MR.PEG Property Inspections℠

Energy Conservation Measures Report

Address:	**1234 Main St., Winnipeg, MB R01 0A1**
Climate Zone:	**Zone 7A, HDD 5000-5999**
House type:	**Single Detached**
Year built:	**2013**
Front orientation:	**South**
# of bedrooms:	**4**
Inspector:	**Mr. Peg Property Inspections**
Evaluation date:	**2021-09-24**

NATURAL AIR INFILTRATION DATA

Please see attached companion **Air Leakage Test Results** for details.

Heated Volume	**650** m^3
Air Change per Hour @ 50 Pa	**5** ACH@50
Equivalent Leakage Area (ELA)	**350** cm^2
Correlation coefficient, r (r >= .99)	1.15 **r**
Relative error % (< 7% error)	**5** %
Flow exponent, n (.5 < n < 1.0)	0.76 **n**

AIR SEAL

☒ Perform air sealing. Air leakage control is the single most important retrofit activity, and it should be considered first in any retrofit strategy. Air leakage control is essential, so every time you insulate, install or upgrade the air barrier system, ensure that moisture does not enter the insulation or building envelope. Consult Chapter 4 of *Keeping the Heat In* for more information.

MAIN WALLS

☒ The insulation of your main walls was accessed at **R-15**. Increase exterior wall insulation to meet the minimum effective thermal resistance values of Table 9.36.2.6. of the NBC 9.36 Energy Efficiency. Walls can account for about 20 percent of heat loss in houses. In addition to heat loss through the walls, there are many cracks and penetrations that allow uncontrolled air leakage into and out of the house. Consult Chapter 7 of *Keeping the Heat In* for more information.

CEILINGS

☒ The insulation of your attic ceilings was accessed at **R-30**. Increase attic ceiling insulation to meet the minimum effective thermal resistance values of Table 9.36.2.6. of the NBC 9.36 Energy Efficiency. Consult Chapter 5 of *Keeping the Heat In* for more information.

CATHEDRAL CEILINGS & FLAT ROOFS

☒ The insulation of your cathedral ceilings and flat roofs was accessed at **R-15**. Increase cathedral ceiling and flat roof insulation to meet the minimum effective thermal resistance values of Table 9.36.2.6. of the NBC 9.36 Energy Efficiency. Consult Chapter 5.4 of *Keeping the Heat In* for more information.

EXPOSED FLOORS

☒ The insulation of your exposed floors was accessed at **R-15**. Increase exposed floor insulation to meet the minimum effective thermal resistance values of Table 9.36.2.6. of the NBC 9.36 Energy Efficiency. Consult Chapter 6 of *Keeping the Heat In* for more information.

RIM JOISTS

☒ The insulation of your rim joists walls was accessed at **R-15**. Increase rim joist insulation to meet the minimum effective thermal resistance values of Table 9.36.2.6. of the NBC 9.36 Energy Efficiency. Consult Chapter 6 of *Keeping the Heat In* for more information.

FOUNDATION

☒ The insulation of your foundation walls was accessed at **R-15**. Increase foundation wall insulation to meet the minimum effective thermal resistance values of Table 9.36.2.8. of the NBC 9.36 Energy Efficiency.. Consult Chapter 6 of *Keeping the Heat In* for more information.

WINDOWS

☒ Install ENERGY STAR® certified windows that meet the required thermal transmittance values (U-value) of Table 9.36.2.7. of the NBC 9.36 Energy Efficiency. Consult Chapter 8.1 of *Keeping the Heat In* for more information.

DOORS

☒ Install ENERGY STAR® certified exterior doors that meet the required thermal transmittance values (U-value) of Table 9.36.2.7. of the NBC 9.36 Energy Efficiency. Consult Chapter 8.2 of *Keeping the Heat In* for more information.

