Canada ecohouse

THE HIGH-PERFORMANCE HOUSING MAGAZINE FOR DESIGNERS, BUILDERS AND HOMEOWNERS | SUMMER 2014

WINNING PROJECT

ONE PLANET RENO

RESIDENTIAL WINNER OF THE 2014 CANADIAN GREEN BUILDING AWARDS

TIPS FROM THE FIELD
Essentials for a green home or reno

GREAT GULF ACTIVE HOUSE
Big builder pushes the boundaries

BUILDING BETTER BASEMENTS
More comfort and healthier indoor air

GREAT GULF ACTIVE HOUSE

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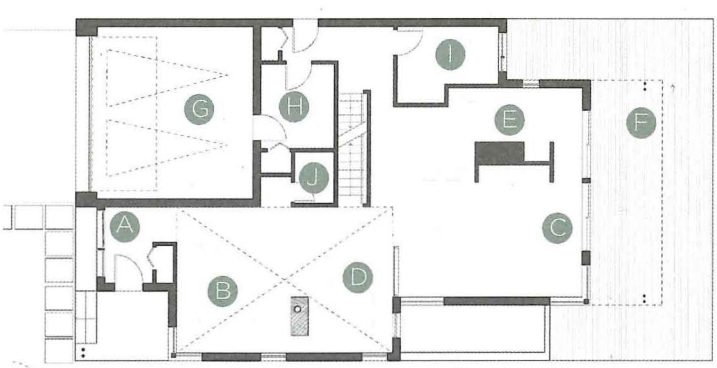
Big builder pushes the boundaries of green residential development

Great Gulf, one of the country's largest home builders, is simultaneously concerned with being an innovative, forward-thinking company, and a competitive builder in the residential market. This project in Thorold, Ontario was a leap of faith in a market that has not to date shown much interest in sustainability. Using the existing local design guidelines of a traditional gabled roof design and adapting them for the Active House yielded a multi-functional design that was the basis for an open plan, an abundance of interior daylight, and a house of superior environmental performance.

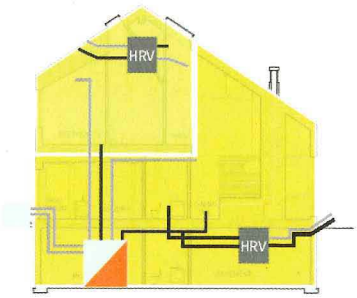
By Meg Graham

ALTHOUGH ADAPTED TO THE ACTIVE HOUSE SYSTEM, THE TRADITIONAL GABLED ROOF DESIGN SITS NATURALLY BESIDE ITS MORE CONVENTIONAL NEIGHBOURS [1]. THE INTERIOR IS AN OPEN PLAN, AND HAS AN ABUNDANCE OF INTERIOR DAYLIGHT AND SUPERIOR ENVIRONMENTAL PERFORMANCE [2].



Ground floor plan N

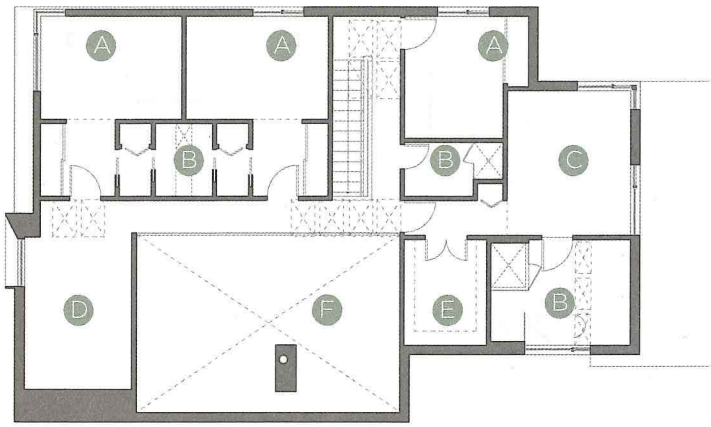
A	Entry	D	Dining Area	G	Garage	I	Study
B	Living Room	E	Kitchen	H	Mudroom	J	Powder Room
C	Den	F	Outdoor Terrace				



Two HRV zone mechanical system

The proportions and massing of the house are derived from the design guidelines ensuring that the house sits naturally beside its more traditional neighbours.

Removing visual barriers between living spaces helps give the impression of a home much larger than its 3,200 square feet. The openness of the plan is guided by two intersecting axes that maximize cross breezes and natural ventilation, therefore minimizing a reliance on air conditioning.



Upper floor plan N

A	Bedrooms	C	Principal Bedroom	E	Office
B	Bathrooms	D	Study	F	Open to below

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MATERIALS AND CONSERVATION

The house was designed as a prefabricated panelized wood structure to both reduce construction waste and the duration of on-site construction. Wall, floor and roof panels were factory built, flat packed and brought by truck to the site, and erected in just a few days.

