Passive House Affordable Housing

Lisa Ker
Executive Director

Vaughan, November 8th , 2016

2082.2	m^2
14	**kWh/(m^2a)**
11	**W/m^2**
1	**kWh/(m^2a)**
4	**W/m^2**
	%
117.69	**kWh/(m^2a)**
55	kWh/(m^2a)
	kWh/(m^2a)
0.3	**1/h**

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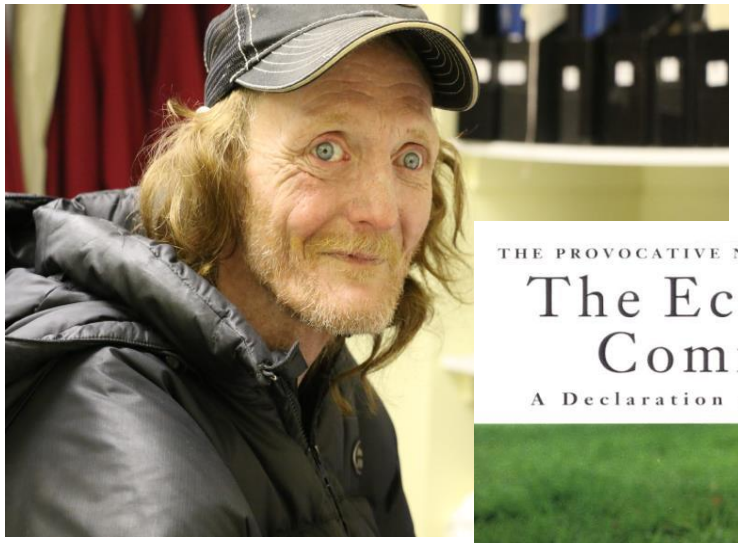

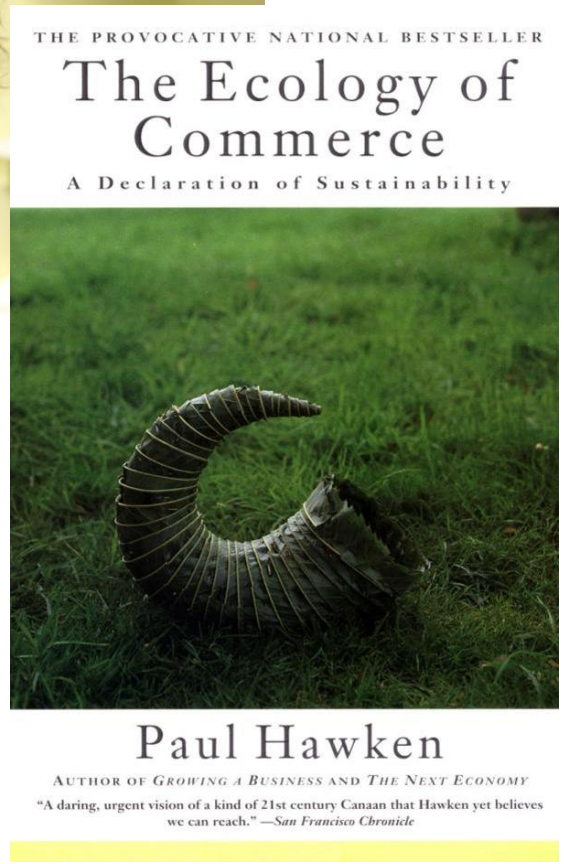

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Combat Stigma:
How the community sees us

Role Model:
How we see ourselves

Building Health Mental Health
How our tenants see us

From *'housing'* to Home:
How our tenants see themselves

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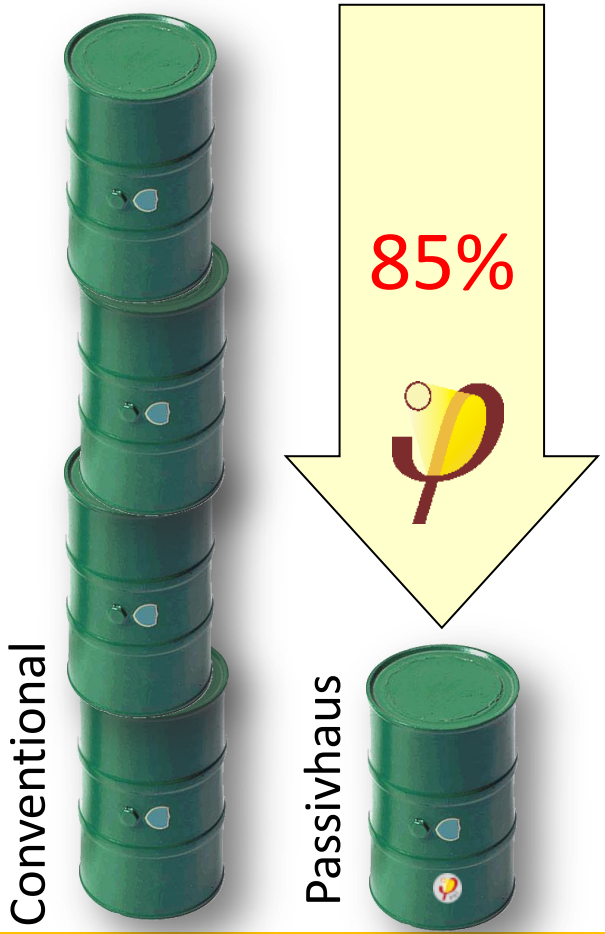
"A Passive House is a building, for which thermal comfort can be achieved ***solely by post-heating or post-cooling of the fresh air mass*** *which is required to achieve sufficient indoor air quality conditions –* ***without the need for additional recirculation of air****."* Dr Wolfgang Feist, PHI



Passive House Metrics

1. **10 W/m²** Heating /Cooling Load based on 20°C
   (or **15 kWh/(m²a)**)
   Space Heating/ Cooling Demand
2. **0.6 ACH@50Pa**
   Building Airtightness w/ Mech Ventilation
3. **120 kWh/(m²a)**
   Primary Energy Demand
4. **Ψ < 0.01 W/mK**
   Thermal-Bridge Free Construction
5. **< 10%**
   Overheating Frequency based on 25°C

PassivHaus

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Do we have the right site?

infill site, south façade fully shaded.

