHG emissions in existing buildings by 20% over 2007 levels.	Total tonnes of CO <sub>2</sub> e from residential and commercial buildings	1,145,000 tCO <sub>2</sub> e (2007)	1,085,000 tCO <sub>2</sub> e <sup>1</sup>	-5%	Yes	920,000 tCO <sub>2</sub> e
<b>Target 2:</b> Require all buildings constructed from 2020 onward to be carbon neutral in operations.						
<b>GREEN TRANSPORTATION</b>						
<b>Target 1:</b> Make the majority of trips (over 50%) by foot, bicycle and public transit.	Per cent mode share by walk, bike and transit	-- <sup>4</sup>	50% of trips	-- <sup>4</sup>	-- <sup>4</sup>	50% of trips
<b>Target 2:</b> Reduce average distance driven per resident by 20% from 2007 levels.	Total vehicle km driven per person	5,950 km/person/year (2007)	4,680 km/person/year	-21%	Yes	4,760 km
<b>ZERO WASTE</b>						
<b>Target:</b> Reduce total solid waste going to the landfill or incinerator by 50% from 2008 levels.	Annual solid waste disposed to landfill or incinerator from Vancouver	480,000 tonnes (2008)	394,600 tonnes <sup>5</sup> (2013)	-18%	Yes	240,000 tonnes
<b>ACCESS TO NATURE</b>						
<b>Target 1:</b> Ensure that every person lives within a five minute walk of a park, greenway or other green space.	Per cent of city's land base within a 5 min walk to a green space	92.6% (2010)	92.7%	+0.1%	Yes	95% <sup>6</sup>
<b>Target 2:</b> Plant 150,000 additional trees in the city.	Total number of additional trees planted	-- (2010)	37,000 trees	+37,000	Yes	150,000 trees
<b>CLEAN WATER</b>						
<b>Target 1:</b> Meet or beat the most stringent of British Columbian, Canadian and appropriate International drinking water quality standards and guidelines.	Total number of instances of not meeting drinking water quality standards	0 instances	0 instances	0	Yes	0 instances
<b>Target 2:</b> Reduce per capita water consumption by 33% from 2006 levels.	Total water consumption per capita	583 L/person/day (2006)	490 L/person/day	-16%	Yes	390 L/person/day
<b>LOCAL FOOD</b>						
<b>Target:</b> Increase city-wide and neighbourhood food assets by a minimum of 50% over 2010 levels.	Total number of neighbourhood food assets <sup>10</sup> in Vancouver	3,340 food assets (2010)	4,556 food assets	+36%	Yes	5,158 food assets
<b>CLEAN AIR</b>						
<b>Target:</b> Meet or beat the most stringent air quality guidelines from Metro Vancouver, British Columbia, Canada, and the World Health Organization.	Total number of instances of not meeting air quality standards for ozone, particulate matter (PM 2.5), nitrogen dioxide and sulfur dioxide from both the Kits and Downtown stations combined <sup>9</sup>	27 instances (2008)	0 instances <sup>9</sup>	-100%	Yes	0 instances
<b>GREEN ECONOMY</b>						
<b>Target 1:</b> Double the number of green jobs over 2010 levels.	Total number of green and local food jobs	16,700 jobs (2010)	19,900 jobs (2013) <sup>1</sup>	+19%	Yes	33,400 jobs
<b>Target 2:</b> Double the number of companies that are actively engaged in greening their operations over 2011 levels.	Percent of businesses engaged in greening their operations	5% of businesses engaged (2011)	Survey to be conducted in 2016	--	--	10% of businesses engaged
<b>LIGHTER FOOTPRINT</b>						
<b>Target:</b> Reduce Vancouver's ecological footprint by 33% over 2006 levels.	Proxy: Number of people empowered <sup>7</sup> by a City-led or City-supported project to take personal action in support of a Greenest City goal and/or to reduce levels of consumption (cumulative)	600 people (2011)	10,700 people	+10,100	Yes	To be determined

Taken from the Greenest City 2020 Action Plan Part two: 2015-2020

Definition of terms:

Fenestration: Windows, doors and skylights

Heat Recovery Ventilator (HRV): HRVs simultaneously supply and exhaust equal quantities of air to and from a house while transferring heat between the two air streams (with minimal mixing of air in the two streams).<sup>11</sup>

