

3911 W 23rd Ave

HERITAGE ENERGY RETROFIT GRANT CASE STUDY

Building at a Glance

Location – 3911 West 23rd Avenue

Size – 255 meters squared

Style – Single family detached dwelling

Built – 1931

Purchased – 2000

GHG reductions – 5.5 tonnes/year

Post Retrofit Emissions – 1.4 tonnes/ year

Energy Efficiency Retrofits

HVAC - Central Air Source Heat
Pump

Air sealing - 24% Improvement
(9.18 ACH to 6.97 ACH)

Installation of 12 storm windows



Photo Credit: VHF

Background

The Heritage Energy Retrofit Grant (HERG) Program aims to achieve greenhouse gas emissions reductions in heritage houses while maintaining the character and integrity of the home. It also enables homeowners to reduce their energy bills and increase the comfort of their home.

In preparation for their retirement, the homeowners of 3911 W 23rd Ave wanted to make some changes to create a more comfortable home. They approached the Vancouver Heritage Foundation regarding HERG as they valued the heritage fabric of their home and wanted to make the most sustainable upgrades possible.



Photo Credit: VHF

Storm Windows

Storm windows are secondary glazing that can be installed in either the interior or exterior of a window to significantly increase heat retention. They mimic the effects of a double-glazed window by adding an additional layer of glass but protect the integrity of the original windows.

Windows

The homeowners told us that after 22 years in this house, the winter following their retrofits was the most comfortable winter they'd had in their home, especially in their front living room. The living room ducts have the longest run so the previous gas furnace struggled to bring even or adequate heat to this front room. The leaky chimney and single pane windows also caused a substantial amount of heat loss.

They were unsure if they could increase the heat retention of their home while retaining the remaining original windows. During their initial home renovation in 2000, they were not offered options to maintain the wood windows in their basement unit and were told to switch to vinyl windows by their contractor. In this renovation, they found more options to upgrade and maintain the character windows. The front windows had fixed storm windows installed, which allows the casement windows to open and protects the leaded glass, while significantly improving heat retention.

Storm windows have played a large part in helping to retain heat, even on the large single pane picture window in the living room. The homeowners had previously installed weather stripping before deciding to install storm windows; however, the large cut outs for the hinges on these original wood windows made it extremely difficult to create an airtight seal. Therefore, the contractor decided to install interior wood moulding with weather-stripped backing, while using the old hardware to maintain the integrity of their original leaded wood windows.

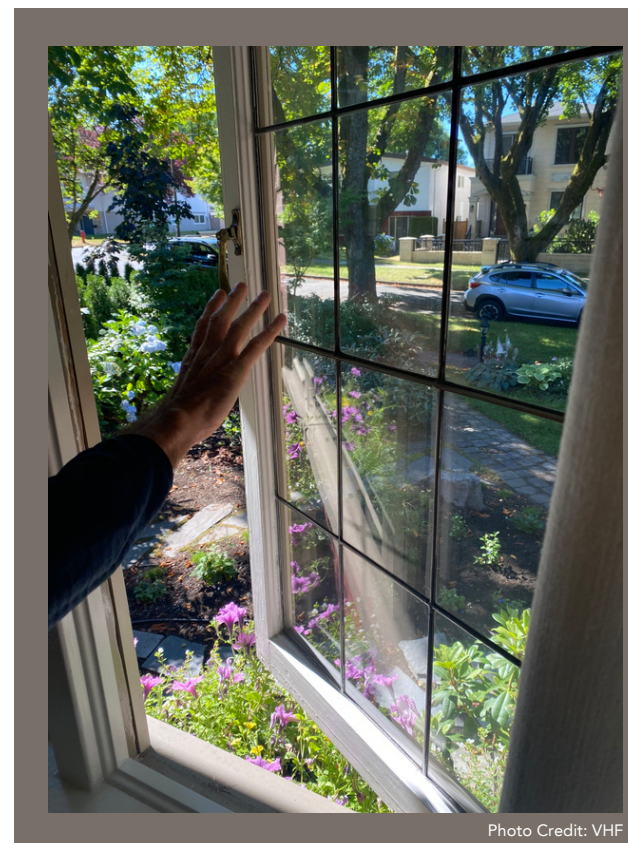


Photo Credit: VHF

Interwar Arts and Crafts

3911 W 23rd Ave is an Interwar Arts and Crafts style house built in 1931. This home features a jerkinhead roof with side gables, which is a common identifying feature of Interwar Arts and Crafts homes. This style of house may also have windows set in threes with a projecting bay facing the street.

Interwar Arts and Crafts houses tend to be smaller than the grand pre-war Arts and Crafts mansions and are often associated with Storybook cottage styles. Material composition of these houses, built between 1920 to 1940 are stucco or lap siding with the roof often being asphalt shingles. This house has mostly casement windows with sections in leaded glass.

Jerkinhead Roofline



Photo Credit: VHF



Photo Credit: VHF

Leaded Glass Windows

Leaded glass windows are a particularly vulnerable character feature in heritage homes. The lead came is quite soft and will commonly bow with age.

For houses with these types of windows, exterior storm windows are recommended to protect the glass and increase the R-value.



Photo Credit: VHF

Heat Pump Installation

The homeowners placed their heat pump in the back of the house for the best air circulation and access to the existing utilities.