Do we have enough roof space for PV?

Areas m²	Final energy demand (PH)	80% roof cover with PV	Net-Zero
TFA =265 m² footprint =141 m²	12 MWh/a	~13 MWh/a (115% *)	✓
TFA =2118 m² footprint =629 m²	95 MWh/a	~60 MWh/a (63% *)	☹

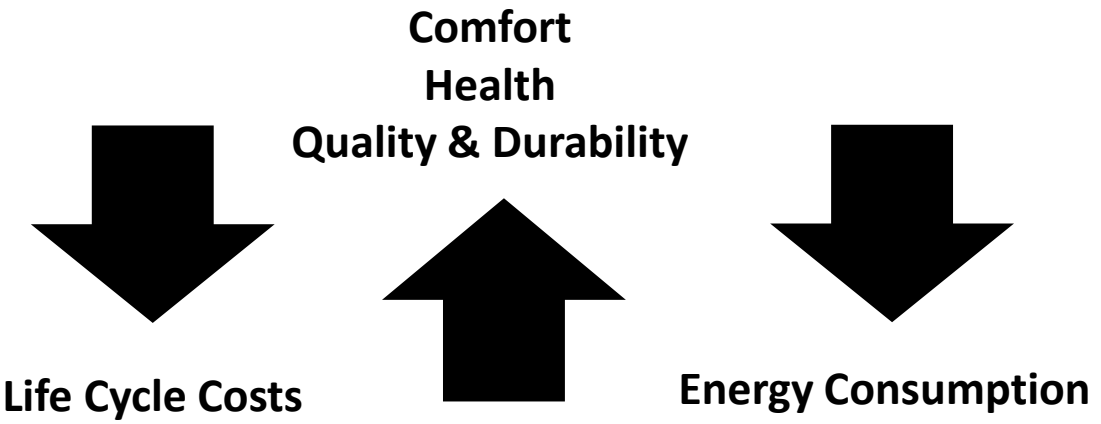
Credit: Jessica Grove Smith, PHI

Costs : analysis showed that it was cheaper to save energy than to produce energy

Is it the right scale for maintenance?

High risk of underperformance due to operator error and poor maintenance

- *Radical Energy **Efficiency***
- *Reliable **quality** assurance*
- ***Performance** that lasts*
- *Exemplary **comfort** all year round*



Efficiency, affordability, reliability first. Renewables…someday

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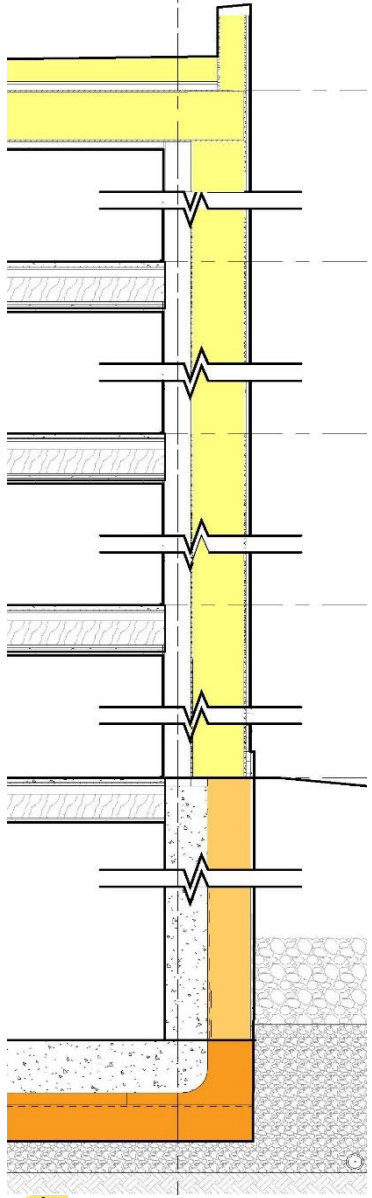
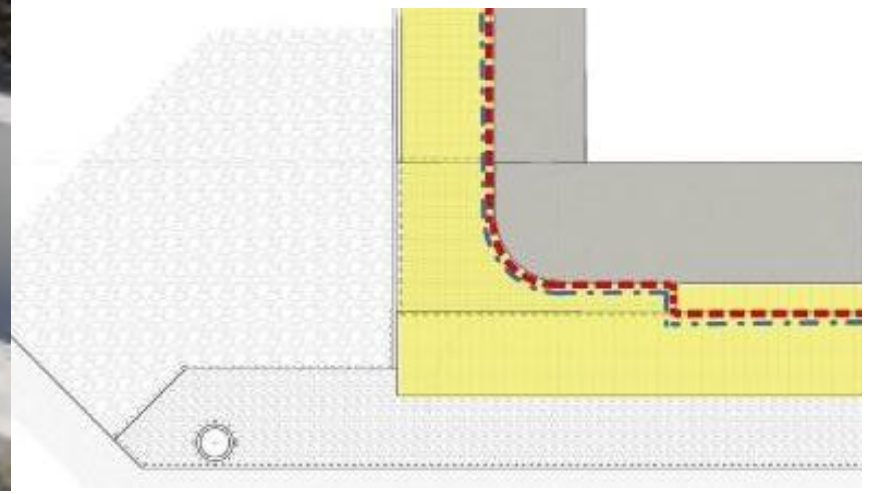


Slab on Grade: R54

13” Concrete

13” Insulation w/ vapour barrier

Granular



1-Insulation
2- Thermal bridge Free
3- Airtightness
4- High Efficiency Windows and Doors
5- MVHR