Air-source heat pump (HP): An air-source heat pump transfers heat from the outdoor air to the indoor air for space heating during the winter and reverses the process in the summer to provide air conditioning. The system consists of an indoor unit, typically contained within a forced air heating system, and an outdoor unit.<sup>12</sup>

U-Factor: The heat transfer per time per area and per degree of temperature difference in  $W/m^2 \cdot K$  (Btu/h  $ft^2 \cdot ^\circ F$ ).<sup>13</sup>

Sensible Recovery Efficiency (SRE): The net sensible energy recovered by the supply airstream as adjusted by electric consumption, case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams and the energy used for defrost (when running the Very Low Temperature Test), as a percent of the potential sensible energy that could be recovered plus the exhaust fan energy. This value is used to predict and compare Heating Season Performance of the HRV/ERV unit.<sup>14</sup>

Coefficient of Performance (COP): A measure of the efficiency of a heat pump or air-conditioning equipment. It is the ratio of input energy to output energy. A device that has an energy input of 1 kW and an output of 3 kW, will have a C.O.P. of 3.<sup>15</sup>

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<sup>11</sup> <https://vancouver.ca/files/cov/heat-recovery-ventilation-guide-for-houses.pdf>

<sup>12</sup> <https://www.nrcan.gc.ca/energy/efficiency/housing/home-improvements/15690#air-source-heat-pump>

<sup>13</sup> <http://www.nrcan.gc.ca/energy/products/for-participants/specifications/13720>

<sup>14</sup> [https://www.hvi.org/proddirectory/CPD%20Files/Sec3\\_cover.pdf](https://www.hvi.org/proddirectory/CPD%20Files/Sec3_cover.pdf)

<sup>15</sup> <https://www.nrcan.gc.ca/energy/efficiency/housing/home-improvements/15690#cop>

Survey Questions:

- Fenestration Survey

## Local Fenestration Market

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Local Fenestration Market

In preparing for the 2021 and 2025 Vancouver Building Bylaw (VBBL) energy updates for single family homes, we are working to better understand the supply side of the high performance fenestration market in terms of capacity and gaps.

As we move forward with these updates, we want to ensure future regulation on improved energy performance of windows can be supplied by local manufacturers.

To assist with that, we are contacting window manufacturers like yourself, to learn more about the types of high-performance window lines that are currently produced in the local industry and the capacity of businesses to increase production of these lines.

Please note that individual responses will not be shared and your response will only be reported in aggregate format.

We thank you for your time filling out this survey.

Your feedback is important and will help inform our recommendations and timelines for compliance.

**1) As the survey may be filled out by more than one person from your company, please indicate the name of your company**

Individual responses will not be shared and your response will only be reported in aggregate format

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**2) What percentage of your sales in Vancouver do you estimate to be residential versus commercial:\***

Write the percentage next to each category

Total should equal **100%**

Residential: \_\_\_\_\_

Commercial: \_\_\_\_\_

**3) What percentage of your sales in Vancouver do you estimate is for:**

Write the percentage next to each category

Total should equal **100%**

Single Family: \_\_\_\_\_

Low-rise to six story residential: \_\_\_\_\_

High rise residential: \_\_\_\_\_

Commercial site-glazed: \_\_\_\_\_

**4) Which segment of the market do you see yourself as serving?**

Choose a maximum of two

Lowest cost

Value leader

Mid-market

Upper market

Luxury

**Logic: Show/hide trigger exists.**

5) *Do you supply or install triple glazed products?\**

Yes

No

Not currently but this is something we are exploring

**Logic: Hidden unless: #5 Question "Do you supply or install triple glazed products?" is one of the following answers ("Yes")**

6) *What percentage of your window products do you estimate to be:*

\*

Double glazed: \_\_\_\_\_

Triple glazed: \_\_\_\_\_

**Logic: Hidden unless: #5 Question "Do you supply or install triple glazed products?" is one of the following answers ("Yes")**

7) *By approximately how much is the installation cost affected by triple glazing?*

\*

\_\_\_\_\_

8) *What percentage of your products do you estimate that you:*

Total should equal **100%**

Supply without installation: \_\_\_\_\_

Supply and install: \_\_\_\_\_

9) *What is your window production capacity for the following U values and operator types in a typical year?(Units = m<sup>2</sup>/year or number of windows/year)\**

Round up or down to the nearest decimal, for instance if you produce 1.25 or above please choose 1.3, if you produce 1.24 - 1.20 please choose 1.2

