Optimizing the Design of High Performance Homes

Achieving Step Code 5 with Natural Gas

Kimberley, BC

PRESENTED BY

ICF

FORTIS BC™

CHALLENGE

Traditionally a custom home builder, this was one of the first development projects for Tyee Homes, with Stage 1 consisting of seven duplexes. Two floorplans were designed and built - a smaller model (1,984 ft²) and a slightly larger model (2,450 ft²). While their tried-and-true building materials and techniques were used in each unit, some achieved Step Code 5 (detailed here) while other units achieved Step Code 4.

PRO TIP

Having experimented with products from a variety of manufacturers, Tyee Homes relies on the SIGA wrap and tape to help achieve high degrees of airtightness. To optimize results, they thoroughly inspect the air sealing before it's covered with rigid insulation and cladding.

LESSONS LEARNED

Moving forward, Tyee Homes plans to work more closely with their energy advisor to see what design modifications can be made to ensure all of their units meet Step Code 5 requirements. For instance, their energy advisor noted that, in addition to achieving superior airtightness, a home's orientation is an important driver and that the solar heat gain coefficient (SHGC) of windows should be tailored to their placement. In addition, it is important to monitor window-to-wall ratios since more windows and higher ceilings make it harder to meet Step Code 5 requirements. Additional attic and under slab insulation and further energy modeling can be used to help ensure compliance as well.

BACKGROUND

Tyee Homes has been designing and building award winning homes in the East Kootenays of BC for over 15 years. They are dedicated to quality and energy efficient construction, achieving high Energy Step Code levels for all of their homes.

HOME PROFILE

Location	Kimberley (Climate Zone 6)
Construction	2020
Size	2,450 ft² per unit
Bedrooms 4	**Bathrooms** 3
BC Energy Step Code Level	
Targeted	Step 5
Achieved	Step 5

"We're not doing anything that complicated. It's just something that anyone can do"

Carl Lauren, Owner, Tyee Homes

INCORPORATING PASSIVE SOLAR

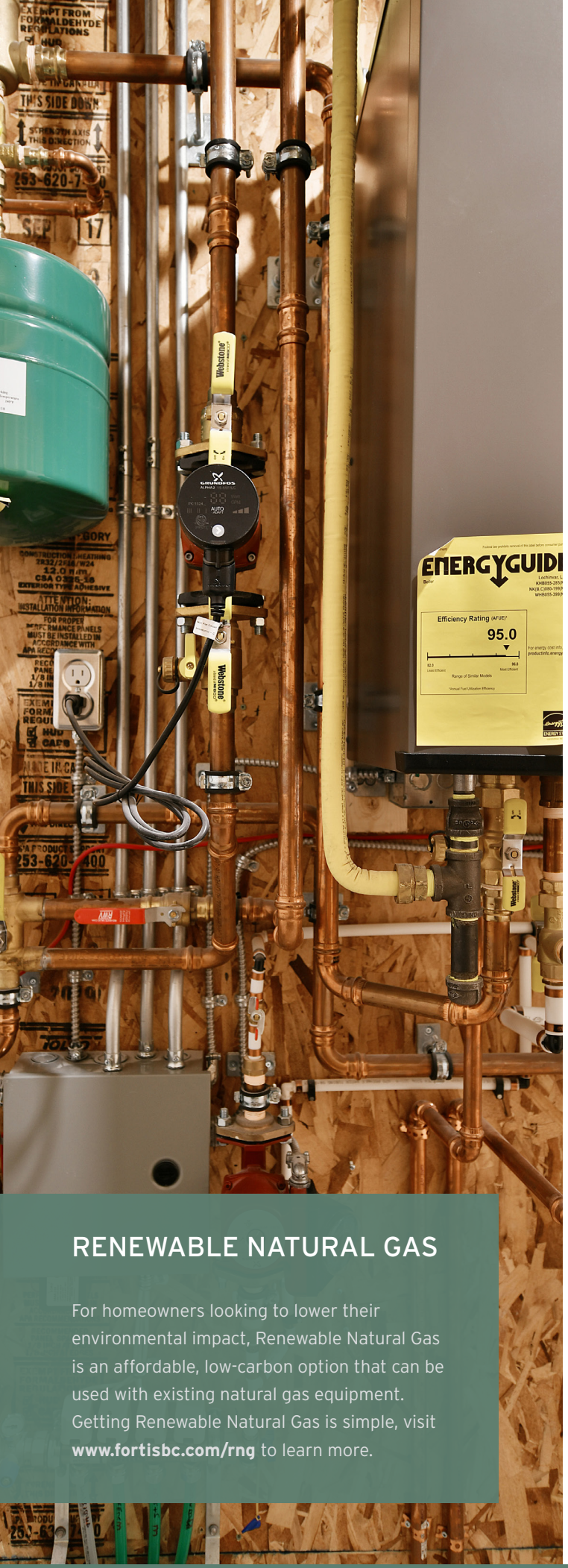
Incorporating passive solar in the design of these duplexes was challenging, given limitations of the property lots and the surrounding trees and mountains. Tyee Homes used triple glaze windows and selected the coatings based on each window's orientation. Covered decks were also provided to protect the exterior from freeze/thaw cycles in the winter and to protect against heat gain in the summer.