Tray Slab Foundation

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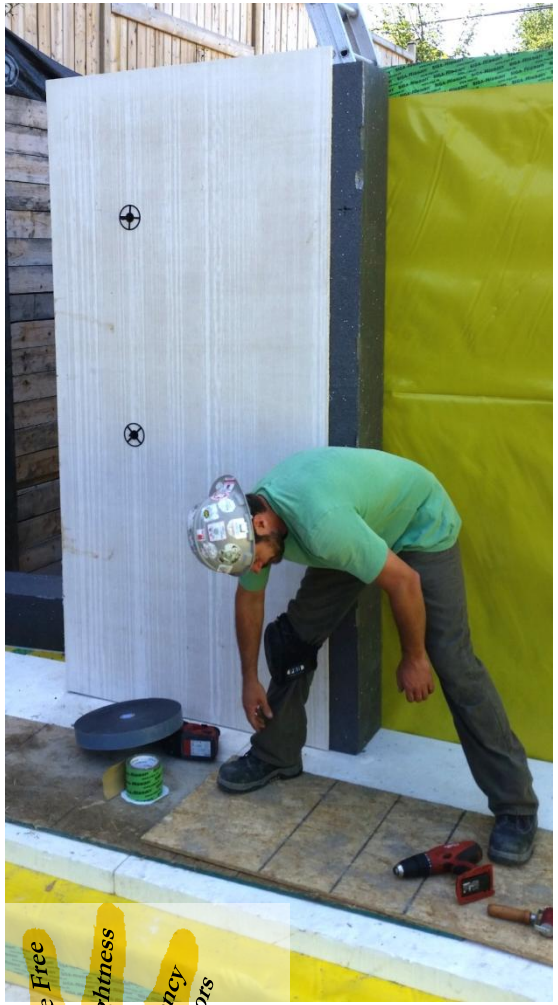

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SIPs

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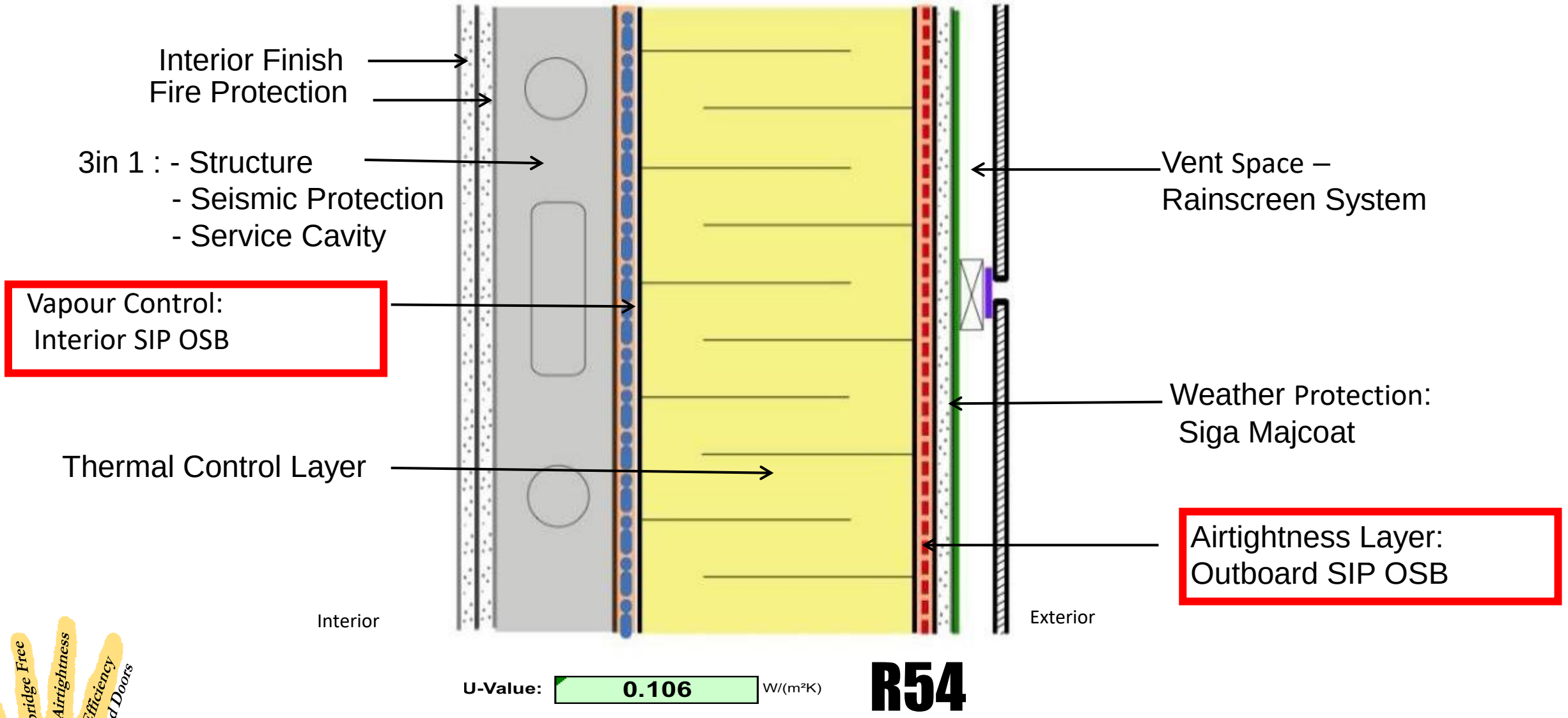