VENTILATION SYSTEM

☒ Install ENERGY STAR® certified heat-recovery ventilator that meets the equipment performance standards of Article 9.36.3.9. of the NBC 9.36 Energy Efficiency.. Please read *How to get the ventilation you need in your house* and Chapter 9 of *Keeping the Heat In* and consult qualified heating and ventilation contractor.

☒ Install smart HRV control

HOT WATER SYSTEM

☒ Install ENERGY STAR® certified domestic hot water system that meets the equipment performance standards of Table 9.36.4.2. of the NBC 9.36 Energy Efficiency. Please read *Water Heater Guide* and Chapter 9 of *Keeping the Heat In* and consult a qualified hot water system contractor.

HEATING SYSTEM

☒ Install ENERGY STAR® certified heating system that meets the equipment performance standards of Table 9.36.3.10. of the NBC 9.36 Energy Efficiency. Please read Chapter 9 of *Keeping the Heat In* and consult a qualified heating and ventilation contractor.

☒ Install smart thermostat

COOLING SYSTEM

☒ Install ENERGY STAR® certified cooling system that meets the equipment performance standards of Table 9.36.3.10. of the NBC 9.36 Energy Efficiency. Consult Chapter 9.1 of *Keeping the Heat In* for more information.

APPLIANCES

☒ Install ENERGY STAR® certified clothes dryer

☒ Install ENERGY STAR® certified clothes washer

☒ Install ENERGY STAR® certified dishwasher

☒ Install ENERGY STAR® certified refrigerator

☒ Install ENERGY STAR® certified range

☒ Install ENERGY STAR® certified LED bulbs and light fixtures

WATER CONSERVATION MEASURES

☒ Install aerated bathroom faucet with flow rate of 2 LPM (0.5 GPM)

☒ Install low-flow showerhead with flow rate of 5.7 LPM (1.5 GPM)

☒ Install low-flush water closets: single flush 4.8 LPF (1.3 GPF) and 1000 grams of waste per flush;

☒ Install low-flow kitchen sink faucet: 5.7 LPM (1.5 GPM) flow pressure compensating aerator outlet

RENEWABLE ENERGY

☒ Consult with a qualified renewable energy contractor regarding installing renewable energy system into your home. Please read *Renewable Energy Facts* for more information.

WARNINGS

☒ There may be risk of hazardous combustion fumes being drawn into your home. Please refer to *Combustion Gases in Your Home - Things You Should Know About Combustion* and consult a qualified heating and ventilation contractor.

☒ Your home is insulated with vermiculite insulation. Some vermiculite insulation used to insulate homes may contain asbestos, which can cause health risks if inhaled. Read the Health Canada's *Health Risks of Asbestos* for more information.

OTHER RECOMMENDATIONS

- Read Canada Greener Homes Grant
- Read Protect Yourself - Get it in Writing! and obtain at least 3 quotations from qualified contractors. Obtain building permit from the authority having jurisdiction before commencing any repair work.
- Read Canadian Prohibition of Urea Formaldehyde Foam Insulation.
- Read Health Risks of Asbestos.
- Read Radon gas: it's in your home.

WHAT IS AN ENERGY AUDIT?

An energy audit at a dwelling is often the first step in making a home more energy efficient and comfortable. An audit can help assess how much energy the dwelling uses. It can provide a list for what measures need to be taken to improve efficiency. A professional home-energy auditor can use a variety of techniques and equipment to determine the energy efficiency of a home. Thorough audits often use equipment such as blower doors, which measure the extent of leaks in the building envelope, and infrared cameras, which reveal hard-to-detect areas of air infiltration and missing insulation.

Many things can affect the energy performance of homes. An energy audit can identify the factors that contribute to the waste of energy in a home. It can also help with making the home more comfortable to the occupants. An audit can help with identifying factors that affect the health and safety of the occupants. Energy audits alone don't save energy. The objective of an energy audit is to make recommendations that will likely improve the performance of the structure while lowering energy consumption.