The installation of the heat pump was easy, even in the dead of winter. The process took two days, and the installers left the gas furnace connected over the first night before coming back the following day and fully connecting the heat pump, ensuring that there was never a night without heating. The heat pump is currently utilizing the existing ducts and no major electrical upgrades were needed.

What is a Heat Pump?

A heat pump is an electrically driven device that extracts heat from a low temperature place (a source), and delivers it to a higher temperature place (a sink).*

The benefit of the heat pump and storm windows were clear immediately. The heat pump can better distribute the heat through the house compared to the furnace, even though the ducting is the same. The windows have improved heat retention as well. They help maintain the warmth in the house by keeping it at a consistent temperature of 20°C with the heat pump, compared to 13-18°C previously with the gas furnace.

Despite the 2-7 degree increase in the average temperature, the running costs have been virtually the same as the gas furnace with the current electric air-source heat pump. That is with a higher temperature in the house and greater comfort. A heat pump could also be used to air-condition in the summertime to achieve greater comfort as well. In this case, the homeowners opt not to use their heat pump in the summer to decrease their electricity intake.

Heat Pump Specs

BTU: 36,000

Brand: Mitsubishi

Model: PUZ-HA36NHA5 Hyper Heat inverter

Air Handler: PVA-A36AA7 variable speed air handler



Photo Credit: VHF

*<https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about/energy-star-announcements/publications/heating-and-cooling-heat-pump/6817>

One of the most common concerns with heat pumps is their volume, especially as they are placed outside, sometimes very close to neighbouring houses. The homeowners stated that while the heat pump does make noise, it is not loud, it cannot be heard from the house, and they have received no complaints from their neighbors. They have found that the air exchanger inside the house is actually quieter than their previous gas furnace.



Photo Credit: VHF

The homeowners were motivated to make the most sustainable decision and reduce their greenhouse gas emissions. They especially wanted to reduce their gas consumption, which led them to consider a heat pump. Electricity is lower carbon intensive compared to natural gas in BC, which significantly affects the GHG emissions of the house. They also felt like they needed to do something about the heating, as they wanted a more comfortable house, and the gas furnace was not sufficient.



Photo Credit: VHF

They considered many different installation companies and had many groups visit their home for an initial visit to conduct a cost assessment as well as make recommendations regarding the size and model of heat pump that would best suit their home.



Photo Credit: VHF

Air Sealing

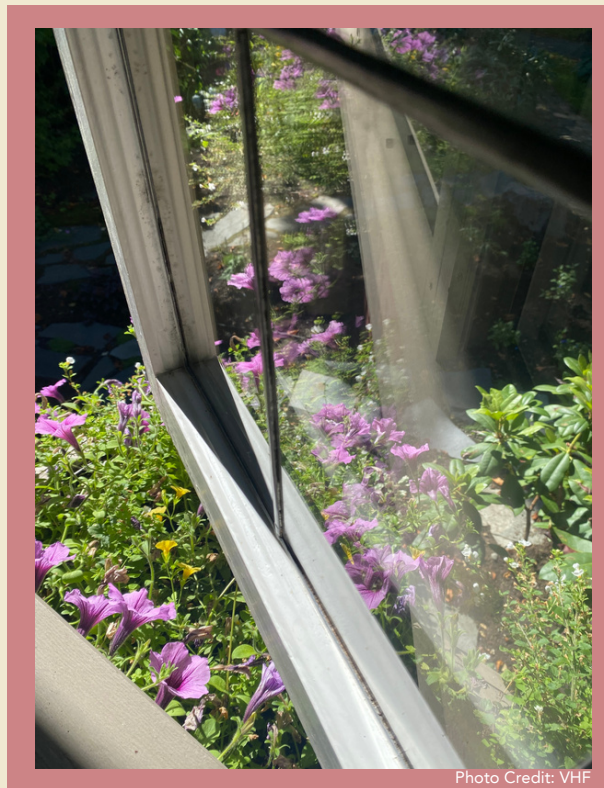
Air sealing the large fireplace in their living room was one of the primary suggestions highlighted by the pre-retrofit evaluation. The homeowners installed a wood-burning insert into the fireplace, lessening the air leakage as the first air sealing project before they began evaluating their original windows.

Home Energy Assessment

The homeowners' advice for anyone considering a large retrofit project is to think about the whole house. Consider what you need, what you are unhappy with, and make a step-by-step plan on how to accomplish those things, looking at the house as a whole system.

The homeowners found that the suggestions provided by the energy advisors were helpful in prioritizing their plan. They had prepared significant research beforehand so when their home was assessed, they already had a solid idea of the primary upgrades they would need to undertake.

The assessment also provided them with additional information that aided in making more informed decisions, such as thermal imaging and the r-value (insulation) of main walls and windows.



Conclusion

Through their energy efficiency retrofits, the homeowners accomplished a 5.5 tonnes per year reduction in their home's greenhouse gas emissions.

Their most important achievement was accomplishing their goal of transforming their home into a comfortable and warm space without increasing the cost of their utility bills.

The 24% improvement in air sealing accomplished by the storm windows, weather stripping and fireplace insert aided greatly in the home's heat retention. With that greater heat retention, the heat pump can run as efficiently as possible, leading to minimal GHG emissions and low utility bills.

These retrofits were completed with minimal disturbance to their daily lives as they continued to live in their home during all of the renovations.

The homeowners extensive research and the advice of VHF and the Energy Advisors also helped the homeowners to access the maximum rebates available, allowing for a robust and successful whole home energy retrofit.