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Exterior Wall Assembly

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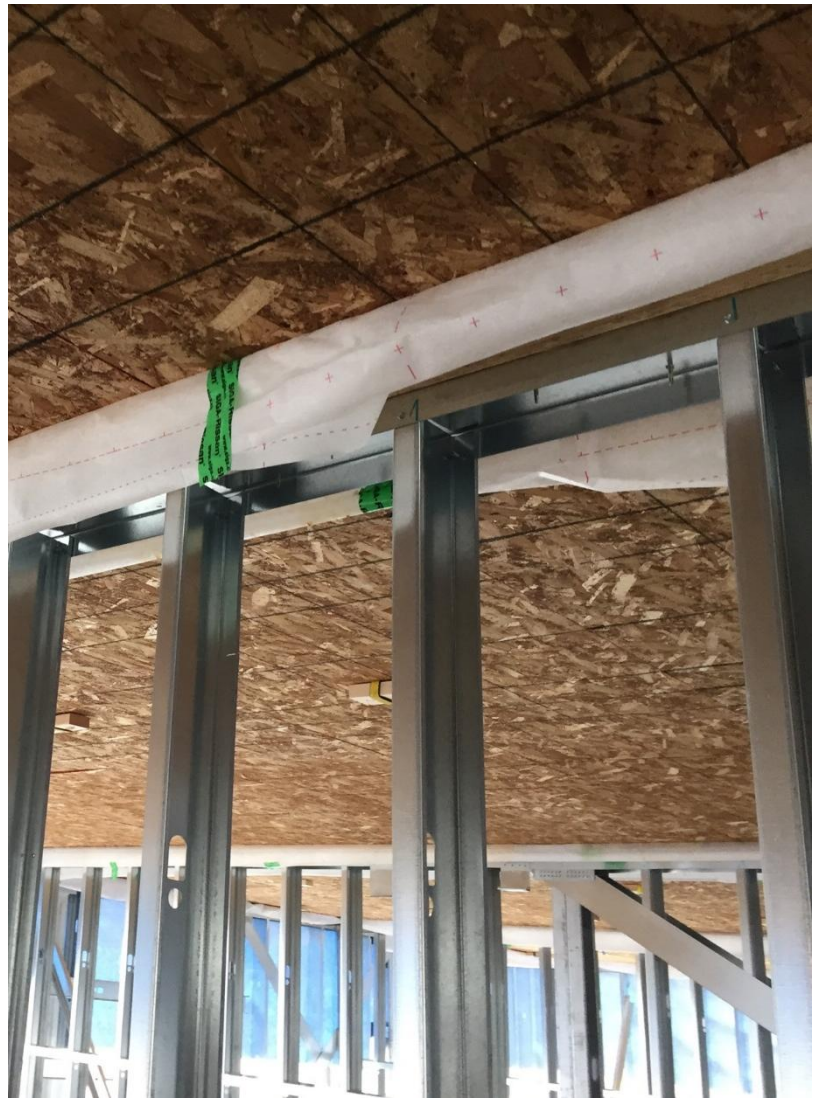

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Roof SIPs + 6” tapered insulation

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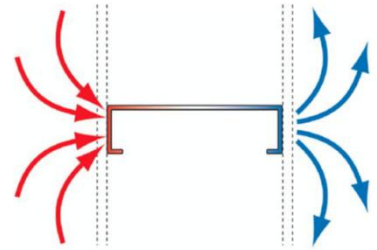
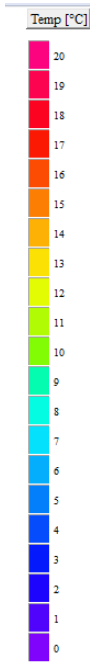




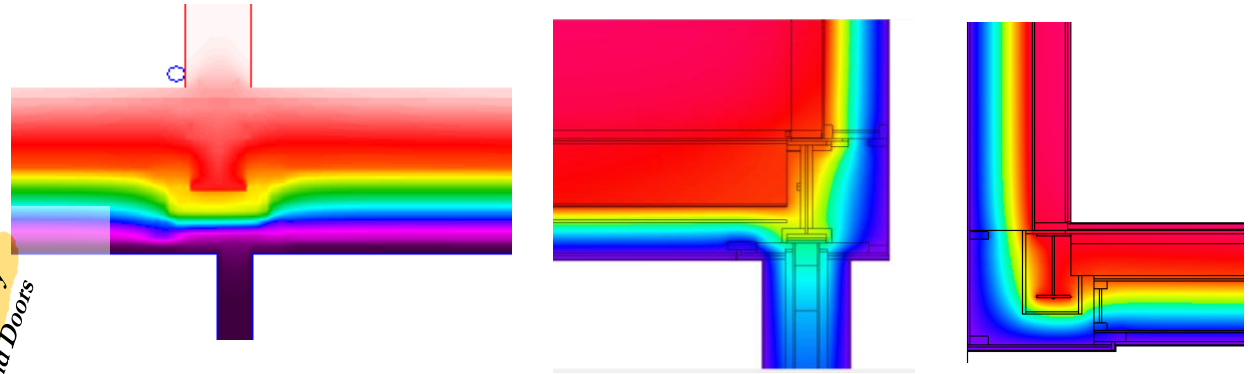
Thermal conductivities:

Neopor Insulation: 0.032 W/mK

Wood: 0.13 W/mK

Concrete: 2.3 W/mK

Steel: 50 W/mK



Thermal bridge description	User determined length [m]	Ψ W/(mK)	Fraction of transmission heat losses
Det 4/A825 Beam along K @ parking	4.73	0.082	0.1%
PH825.1R2 Garbage/ West wall	3.68	0.082	0.1%
PH825.2R2 G1 Beam above Parking	8.66	0.016	0.0%
3/A825 Column &Beam connection at G	1.00	0.024	0%

98 kWh/year - $5.00/ year

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Thermal conductivity

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All service penetrations are meticulously taped for state of the art airtightness

air tight installation at the Steel brackets with Siga Nail Seal Tape

Final Blower Door Test Results:

Depressurization:0.30 n50

Pressurization 0.34 n50

Average: **0.32 n50**

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Air Barrier

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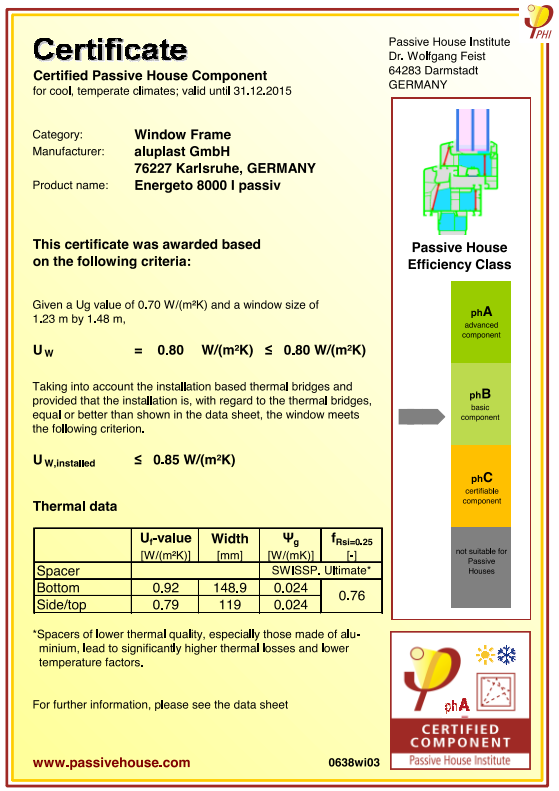


Certificate

Certified Passive House Component
for cool, temperate climates; valid until 31.12.2015

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: **Window Frame**
Manufacturer: **aluplast GmbH**
76227 Karlsruhe, GERMANY
Product name: **Energeto 8000 I passiv**

This certificate was awarded based on the following criteria:

Given a Ug value of 0.70 W/(m²K) and a window size of 1.23 m by 1.48 m,

U_W = 0.80 W/(m²K) ≤ 0.80 W/(m²K)

Taking into account the installation based thermal bridges and provided that the installation is, with regard to the thermal bridges, equal or better than shown in the data sheet, the window meets the following criterion.

$U_{W,installed}$ ≤ 0.85 W/(m²K)

Thermal data

	U_f-value [W/(m²K)]	Width [mm]	Ψ_g [W/(mK)]	$f_{Rsi=0.25}$ [-]
Spacer			SWISSP. Ultimate*	
Bottom	0.92	148.9	0.024	0.76
Side/top	0.79	119	0.024	

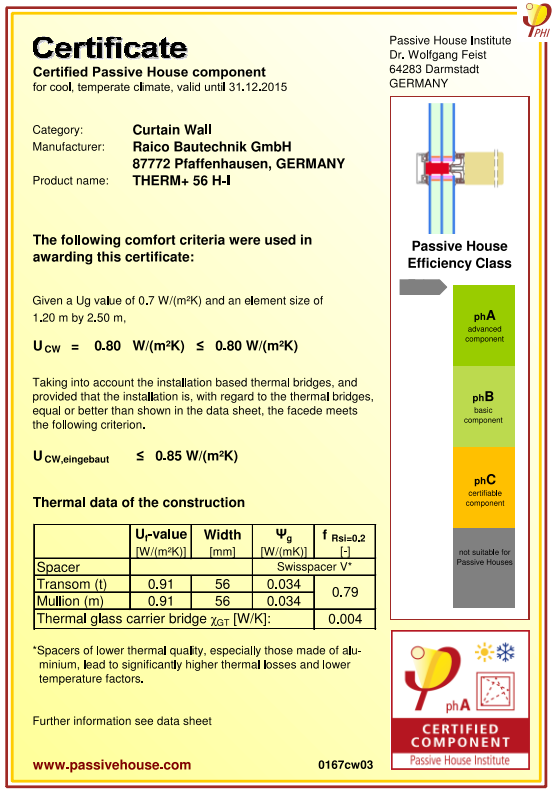
*Spacers of lower thermal quality, especially those made of aluminium, lead to significantly higher thermal losses and lower temperature factors.

For further information, please see the data sheet

www.passivehouse.com 0638wi03

Passive House Efficiency Class
phA advanced component
phB basic component
phC certifiable component
not suitable for Passive Houses

phA CERTIFIED COMPONENT Passive House Institute



Certificate

Certified Passive House component
for cool, temperate climate, valid until 31.12.2015

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: **Curtain Wall**
Manufacturer: **Raico Bautechnik GmbH**
87772 Pfaffenhausen, GERMANY
Product name: **THERM+ 56 H-I**

The following comfort criteria were used in awarding this certificate:

Given a Ug value of 0.7 W/(m²K) and an element size of 1.20 m by 2.50 m,

U_{CW} = 0.80 W/(m²K) ≤ 0.80 W/(m²K)

Taking into account the installation based thermal bridges, and provided that the installation is, with regard to the thermal bridges, equal or better than shown in the data sheet, the facede meets the following criterion.

$U_{CW,eingebaut}$ ≤ 0.85 W/(m²K)

Thermal data of the construction

	U_f-value [W/(m²K)]	Width [mm]	Ψ_g [W/(mK)]	$f_{Rsi=0.2}$ [-]
Spacer			Swisspacer V*	
Transom (t)	0.91	56	0.034	0.79
Mullion (m)	0.91	56	0.034	
Thermal glass carrier bridge χ_{GT} [W/K]:				0.004

*Spacers of lower thermal quality, especially those made of aluminium, lead to significantly higher thermal losses and lower temperature factors.

