



# Local Resident Takes the Extra Step

Step 5 with Passive Solar Design  
and Natural Gas Heating

Kimberley, BC

PRESENTED BY





## THE CHALLENGE

Sanford Brown decided to leverage his experience with inspecting and building other people's homes to design and build his own energy efficient and sustainable home. Although he had very limited experience with Step 5 homes, he understood the principles in both construction and design. It was also important for him to include natural gas to reduce ongoing operating costs.



## THE SOLUTION

Sanford and his wife purchased a corner lot with southern exposure and began to incorporate passive solar design into their dream home. In addition to maximizing window space in the appropriate areas to ensure lots of natural light and passive solar gains for added winter comfort, the home was oriented to allow for solar PV panels to be added to the roof in the future. The home mimics Scandinavian architecture and minimizes the surface area of exterior walls to help reduce thermal bridging. The home also incorporates a gas-fired combi-boiler, which enables in-floor radiant heating and is an affordable solution for hot water heating.



## HOME PROFILE

<b>Location</b>	Kimberley (Climate Zone 6)
<b>Construction</b>	Spring 2019
<b>Size</b>	3,000 ft <sup>2</sup>
<b>Bedrooms</b> 4	<b>Bathrooms</b> 4
<b>BC Energy Step Code Level</b>	
<b>Targeted</b>	Step 5
<b>Achieved</b>	Step 5

## PRO TIPS

- Where possible, consider your lot prior to designing, and incorporate passive solar into the home's design.
- Insulation is relatively cheap, so add it everywhere you can!



*"It was important to my family to invest in our home with better building products that would save money by reducing long term operating costs"*

Sanford Brown, Homeowner, Builder & Designer



## THE PROJECT UPGRADES

The home's R41 walls are comprised of two 2x4 walls with a 3.5 inch gap in between filled with three layers of R14 Rockwool insulation. Insulated concrete forms (ICF) were employed for the building foundation, providing R22 insulation in the basement and the home includes R27 under-slab insulation.



## FINDING THE RIGHT PRODUCTS

Sanford believed the right products could help improve his home's envelope. He understood that a high-quality air barrier on the exterior would help achieve Step 5, so he used air barrier products from Swiss manufacturer Siga to better seal off his home. Sanford also opted to purchase higher quality windows and doors. It took quite a bit of time to find the right products and they were relatively expensive; however, Sanford knows that the home will be more comfortable and the reduced operating costs will pay for these investments quickly.

## WORKING WITH AN ENERGY ADVISOR

Having worked in the construction and home inspection space, Sanford knew that the energy advisor would be an important resource. He relied on his advisor throughout the entire process, including during the design phase. The advisor provided support to ensure insulation levels were not applied beyond the point of diminishing returns and that window placement and design specs allowed sufficient natural light and passive heat but not too much that the home might overheat. Furthermore, Sanford conducted a mid-construction blower door test to flag any leaks and repair them prior to drywalling.



## PROJECT DETAILS

### ENVELOPE

<b>Airtightness</b>	0.45 ACH <sub>50</sub>
<b>Attic Insulation</b>	R53
<b>Foundation Insulation</b>	R23 - Insulated Concrete Forms
<b>Under Slab Insulation</b>	R27
<b>Wall Construction</b>	Double frame (2x4) walls with 3.5 inch gap filled with insulation
<b>Wall Insulation</b>	R41
<b>Window/Wall Area</b>	18.3%
<b>Windows</b>	Triple glazed, argon filled, 0.9-1.0 U-value, multiple gaskets to improve airtightness

### MECHANICAL SYSTEMS

<b>Space and Water Heating</b>	Hydronic in-floor heating (AO Smith Vertex condensing natural gas combi-boiler, 189 L, 0.93 EF)
<b>Cooling</b>	Roughed-in
<b>Ventilation</b>	Venmar, 75% efficiency, 64 cfm flowrate
<b>Other Gas Equipment</b>	Hookups for gas BBQ and range

### LOADS, COST & REBATES

<b>Heating Load (TEDl)</b>	16 kWh/m <sup>2</sup> per year
<b>Mechanical Load (MEUI)</b>	32 kWh/m <sup>2</sup> per year
<b>% More Efficient than Home Built to BC Building Code</b>	61%
<b>Incremental Cost</b>	\$25,000 (6% more expensive than similar home built to BC Building Code)
<b>Fortis BC Home Performance Rebates</b>	\$8,500

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