View Home Energy Audit Agreement

GLOSSARY

air changes per hour at 50 pascals (ACH@50 Pa)
The number of times per hour the entire heated volume of air in a house is replaced when the building envelope is subjected to an interior-exterior pressure differential of 50 pascals (Pa).

correlation coefficient (r)
A factor derived from the airtightness test results. In essence, the “r” indicates the reliability of the airtightness test results. In order for test results to be valid, the correlation coefficient “r” must be greater than 0.99.

effective thermal resistance
The combined resistance to heat flow of all the elements of a given assembly (e.g. insulation, framing members) measured in RSI/R-values.

equivalent leakage area (ELA)
The size of the hole, expressed in cm^2 (sq.in.), through which would pass the same amount of air that passes through all of the air leakage holes in the building envelope at a pressure difference of 10 Pa (ELA@10Pa).

flow exponent (n)
A correlation factor derived from the airtightness test results. It provides an indication of the size of and number of leakage holes, based on whether it is closer to 0.5 or 1.0. An “n” value approaching 1.0 indicates that the building envelope has many small holes; an “n” value approaching 0.5 indicates that the house has a few large holes. In order for test results to be valid, the flow exponent “n” must be between 0.5 and 1.0 inclusively.

heated floor area
The sum of the usable floor area of the building or unit, including all above-grade heated areas regardless of ceiling height, and all below-grade heated areas, such as basements, with a ceiling height of more than 1.2 m (4 ft.).

heated volume
The volume of heated space contained within the house during the heating season, as determined in accordance with the airtightness test.

relative error (%)
The variance of each data point from the plotted curve derived from the airtightness test readings. In essence, it indicates the reliability of each reading. In order for test results to be valid, at least five data points are modelled in which the relative error on each data point is less than ± 6%; and the relative standard error of the ELA at 10 Pa must be less than 7%.

Air Leakage Test Report

In compliance with CAN/CGSB 149.10 (2019)

Mr. Peg Property Inspections Inc.

Building Address:	1234 Main St. Winnipeg, MB Canada R01 0A1
Performed for:	
Performed by:	Mr. Peg
Test date:	2021-09-24
Associated Test file:	CGSB2019 2021-09-24 1101
Report Number:	12345
Unique Property ID Number:	

Summary

retrotec **FanTestic**	version: **5.12.31**	licensed to: **Mr. Peg Property Inspections Inc.**
Test date: **2021-09-24**	By: **Mr. Peg**	
Customer:		
Building Lot Number:		
Building address:	**1234** **Main St.** **Winnipeg, MB** **Canada** **R01 0A1**	

Building and Test Information	
Test file name:	**CGSB2019 2021-09-24 1101**
Building volume [m³]:	**650**
Envelope Area [m²]:	**2,000**
Floor Area [m²]:	**600**
Building Height (from ground to top) [m]:	**8**

Results	
Corrected flow at 50 Pa, [L/s]	**3233.5**
Air changes per hour at 50 Pa [/h]	**17.91**

Corrected flow at 10 Pa, [L/s]	**1616.5**
Equivalent leakage area at 10 Pa [cm²]	**4890**
Effective leakage area at 4 Pa [cm²]	**2980**
Permeability at 50 Pa, [L/s/m²]	**1.6168**
Specific Leakage Rate at 50 Pa, [L/s/m²]	**5.389**
Normalized Leakage Area [cm²/m²]	**2.44**

Compliance

*** Set 1 Slope below 0.5 generally means test is invalid.**

*** Set 1 One or more of the test parameters is not valid.**

*** Set 1 (Slope n is not in compliance.**
)

Assumptions and warnings

While FanTestic software may calculate air leakage results based on user input, use of this software does not in any way guarantee these results.