Further information see data sheet

www.passivehouse.com 0167cw03

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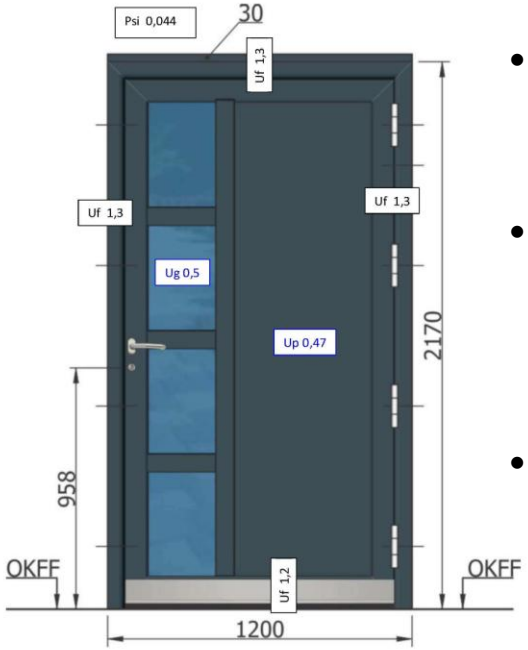
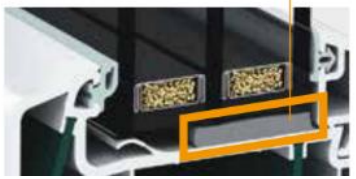
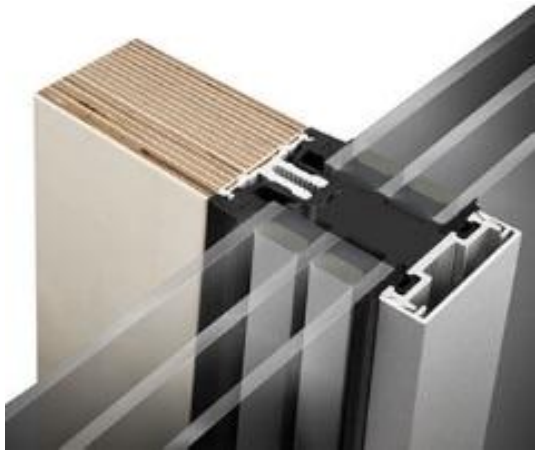


- Fenetres:
  U= 0.80 W/(m2K)
- Triple Vitrage:
  U= 0.57 W/(m2K)
  SHGC: 0.5
- Portes Exterieures:
  U = 1.1 W/(m2K)



U=0.8W/(m2K), R7



Gaulhofer

RAICO

HERRMANN'S Timber-Frame Homes

IC² TECHNOLOGIES INC.

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Windows and Doors

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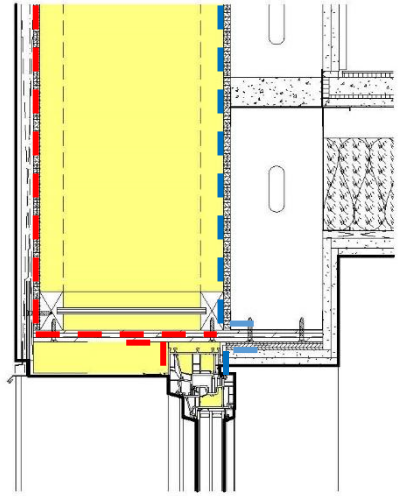
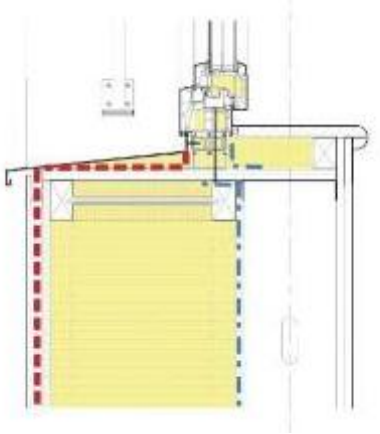


Fill the gaps of the I joists with neopor

Plywood box install

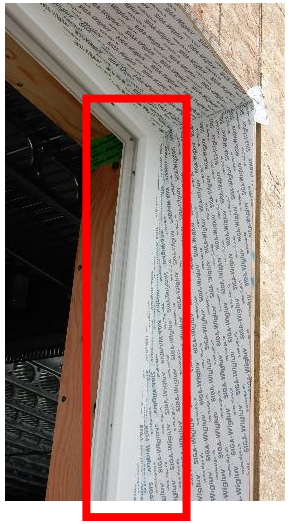
Airtightness at window opening

Lap to primary airtightness layer



Vapour control: Lap to primary vapour control layer

Window is set and screwed in place



More taping around the exterior perimeter of the frame for continuity of the airtightness and vapour control layers

Vapour Open Spray Foam on the inside

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PH Windows : Tilt, turn, sensors

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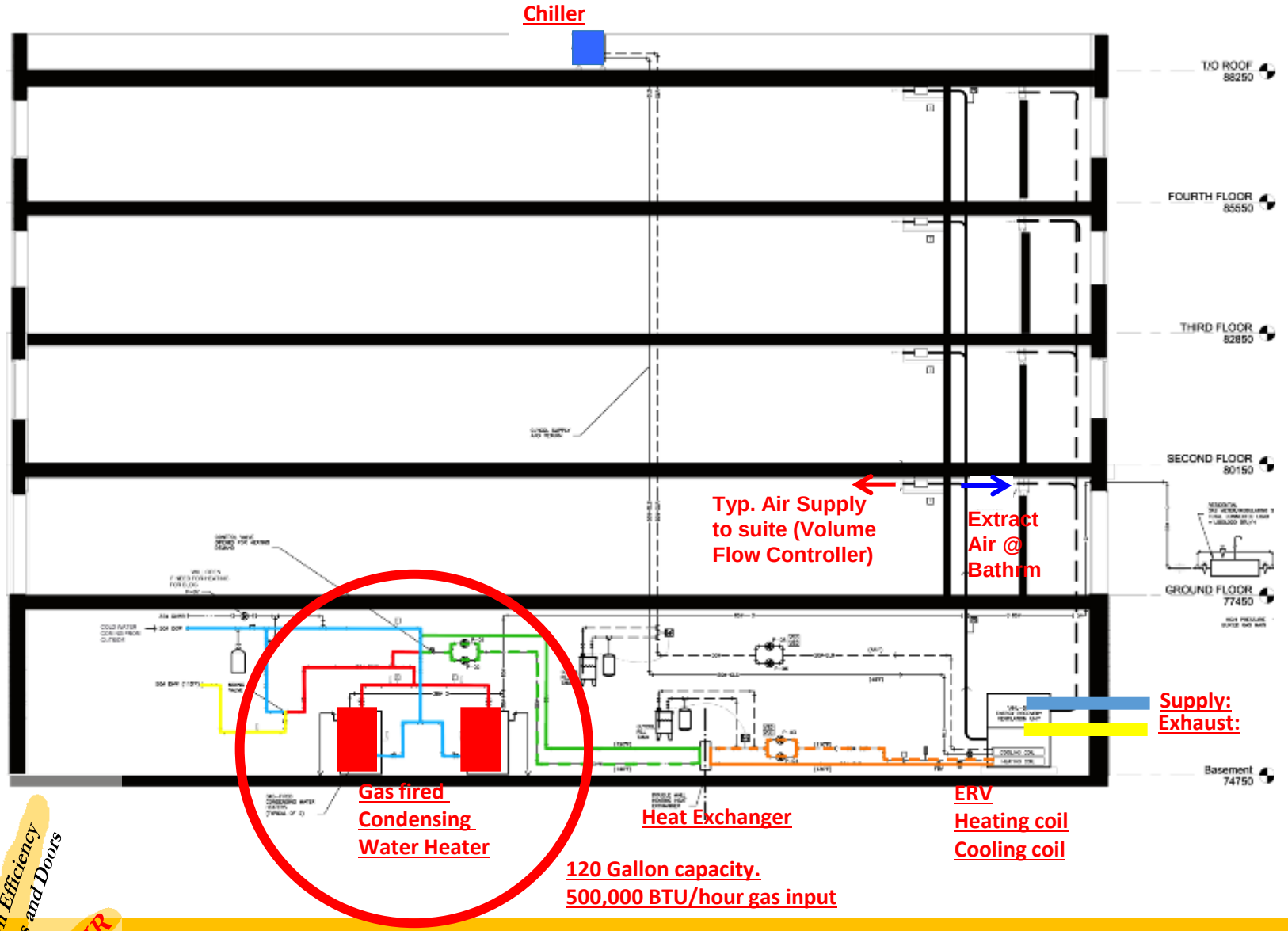