The thermal environment of the Thorold House optimizes comfort and efficiency using zoned heating, HRVs and a high-efficiency furnace. South-facing glazing maximizes solar heat gain in the winter, while overhangs and shades keep the house cool in the summer. A heavily insulated building envelope and home automation system that operates motorized shades, skylights and windows based on heating and cooling loads ensure the house operates efficiently.

A cistern and rain water system was installed to reduce the need for municipal water when watering the lawn or using the low-flush toilets. The system captures rain from the roof and lawn close to the house; water is pumped from the weeping tile system into the cistern.

MATERIALS

- Prefabricated panelized wood structure; closed cell medium density spray foam insulation, also acts as air barrier
- **VELUX** Canada Inc. supplied:

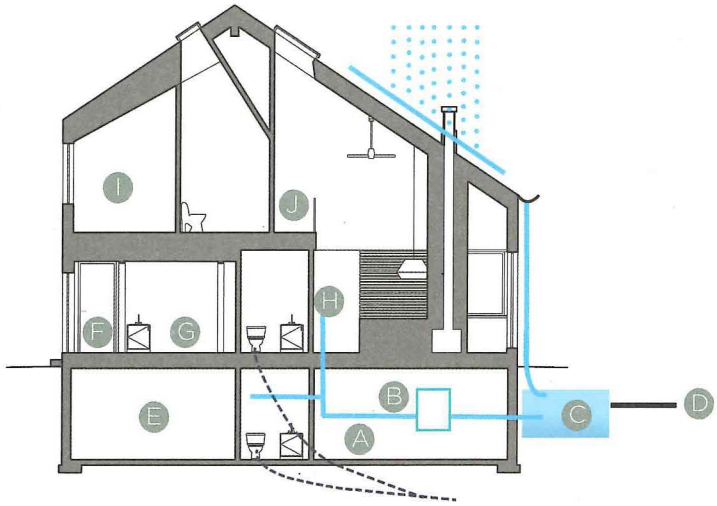
VELUX Daylight Visualizer simulation software, Electric Venting Deck Mounted unit- VSE C01, three Electric Venting Deck Mounted units- VSE C06, eight Electric Venting Deck Mounted units- VSE M08, two Solar Powered Deck Mounted units- VSS M08, and four Solar Powered light filter blinds, M08 size.

- Triple pane, dual-glazed LowE windows
- Variable speed furnace, 19 SEER air conditioner, dual zoned system with two heat recovery ventilators [HRV]; drain water heat recovery using Power Pipe; rain water cistern collects water from perimeter drainage tiles and rain leaders for toilet flushing and hose bibs

The House achieves a 35% reduction in fresh water consumption, compared to a house with a similar occupant load and roof area.

A power pipe which functions as a heat exchanger was installed. As fresh water flows up the multiple fresh water coils, warm to hot drain water flows down the inside wall of the drainpipe as a falling film. This counter flow design maximizes the amount of energy that can be recovered from the drain water while minimizing pressure loss. The power pipe is a passive energy saving device, has no moving parts, is self-cleaning, and requires no maintenance.

PROJECT CREDITS
ARCHITECT Superkül
OWNER/DEVELOPER Great Gulf
GENERAL CONTRACTOR Great Gulf
MECHANICAL ENGINEER Enermodal Engineering
STRUCTURAL ENGINEER Quaile Engineering Ltd.
PHOTOS Torben Eskerod, Copenhagen, Sweden



Water management system

A	Basement	E	Mechanical room	H	Dining room
B	Pump	F	Mud room	I	Bedroom 2
C	Cistern	G	Laundry	J	Hall
D	To the street				

IT IS CLEAR UPON ENTERING THE HOUSE THAT USING NATURAL DAYLIGHT AND VENTILATION WAS A MAIN OBJECTIVE. LITTLE TO NO ARTIFICIAL LIGHTING IS REQUIRED DURING THE DAY [3]. VIEW FROM THE STREET SHOWING WESTERN RED CEDAR ACCENT SIDING [4]. THE SECOND FLOOR HALLWAY OVERLOOKS THE DEN AND KITCHEN. FRESH AIR IS SUPPLIED THROUGH THE FURNACE INTAKE AND IS PRE-CONDITIONED BY ONE OF THE TWO HEAT RECOVERY VENTILATORS [HRV]. A SECOND HRV IN THE CONDITIONED ATTIC NEAR THE MASTER BEDROOM ENSURES THAT BEDROOMS HAVE AMPLE FRESH AIR [5]. VELUX SKYLIGHTS, OPERATED BY A HOME AUTOMATION SYSTEM, ARE A MAJOR CONTRIBUTOR TO DAYLIGHTING AND NATURAL VENTILATION [6].