Building Information

Building Measurements

Building Volume [m³]: 650

Envelope Area (A_E) [m²]: 2,000

Floor Area (A_F) [m²]: 600

Building Height (from ground to top) [m]: 8

Heating/Ventilation System

HVAC Systems Present:

Pictures

Test Method

Set-up Conditions:

Openings and Temporary Sealing

Deviations from the test method:

Discussion of Results

Combined Test Data (Tested in one direction only)

	Results	Uncertainty
Corrected flow at 50 Pa, [L/s]	3233.5	+/-0.2%
Air changes per hour at 50 Pa [/h]:	17.91	+/-0.5%
Corrected flow at 10 Pa, [L/s]	1616.5	+/-0.2%
Equivalent leakage area at 10 Pa [cm²]	4890	+/-0.5%
Effective leakage area at 4 Pa [cm²]	2980	+/-0.9%
Permeability at 50 Pa, [L/s/m²]	1.6168	+/-0.2%
Specific Leakage Rate at 50 Pa, [L/s/m²]	5.389	+/-0.2%
Normalized Leakage Area [cm²/m²]:	2.44	

Air Leakage Test Data Appendix–

Depressurize Data Set

Test Dataset Date:
Start time:

Sample Report only.

Environmental Conditions		
Wind speed:	10	from the
Wind variability:		
Operator Location:	Inside the building	
Initial Bias Pressure:	1.00 Pa	
Final Bias Pressure:	0.00 Pa	
Average Bias Pressure:	0.5 Pa	
Initial Temperature:	indoors: 20 C	outdoors: 20 C
Final Temperature:	indoors: 20 C	outdoors: 20 C
Barometric Pressure	101.325 kPa	from Standard temp/pressure

Test Analysis		

Correlation coefficient, r:	0.99971	
Slope, n:	0.431	
Intercept, C_r [L/s/Pa^n]:	603.45	
	Results	Error
Corrected flow at 50 Pa, [L/s]	3233.5	+/-0.2%
Air changes per hour at 50 Pa [/h]:	17.91	+/-0.2%
Corrected flow at 10 Pa, [L/s]	1616.4	+/-0.5%
Equivalent leakage area at 10 Pa [cm²]	4889	+/-0.5%
Effective leakage area at 4 Pa [cm²]	2982	+/-0.9%
Permeability at 50 Pa, [L/s/m²]	1.6168	+/-0.2%
Specific Leakage Rate at 50 Pa, [L/s/m²]	5.3892	+/-0.2%
Normalized Leakage Area [cm²/m²]:	2.44	+/-0.5%

Measured pressure [Pa]		-15.0	-20.0	-25.0	-30.0	-35.0	-40.0	-45.0	-50.0
Induced Pressure [Pa]		-15.5	-20.5	-25.5	-30.5	-35.5	-40.5	-45.5	-50.5
#1, Range Open	Fan Pressure [Pa]	60.0	75.0	90.0	105.0	120.0	135.0	150.0	165.0
	Flow [L/s]	1987	2221	2432	2626	2806	2976	3136	3288
Total Flow [L/s]		1986.98	2220.52	2431.57	2625.59	2806.11	2975.64	3135.94	3288.36
Corrected Flow [L/s]		1982.7	2215.8	2426.4	2620.0	2800.1	2969.2	3129.2	3281.3
Error [%]		0.9%	-0.1%	-0.4%	-0.4%	-0.3%	-0.1%	0.1%	0.4%

6 induced pressures each taken for 0 of the required 20 seconds.

1 baseline pressures each taken for 5 of required 10 seconds.