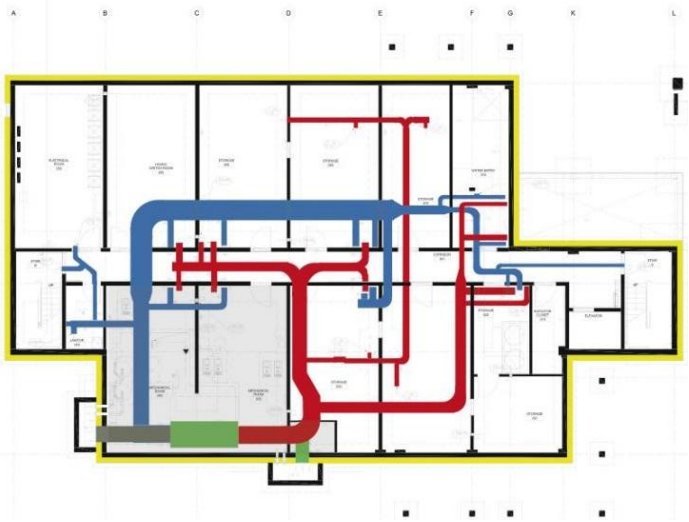

Legend

- DHW @ 60 °C
- Domestic Cold Water DCW
- DHW @ 44 °C
- DHW to heat exchanger
  - Supply
  - Return
- Space Heating Water (to heating coils)
  - Supply
  - Return

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HVAC

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Why Gas, not Electricity?

Electricity

Cost 14 cents/ kWh

Carbon emissions: 532g/ kWh at the source energy

Gas

Cost: 5 cents/ kWh

Carbon emissions: 250g/kWh at the source energy

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Haiku
K3127-S0-PB-04-02-C,
K3127-S0-PW-04-02-C

Size (Diameter in Inches)		52
Airflow Efficiency by Speed (CFM/Watt)	Low	699
	Medium	640
	High	438
Annual Energy Use (kWh)*		6.7452
Annual Operation Cost		$.77
Lifetime Operation Cost		$7.75
Motor Warranty (Years)		Lifetime
Components Warranty (Years)		1
MSRP		–

Features:
Haiku® I Series ceiling fans come equipped with breakthrough SenseME™ Technology that allows users to automate their comfort and save energy year-round. These 60" fans are built from a durable, glass-infused matrix composite and go through a 13-step hand-balancing process to ensure that they won't wobble or rattle.

Featuring an ultra-efficient motor and an elegant design that's won awards the world over, I Series fans operate silently and bring a dash of sleek sophistication to any space. Every I Series fan can be conveniently controlled using the included remote or the Haiku Home app for iOS or Android.

To learn more, visit bigassfans.com EXIT or call 877-244-3267.

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Auxiliary heating and cooling

