

With Passive House, Getting Ventilation Efficiency Right Is Critical

Barry Stephens
Ventacity Systems, Inc



- 4 Storey Apartment Building in Ottawa
- Offers 42 Apartments (40m2 each) for men and women with mental illness
- Interior and Exterior Amenity areas
- 1 community worker office



Candidate



Candidate

Specific building demands with reference to the treated floor area				
		Treated floor area	Requirements	Fulfilled?*
Space heating	Heating demand	2082.2 m ²	15 kWh/(m ² a)	yes
	Heating load	14 kWh/(m ² a)	10 W/m ²	-
	Overall specif. space cooling demand	1 kWh/(m ² a)	16 kWh/(m ² a)	yes
Space cooling	Cooling load	4 W/m ²	-	-
	Frequency of overheating (> 25 °C)	%	-	-
Primary energy	Heating, cooling, deshumidification, DHW, auxiliary electricity, lighting, electrical appliances	114.40 kWh/(m ² a)	120 kWh/(m ² a)	yes
	DHW, space heating and auxiliary electricity	53 kWh/(m ² a)	-	-
	Specific primary energy reduction through solar electricity	kWh/(m ² a)	-	-
Airtightness	Pressurization test result n ₅₀	0.3 1/h	0.6 1/h	yes

* empty field: data missing; - : no requirement

Passive House?	yes
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- Radical energy efficiency
- Exemplary comfort
- Exceptional indoor air quality
- Performance that lasts

Salus Clementine... Ottawa,

Ottawa, March 24th, 2016

Ontario, Canada

Author: Arch. Sonia Zouari

Lesson Learned : We need to use PH-Certified Components!

Imported Certified PH ventilation system was not allowed by local Code – this drove up heating demand in the building, increased costs significantly and cost us delays. This has to change!

Annual heating demand $Q_H =$ kWh/a 28305 kWh/(m²a) 14

Using Canadian-made Ventilation unit (75%)

Annual heating demand $Q_H =$ kWh/a 21625 kWh/(m²a) 10

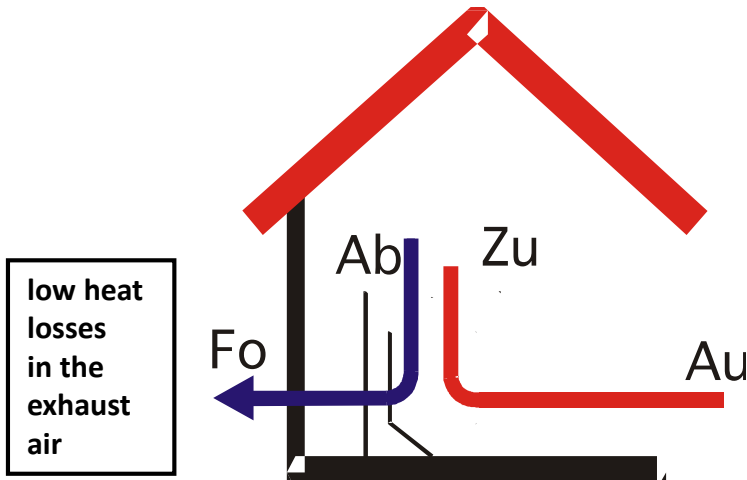
Using PHI-Certified Ventilation unit (85%)

