

2019 July 20

To: City of Victoria Mayor & Council

**Re: 2740/42 Fifth St Rezoning Application - Green Building Features**

Thank you for taking the time to consider this proposed rezoning and the energy efficiency concepts incorporated into the design of this project. As the population continues to expand and there is an increased need for residential buildings to conform to energy standards, incorporating energy saving measures into the design of new buildings from the ground up is the most effective means of reducing residential energy consumption per capita. As society becomes more energy literate, setting local examples as precedent will help demonstrate the realm of possibility.

**TARGETED CERTIFICATIONS**

Using third-party rating systems for energy performance is a measurable way of demonstrating that a project meets specific performance standards. Both the EnerGuide Rating System and Built Green are being utilized for this project.

The current version of the EnerGuide Rating System has abandoned the 0-100 scale, and now provides an energy performance rating, stated in Gigajoules per year. The current design for the proposed development exhibits an EnerGuide Rating which is nearly 20% more efficient than a comparable building built to the BC Building Code minimum standards and using traditional construction practices. This is due to the Passive Building Design principles being utilized.

Built Green Bronze certification is targeted because it takes into account the buildings operational energy performance, sustainable building practices, and the embodied energy involved in constructing a new building. Further, The City of Victoria has accepted Built Green Canada's "Sustainable Building Challenge to Municipalities", so we are aiming to align our project with current City of Victoria goals.

**PASSIVE DESIGN PRINCIPLES**

Passive Building Design principles are important to use when undertaking a building project. We believe in them so much that we used them when building the existing duplex building, and then started a local business to help others use them too.

A building operates as an entire system, rather than just a sum of its parts. Knowing this, we are incorporating tried and true passive design features into this building.

- Building orientation was analyzed to maximize winter season solar gains. By doing so, it reduces the amount of energy needed by an active heating system. The location of the building on the property enables it to receive the greatest amount of winter sunlight. The window sizes and locations were also carefully considered based on the seasonal sun path and the surrounding

buildings and trees. The proposed building is designed so that much of its heating load is provided through the sun, thanks to these considerations.

- Solar shading is incorporated into the design to prevent summer season overheating. Horizontal roof projections have been calculated based on sun paths during summer months, and tested through energy modelling to ensure a comfortable summer temperature. In addition, passive summer ventilation will be provided by strategic window openings and the ventilation system.
- A Heat Recovery Ventilator (HRV) is being used to ventilate the entire building. An HRV enables fresh air to be brought in, without letting the heat out. Further, this unit will see its supply air location installed in such a way as to help the building cool during the summer evenings.
- Window performance values are considered and tested through energy modelling. Doing so ensures solar gains are best utilized, and certification targets are achieved.
- The thermal bypass envelope is the separation between heated and unheated spaces. Sufficient effective thermal insulation values are being considered and tested through energy modelling in order to achieve the desired building certifications.
- Air tightness is also an important feature to achieve low energy use. The air barrier strategy will ensure that the performance of this building exceeds the Step Code design criteria.

The proposed building has been designed to incorporate a careful balance between traditional construction practices and Passive Building Design principles, and is targeted to achieve Step 3 from the BC Building Code's Energy Step Code. Our goal with this project is to prove a concept. This will be achieved by showing people that Step 3 can be easy to achieve without adding extra cost to a project, providing it is designed correctly at the preliminary project phases and executed correctly on site. We don't want to just believe it can be done; we want to prove it.

## **SUSTAINABLE ARCHITECTURE**

One driving concept utilized for the existing building, as well as the proposed building on this property, is sustainable architecture. We have focused on minimizing our environmental impact wherever possible. Let's look at some examples:

Re-purposing materials is a great way to add character and keep materials out of the landfill. The old, dilapidated, existing home on this property was a nuisance for the neighbors and the City's Bylaw Enforcement department. It was unfortunately not salvageable to live in when we purchased the property in 2015, however we made a conscious effort to give away what was re-usable (plants, bricks, lumber, etc) and salvage some existing material during its demolition. We incorporated what was kept of the old vertical grain fir flooring into the interior finishes of the existing building's kitchens, and have saved some for the new proposed house. We've received lots of compliments on the end result thus far.