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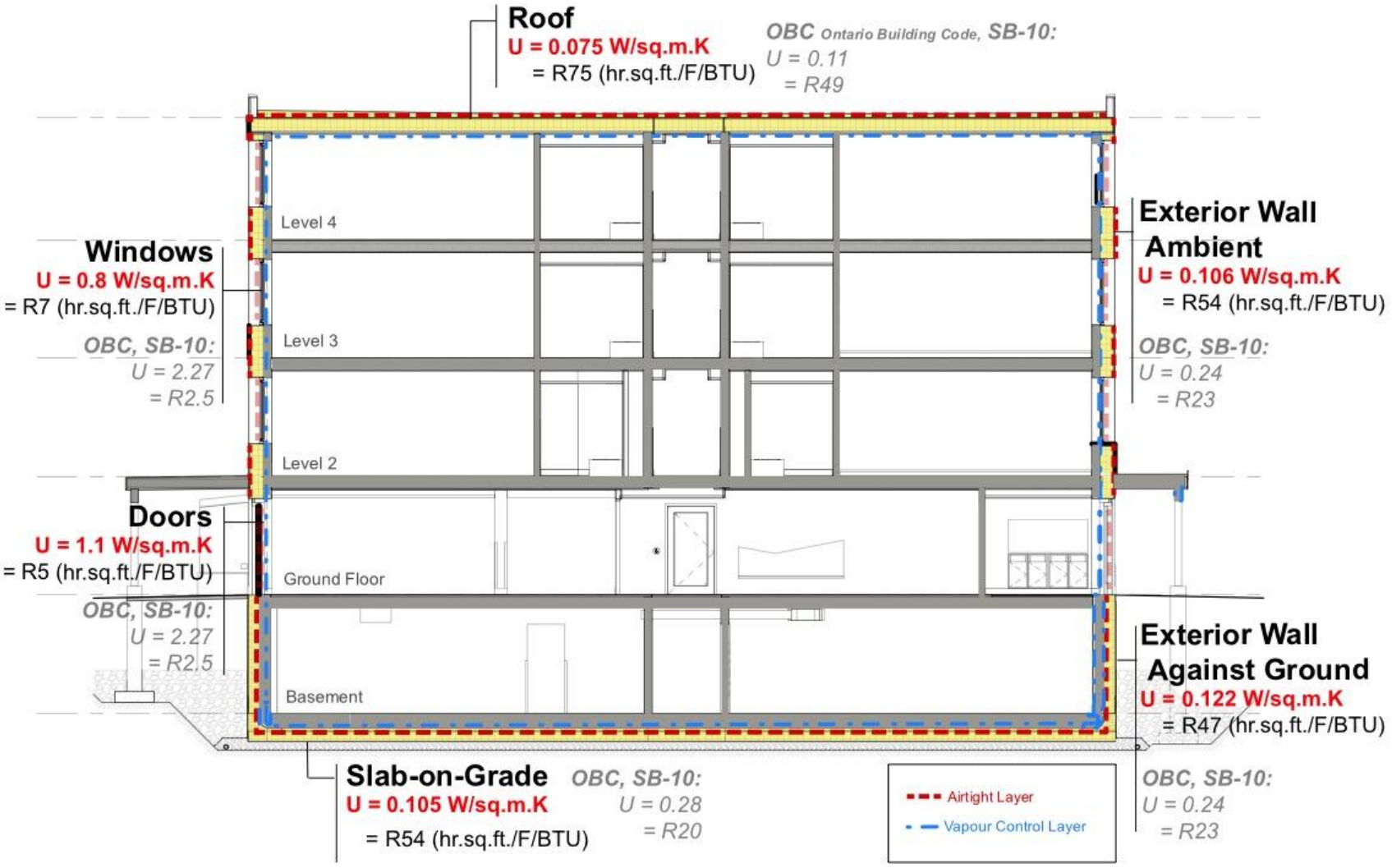

Roof [1.5]
Exterior Walls [2.3]
Below Ground Walls [2.3]
Basement Slab [2.7]
Windows [2.8]
Doors [2]

Ontario Building Code factors

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Total eq. CO_2 emissions including DHW, auxiliary electricity, lighting and appliances

62,490kg/year

or

50% reduction compared to the OBC

Total eq. CO_2 Emission from Heating excluding DHW

Heating demand : **14 kWh/m2 year**

8,544 kg/year

or

85% reduction compared to the OBC

CO2 Emission Recap

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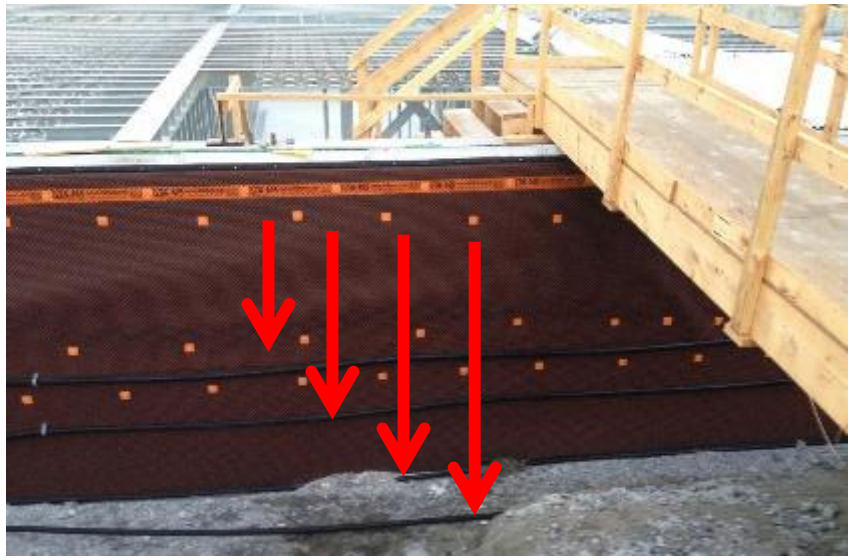
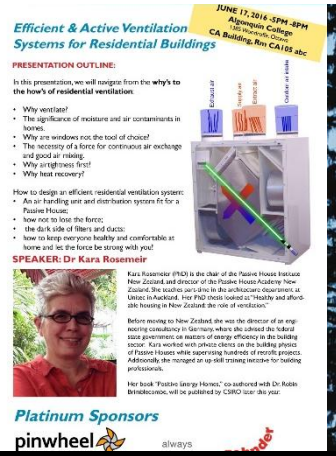
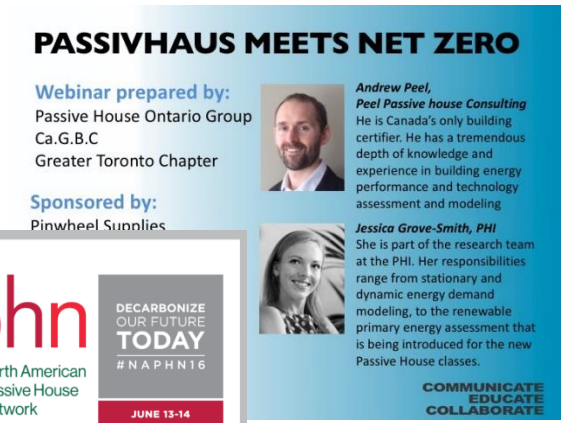
Subsoil Glycol Loop already in place



4 loops (Approx. 400mm)of geothermal horizontal pipes around the foundation wall min 5’ below grade to harvest ground energy.

$29





OTTAWA CONSTRUCTION NEWS

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Thank you…

Questions Welcome

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#PassiveHouseSalus
@salusottawa

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