	U 1.4	U 1.3	U 1.2	U 1.0	U < U 1.0
Fixed	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -
Casement	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -
Tilt turn	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -
Slider	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -
Other (specify)	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -	_____ _____ _____ _____ -

*Comments:*

10) What unit did you use to fill out the table in the previous question?\*

- m<sup>2</sup>/year
- number of windows/year
- Other(specify in the comment section)

*Comments:*

**11) On what percentage of your sold products do you estimate that you use fourth-surface coating?**

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**12) What is an estimated price increase (in percentage) of your U 1.2 window over U 1.4?**

Assume 24" wide \* 36" high and casement operator

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**13) If U 1.2 was to be the Vancouver Building Bylaw requirement regarding level of window efficiency, how much lead time would your company need before it could produce / provide this product?**

\*

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*Comments:*

**14) As the last section, please add any further comments you have?**

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Thank You!

**Thank you for your assistance taking this survey. Your input is invaluable as we move forward to energy efficient updates on the Vancouver Building Bylaw in 2021.**

- HRV Survey

## HRV market in Vancouver

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### Heat Recovery Ventilator(HRV) Market in Vancouver

**In preparing for the 2021 and 2025 Vancouver Building Bylaw (VBBL) energy updates for single family homes, we are working to better understand the supply side of the high performance heat recovery ventilator (HRV) market in terms of gaps.**

**As we move forward with these updates, we want to ensure future regulation on improved energy performance of HRVs can be supplied by manufacturers at a market acceptable price.**

**To assist with that, we are contacting HRV manufacturers like yourself, to learn more about the types of high-performance residential HRV/ERV lines that are currently produced in the industry.**

**Please note that individual responses will not be shared and your response will only be reported in aggregate format.**

**Your feedback will help inform our recommendations and timelines for compliance.**

**Please fill out the survey by Wednesday July 18th 5 pm PT**

#### **1) What is the name of your brand?**

Individual responses will **not** be shared. Only aggregated results will be reported

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**Logic: Show/hide trigger exists.**

2) *Do you have sales in British Columbia?\**

Yes

No

**Logic: Hidden unless: #2 Question "Do you have sales in British Columbia?" is one of the following answers ("Yes")**

3) **Approximately how much of your sales are in the city of Vancouver?**

\_\_\_\_\_

4) *What do you estimate to be the average price increase in your product for higher efficiencies? (SRE @ 0 deg C)\**

	From 65% to 70%	From 65% to 75%	From 65% to 80%
% price increase	_____ _____ _____	_____ _____ _____	_____ _____ _____

5) *Do you require installer training?*

Yes

No

**Logic: Show/hide trigger exists.**

6) *Do you have an installer network?\**

Yes

No

**Logic: Hidden unless: #6 Question "Do you have an installer network?" is one of the following answers ("Yes")**

**7) Please provide the relevant information via a link or note them below**

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**Logic: Show/hide trigger exists.**

*8) Do you offer any add-on filtration or built-in filtration that is MERV rated?*

Yes

No

**Logic: Hidden unless: #8 Question "Do you offer any add-on filtration or built-in filtration that is MERV rated?" is one of the following answers ("Yes")**

**9) Please provide the list of available ratings**

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Much of BC has adopted the BC step code and the City of Vancouver may consider adopting a step code performance path (in addition to the prescriptive path that currently exists) in the next code cycle. Given this we are working with the Vancouver Economic Commission to understand how adoption of the BC step code for Part 9 homes (single family, townhomes and Multi Unit Residential under 4 storeys) could affect HRV manufacturers. With that in mind please take a minute to answer the following questions.

**Logic: Show/hide trigger exists.**

*10) Are you familiar with the BC step code Part 9 homes?\**

Yes

( ) No

**Logic: Hidden unless: #10 Question "Are you familiar with the BC step code Part 9 homes?" is one of the following answers ("Yes")**

**11) What risks do you foresee or anticipate related to the adoption or implementation of the Energy Step Code in BC?**

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**Logic: Hidden unless: #10 Question "Are you familiar with the BC step code Part 9 homes?" is one of the following answers ("Yes")**

**12) Which opportunities do you foresee in the adaptation or implementation of the BC Energy Step Code?**

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**13) What type of policies/incentives do you consider most effective / useful to support industry in meeting the bylaws around energy efficiency upgrading?**

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**14) As the last section, please add any further comments you have**

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Thank You!