Renewable energy generation is gradually becoming popular. Both the existing duplex and the design of the proposed house are prepared for the installations of roof-top photovoltaic (PV) arrays through design, structural considerations, and roughed-in conduit pipes. The proposed house will meet Canada's Solar Ready guidelines for this type of system.

Greenhouse gas emissions have been considered. In order to keep the greenhouse gas emissions low, we are using electrical heating systems through-out. Natural gas systems would drastically increase these emissions. Further, by using electric heating systems, a future PV array will offset most (or all) of the buildings annual heating demand.

We believe in comfortable living spaces, and will eliminate or reduce any unhealthy indoor environment factors. All of the interior finishes (flooring, cabinets, counters, paints, etc) are being selected based on low volatile organic compounds (VOC's). Further, before the building is occupied, the ventilation system will run on high for at least 24 hours, and then have the HRV filters replaced with new, as endorsed by Built Green.

The most energy efficient shape for a building is a sphere. This isn't a practical shape to build, so the next best thing is a cube. The thermal envelope surface area to building volume ratio (SA:V) was chosen based on our experience with designing and building the existing Passive House duplex building. The same SA:V ratio is incorporated with this building, further improving passive design principles.

Rather than lose valuable heat (and energy) down the drain, a Drain Water Heat Recovery (DWHR) unit is being proposed. This device is a simple, cost-effective, and underutilized piece of equipment that can be easily incorporated into a new building. All of the water that enters the water heater passes through this device, and all of the drain water from the upper floor tub and shower also pass through this device. When the showers are being used, the heat from the drain water will be recovered and used to pre-heat the domestic water entering the water heater. This reduces the amount of energy needed to heat the tank, while also improving its performance and longevity.

## **TRANSPORTATION**

Our perception of cars is changing, and electric vehicles are becoming increasingly popular. The proposed new house will have an electric vehicle charging station on it's exterior, so that one of the parking spots can support the charging of an electric car.

We are all for choosing bikes as transportation instead of cars. This project will incorporate the three existing off-street parking spaces, and will not go beyond the minimum required spots outlined by the City. This was decided upon based on the green building indicators checklist on the Rezoning application. The current residents of the property (ourselves and our tenants) have all been easily and safely using these parking spaces over the past 2.5 years, and they serve the property well.

With the ownership of bikes comes the need for added security. The existing duplex units and the proposed house all have large storage rooms connected to the entry foyer. This space has proven beneficial for us and our tenants, and serves as a safe and climate-controlled location to store bikes. We currently store six bikes, wall-mounted in our storage room, with plans for even more.

## **LANDSCAPING AND HORIZONTAL SURFACES**

The original duplex project incorporated permeable concrete for all paved surfaces. We were the second people in the City of Victoria to utilize this building material. We originally decided to use this because it will allow natural groundwater recharging, and also remove the need to install additional underground piping. This material will be continued for the remainder of the paved surfaces on the property.

A peaceful yard space is a great amenity. In addition to having added new trees over the past year, we are not planning to remove any trees.

## CONCLUSION

Our life long belief in environmental responsibility and energy efficiency has driven us to build one of the most energy efficient buildings in the City. The reward of the process and interest in the science of it inspired us to start a local business based on helping others meet and exceed their own building construction projects energy goals. We are now excited by the prospect of building a new home to showcase the relative ease and financial plausibility of constructing a new home that aligns with the City's fast upcoming Step Code adoption in 2020, as well as the Province's expected Step Code level 3 adoption in 2022.

Thank you for taking the time to read this report. Please feel free to contact the undersigned with any inquiries or feedback.

Kind regards,

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