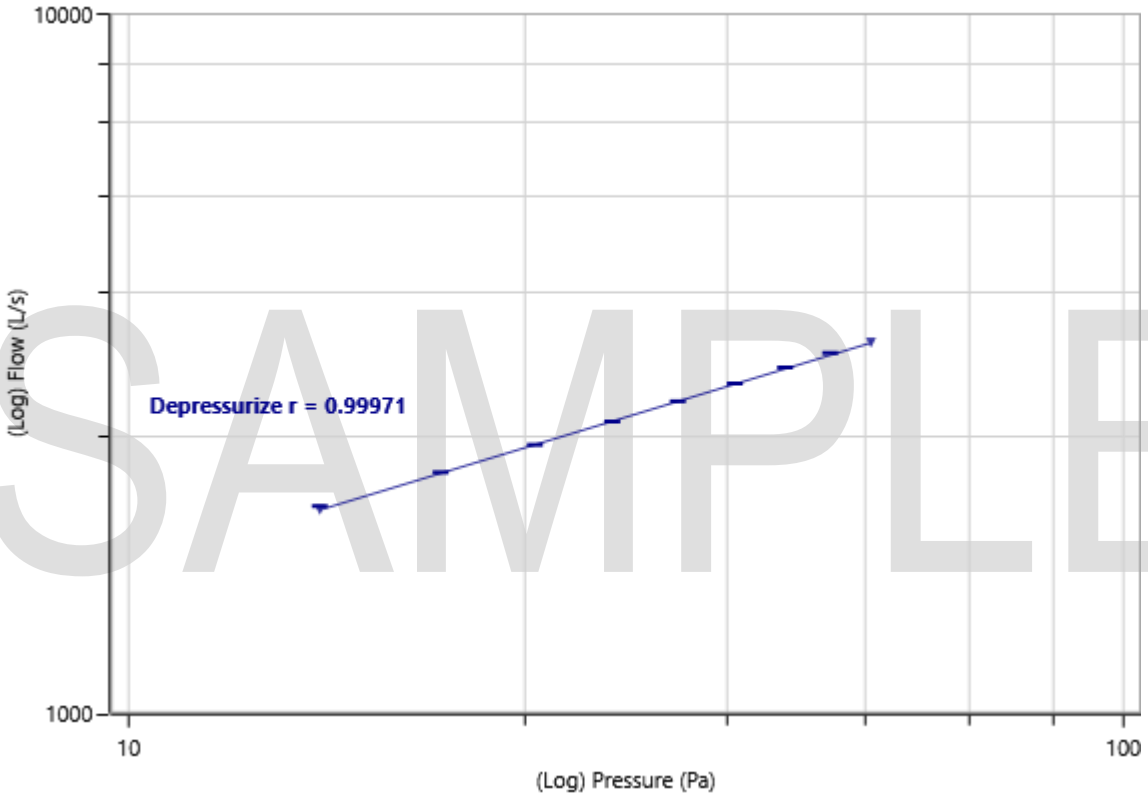
Average Baseline, ΔP: 0.5 Pa

Static Pressure Averages:			

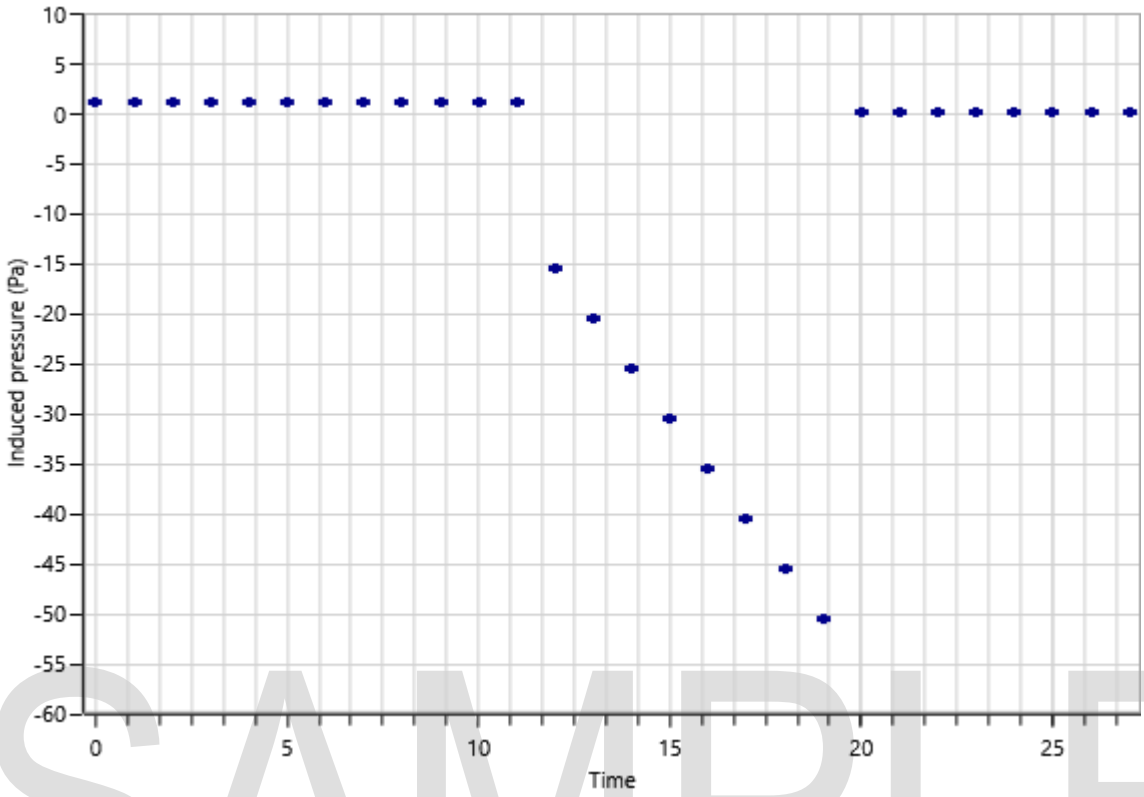
Average Baseline [Pa]	ΔP 0.5		
initial [Pa]	ΔP01 1.00	ΔP01- 0.00	ΔP01+ 1.00
final [Pa]	ΔP02 0.00	ΔP02- 0.00	ΔP02+ 0.00