ACHIEVING AIR TIGHTNESS

Over the years, Tyee Homes has honed their "Tyee Signature Exterior", which includes breathable SIGA wrap membrane, SIGA tape, modified rainscreen, and rigid exterior insulation with R22 batt on the interior walls. Tyee Homes does not outsource this work, as they want to ensure that the wrap and tape are properly installed. By using this approach, air tightness levels of approximately 0.7 air changes per hour are consistently achieved in each home they build. The builder largely attributes their success in achieving Step Code 5 for these duplexes to their emphasis on insulation and airtightness.

MECHANICAL SYSTEM

The duplexes use combi boilers to satisfy both water and space heating. Tyee Homes offers in-floor radiant heating on both levels as a standard heating system for all of their homes due to its high efficiency, ease of use, and improved comfort. Homeowners also appreciate the multi-zone heating capabilities. In addition, in-floor radiant heating systems allow for a tidy and compact mechanical room.



RENEWABLE NATURAL GAS

For homeowners looking to lower their environmental impact, Renewable Natural Gas is an affordable, low-carbon option that can be used with existing natural gas equipment. Getting Renewable Natural Gas is simple, visit **www.fortisbc.com/rng** to learn more.

PROJECT DETAILS

ENVELOPE	
Airtightness	0.77 ACH_{50}
Attic Insulation	R60 (effective)
Foundation Insulation	R22, insulated concrete forms
Under Slab Insulation	R14, EPS
Wall Construction	2x6 walls
Wall Insulation	R22 batts + R6 continuous external EPS
Window/Wall Area	19.3%
Windows	Lux triple glaze, argon filled, 1.3 U-value, coatings optimized for orientation

MECHANICAL SYSTEMS	
Space and Water Heating	Condensing natural gas tankless combi boiler (95% AFUE). Radiant in-floor heating on both floors
Space Cooling	AC (14 SEER)
Ventilation	HRV (75% efficiency, 59 cfm flowrate)
Other Gas Equipment	Cooktop, BBQ

LOADS, COST & REBATES	
Heating Load (TEDI)	21 kWh/m^2 per year
Mechanical Load (MEUI)	39 kWh/m^2 per year
Natural Gas Consumption	28 GJ per year
% More Efficient than Typical New Home	37%
Incremental Cost	$15,000
FortisBC Home Performance Rebates*	$10,000 Step 5 Rebate + $800 Energy Advisor Support per unit

FortisBC Energy Solutions Managers are here to help. Contact us to discuss your next new construction project. www.fortisbc.com/energyteam

*Rebates are subject to change. For current rebate information, visit www.fortisbc.com/newhome

Photo credits: Chris Pullen Photography