PENALTY = 6680 kWh/y

Transmission Losses, Exterior Walls = 12281 kWh/y

Lessons learned...mistakes made

APPLES ≠ ORANGES

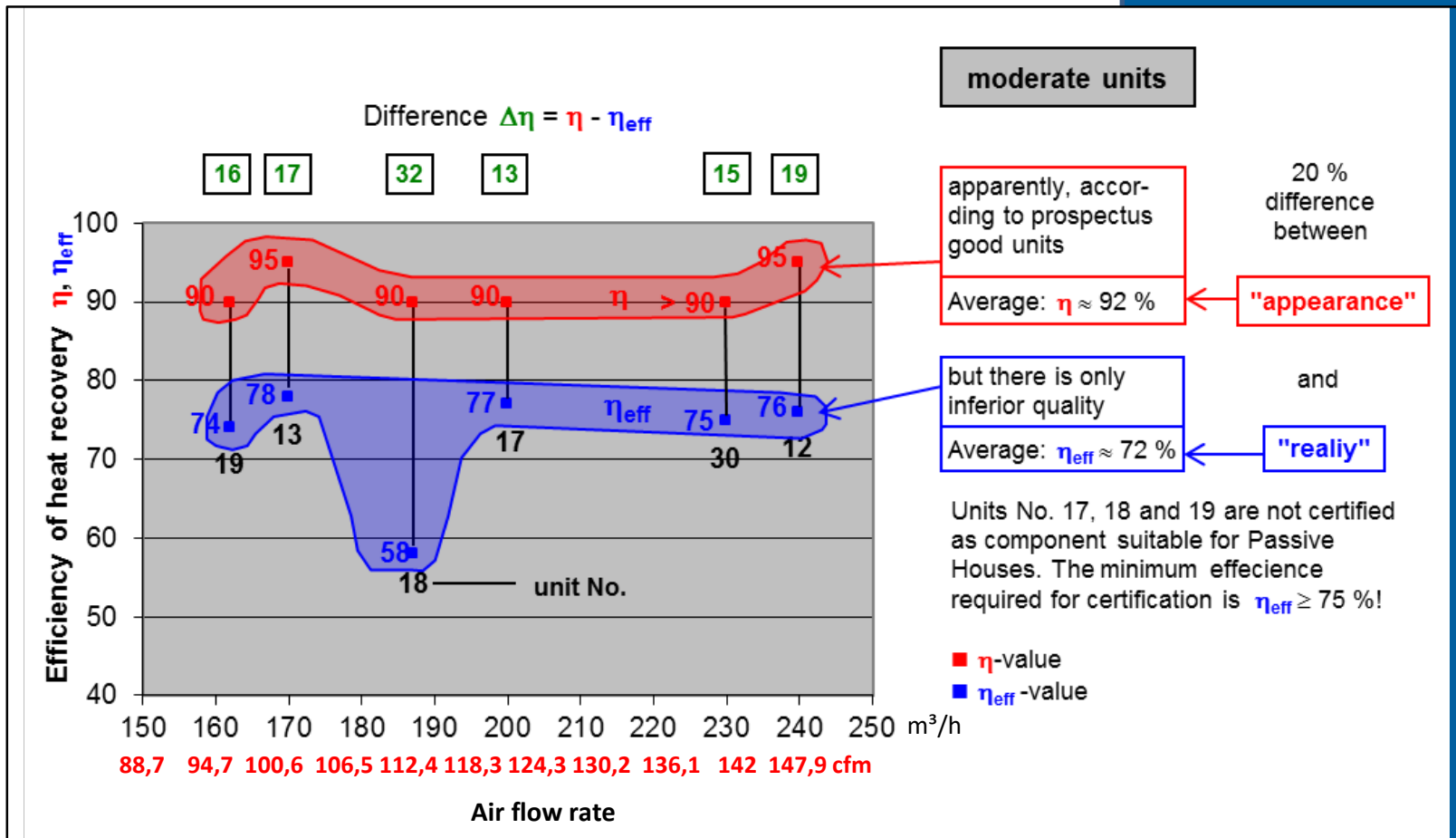


Manufacturer	η_{eff}	η
		$\eta_{\text{Ext}} = \frac{t_{\text{Ext}} - t_{\text{Exh}} + \frac{P_{\text{el}}}{\dot{m} \cdot c_p}}{t_{\text{Ext}} - t_{\text{In}}}$
1	69.9 %	90 %
2	59.2 %	95 %
3	93.0 %	94 %

GE	Test method according to Passive House Institute Dr. Wolfgang, Feist Darmstadt PH certified device see www.passiv.de
GE	DIN V 18599-6:2007-02 and DIN EN 13141-7:2004(D) the included test report requires, among others:
CH	HTA Luzern Prüfreglement für Energie-Etikette (ohne $P_{\text{el}}/\dot{m} \cdot c_p$)
AT	e. g. in Lower Austria for LA energy performance certificate $\eta_{\text{V,eff}} = \eta_{\text{V}} - 12 \%$

Test method as per:
HVI, AHRI, TUV
 η_{Su} is mostly used for brochure data

TESTING, TESTING, TESTING



There is no direct correlation between two metrics for efficiency

η – based on supply air measured air heating (HVI/AHRI)

η_{eff} – based on extract air measured air cooling (PHI)

PASSIVE HOUSE EFFICIENCY

BETTER METRIC, BUT
LOWER EFFICIENCY
NUMBER

Certificate

Certified Passive House Component
For cool, temperate climates, valid until 31 December 2016

Category: **Heat recovery unit**
Manufacturer: **Ventacity Systems, Inc.**
97201 Portland, UNITED STATES
Product name: **VS 1000 RT**

This certificate was awarded based on the following criteria:

Thermal comfort	$\Theta_{\text{supply air}} \geq 16.5 \text{ }^\circ\text{C}$ at $\Theta_{\text{outdoor air}} = -10 \text{ }^\circ\text{C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75\%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
Performance number	≥ 10
Airtightness	Interior and exterior air leakage rates less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes ²⁾
Sound insulation	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: **180 Pa**.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.
2) Only if the supply and return air streams are programmed to be balanced.
3) Recommended performance number is exceeded.

Further information can be found in the appendix of this certificate.

www.passivehouse.com XXXXXX

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Certified for air flow rates of 500 - 1100 m³/h
At an external pressure of 228 Pa¹⁾
Requirements non residential buildings (Therewith device also applicable for residential building)

$\eta_{\text{HR,eff}} 82\%$

Electric power consumption 0.45 Wh/m³

Performance number 9.4³⁾

CERTIFIED COMPONENT

Passive House Institute

- NET RECOVERY EFFICIENCY
- POWER EFFICIENCY
- CROSS-FLOW TRANSFER/ CONTAMINATION
- SOUND LEVEL