Baseline, initial [Pa]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Baseline, final [Pa]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				

Flow vs Induced Pressure (Depressurize Set)



Building Gauge Pressure (Depressurize Set)



Test Equipment

The following test equipment was used in the performance of the air leakage tests.

	Fan	Fan serial	Fan location	Gauge	Gauge serial	Gauge Calibration
#1	Retrotec 5000	1234	Winnipeg	DM32	1234	

Fan Calibration Certificate Retrotec 5000:

Retrotec 5000 1234 Fan last calibrated: (Flow Equation Parameters - 1234B1) . Published Flow Equation Parameters, Round B1. CFM							
Range	**n**	**K**	**K1**	**K2**	**K3**	**K4**	**MF**
Open	0.498	548	0	0.3	0	1	10
A	0.502	287	0	0.4	0	1	20
B8	0.54	113.25	0	0.7	0	1	40

Polynomial Range	**g**	**f**	**a**	**b**	**c**	**d**	**K2**	**MF**

B4	29	-0.19	0.000007943	-0.00864	4.9	206	0.8	40
B2	30	0.1	0.00000088	-0.0029	2.15	90	1	50
B1	30	0	0.0000005	-0.00128	1.02	54	1	60
B74	25	0.15	0.000000796	-0.00095	0.59	18	0.8	35
B47	25	0.09	0.000000269	-0.0003591	0.2435	12.05	1	50
B29	25	-0.02	0.000000111	-0.000149	0.092	4.4	0.6	50

Fan Pressure (FP) is the measured fan pressure when using a self-referenced fan or when Room Pressure (RP) is negative. If using a fan which is not self-referenced, and Room Pressure is positive, Fan Pressure is calculated by subtracting the measured Room Pressure from the Absolute Value of the Fan Pressure.

If PrA>0 and fan is not self-referencing: FP = |PrB|-PrA
If PrA<0 or fan is self-referencing: FP = PrB

Flow calculations are not valid if Fan Pressure is less than either MF or (K2 x |RP|).

Flow in CFM using the above coefficients is calculated as follows for standard Ranges:

$$flow = (FP - (|RP| \times K1)\,)^N + (K + (K3 \times FP))$$

Flow in CFM using the above polynomial coefficients is calculated as follows:

$$flow = (a \times FP^3) + (b \times FP^2) + (c \times FP) + d + \big((g - |RP|) \times f\big)$$