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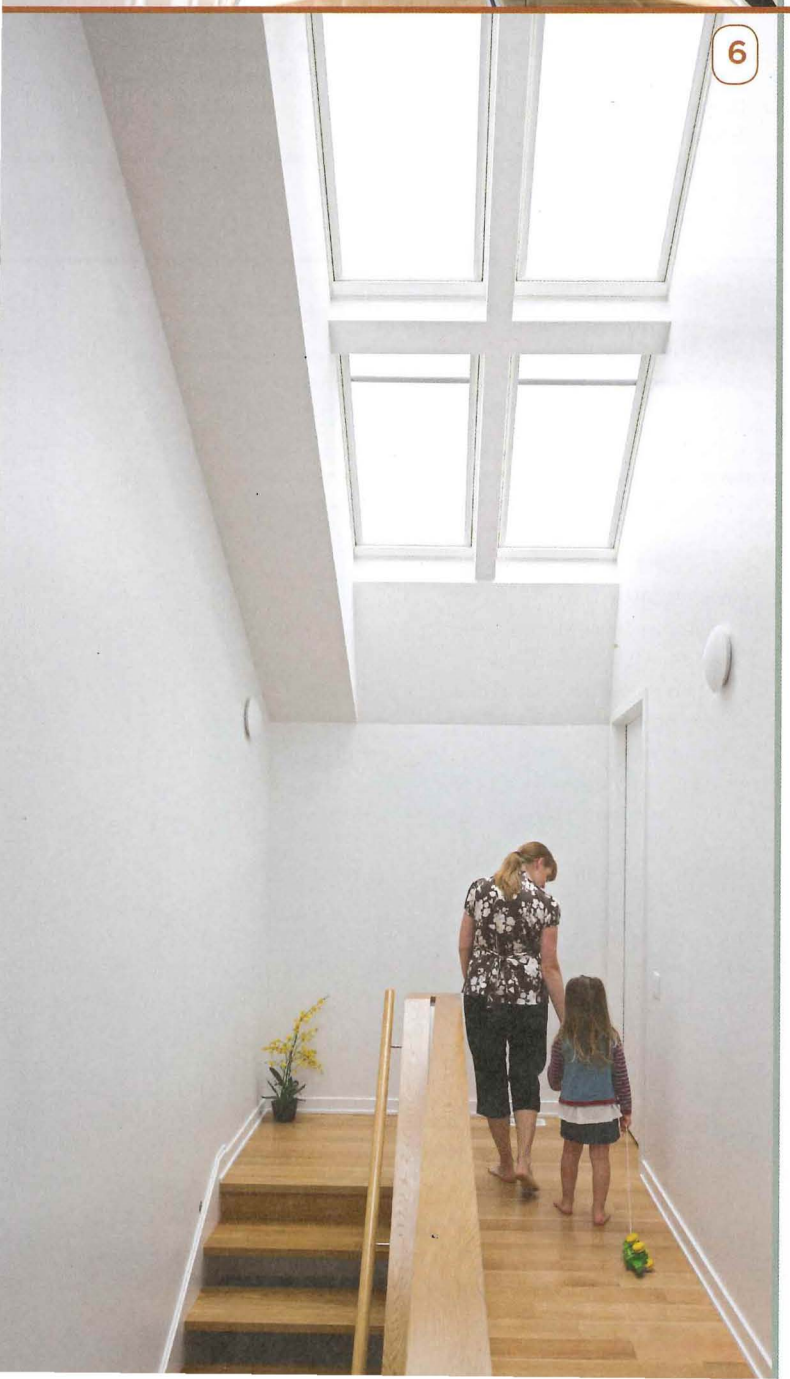
Daylight analysis [left: ground floor, right: upper floor]
The daylight factor [DF] is approximately 4% in most areas.



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LIGHT AND AIR

Upon entering the house, it is clear that one of the main objectives was the promotion of natural daylight and ventilation. The strategic use of natural daylighting helps define the character of the house; there is sufficient daylighting throughout such that little to no artificial lighting is required during the day in even the secondary living spaces.

In order to optimize direct and indirect daylighting, the design team computer modelled the house [using the computer simulation software Velux Daylight Visualizer] and the location and size of the windows and skylights.

The daylight factor [DF] is a common easy- to- use measure for the available amount of daylight in a room. It expresses the percentage of daylight available inside compared to the amount of daylight available outside the building under known overcast sky conditions. The higher the DF, the more daylight is available in the room. Rooms with an average DF of 2% or more are considered day lit. A room will appear strongly day lit when the average DF is above 5%.

Fresh air is supplied through the furnace intake and is pre-conditioned by one of the two heat recovery ventilators [HRVs] in the home. An HRV is a heat exchanger that uses the warm air being exhausted from the home to pre-heat outside winter air coming in. Likewise, in the summer the HRV can pre-cool fresh air coming into the home which reduces the energy needed to heat and cool the home while providing ample amounts of fresh air to all rooms.

A second HRV is located in the conditioned attic near the master bedroom and ensures each bedroom has ample amounts of fresh air, important for a good night's sleep.

WHAT'S NEXT

The Great Gulf Active House is a watershed in Canadian residential development, simultaneously pushing the boundaries of sustainable and modern design on a production-home basis. Lessons learned by the design team and Great Gulf from this project will be applied to the design and construction of the next version of the house, slated for Fall, 2014. ❖

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