**Thank you for your assistance taking this survey. Your input is invaluable as we move forward to energy efficient updates on the Vancouver Building Bylaw in 2021.**

- Heat pump market

## Heat Pump Market in Vancouver

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### Air Source Heat Pump Market in Vancouver

**In preparing for the 2021 and 2025 Vancouver Building Bylaw (VBBL) energy updates for single family homes, we are working to better understand the supply side of the high performance heat pump (HP) market in terms of gaps.**

**As we move forward with these updates, we want to ensure future regulation on improved energy performance of heat pumps can be supplied by manufacturers at a market acceptable price.**

**To assist with that, we are contacting HP manufacturers like yourself, to learn more about the types of high-performance air source heat pump lines for space heating that are currently produced in the industry.**

**Please note that individual responses will not be shared and your response will only be reported in aggregate format.**

**Your feedback will help inform our recommendations and timelines for compliance.**

#### **1) What is the name of your brand?**

Individual responses will **not** be shared. Only aggregated results will be reported

**Logic: Show/hide trigger exists.**

#### **2) Do you sell air source heat pumps in Vancouver?\***

Yes

No

Comments:

**Logic: Hidden unless: #2 Question "Do you sell air source heat pumps in Vancouver?" is one of the following answers ("Yes")**

**3) What do you estimate to be the number of heat pumps for space heating that you sold in 2017 in Vancouver?(all types)**

Please comment if the numbers reflect Metro Vancouver area

Comments:

**Logic: Hidden unless: #2 Question "Do you sell air source heat pumps in Vancouver?" is one of the following answers ("Yes")**

**4) What percentage of your sales in 2017 in Vancouver do you estimate to be for air-source heat pumps for space heating?**

\*

**Logic: Hidden unless: #2 Question "Do you sell air source heat pumps in Vancouver?" is one of the following answers ("Yes")**

**5) What were your most popular models of air source heat pump for space heating in Vancouver in 2017?(Optional)**

Please comment if the numbers reflect the Metro Vancouver area

	Model name	Estimated percentage of sales in Vancouver	COP	Tonnage
Rank 1				
Rank 2				
Rank 3				

*Comments:*

**Logic: Show/hide trigger exists.**

6) Do you have a dealer network in Vancouver?\*

- Yes
- No

*Comments:*

**Logic: Hidden unless: #6 Question "Do you have a dealer network in Vancouver?" is one of the following answers ("Yes")**

**7) If you are willing to share this information please provide the relevant information (such as their website or company name) via a link or note them below**



**Much of BC has adopted the BC step code and the City of Vancouver may consider adopting a step code performance path (in addition to the prescriptive path that currently exists) in the next code cycle. Given this we are working with the Vancouver Economic Commission to understand how adoption of the BC step code for Part 9 homes (single family, townhomes and Multi Unit Residential under 4 storeys) could affect HRV manufacturers. With that in mind please take a minute to answer the following 3 questions.**

**Logic: Show/hide trigger exists.**

*8) Are you familiar with BC step code Part 9 homes?\**

- Yes
- No

**Logic: Hidden unless: #8 Question "Are you familiar with BC step code Part 9 homes?" is one of the following answers ("Yes")**

**9) What risks do you foresee or anticipate related to the adoption or implementation of the Energy Step Code in BC?**



**Logic: Hidden unless: #8 Question "Are you familiar with BC step code Part 9 homes?" is one of the following answers ("Yes")**

**10) Which opportunities do you foresee in the adaptation or implementation of the BC Energy Step Code?**

An empty text input field with a light gray background and a thin border. It includes standard navigation controls: a left arrow, a right arrow, and a vertical scroll bar on the right side.

**11) What type of policies/incentives do you consider most effective / useful to support industry in meeting the bylaws around energy efficiency upgrading?**

An empty text input field with a light gray background and a thin border. It includes standard navigation controls: a left arrow, a right arrow, and a vertical scroll bar on the right side.

**12) As the last section, please add any further comments you have**

An empty text input field with a light gray background and a thin border. It includes standard navigation controls: a left arrow, a right arrow, and a vertical scroll bar on the right side.

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Thank You!

**Thank you for your assistance taking this survey. Your input is invaluable as we move forward to energy efficient updates on the Vancouver Building Bylaw in 2021.**