

Air Pressure Test

to EN13829:2000

**16 Kilgarron Park
Enniskerry**

Co. Wicklow

2014-03-04

Pre-Renovation Test



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Introduction

Ms Joan Bolger commissioned an airtightness test using a 'blower door' machine to determine the level of air sealing in the house prior to renovation works being undertaken.

The blower door machine allows the level of airtightness to be ascertained and for the results to be compared to the general housing stock already tested.

The current report is structured as follows:

1. Summary Blower door result. This is a quick overview of how this dwelling stands
2. Detailed Blower door result. These details are required if the test is to be used in a BER calculation.

In order to understand the technology and some of the terminology used in compiling the report, your attention is drawn to the appendices:

- A. Understanding the Blower door test

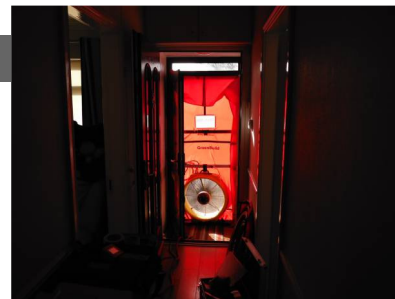
It is recommended that if you wish to understand the report on a deeper level, that you read those sections before tackling the main report.

Overall, the result of $26.041 \text{ m}^3/(\text{hr.m}^2)$ is within what is currently considered “Poor Practise for Airtightness” in Ireland, even for existing Buildings. As 50Pa pressure could not be achieved, which is required by the EN13829 standard being tested to, this test must be considered an invalid test for official purposes. However the result can be considered as indicative of the airtightness level of the building.

Pressure Test Result Summary

16 Kilgarron Park
Enniskerry
Co. Wicklow

2014-03-04



Result @50Pa	Flow m ³ /h	Air changes (n50)	Permeability m ³ /(hr.m ²) (q50)
Averaged Result	12650	28.70	26.041

Comparison of Air Permeability Result (m³/(hr.m²))

Industry Standards	Best Practise <3	Good Practise 3-7	Average 7-10	Poor >10
Your Result				26.041

Notes:

The flow result is area independent.

The air changes rate (air leakage) and m³/(hr.m²) (air permeability) results are both dependent on accurate measurements of the volume and envelope area of the dwelling. The measurements used here were calculated from measurements taken on site.

The Equivalent leakage area is calculated at approximately 4950 cm². (@10Pa)
This is approximately the size a single hole would be through the wall, if all of the leaks now present in the house were concentrated into one hole, measured at 10Pa. That is, about 8 sheets of A4 paper.

The test was undertaken in accordance with the provisions of the standard EN13829 Method B, but the required 50Pa pressure difference could not be achieved during the test. Therefore the **test is not a valid test to the standard**, and the results reported here are indicative only, based on extrapolation. The results cannot be used for any official purpose, such as BER calculations..

Full Door Fan Test Report

Building Address:
16 Kilgarron Park
Enniskerry
Co. Wicklow

Test technician: **Gavin Ó Sé**
 Test company: **Greenbuild Energy**
contact@greenbuild.ie
 Tel: **087 2521032**

Elevation: **100 m**
 Height above ground : **6 m**
 Building Volume, V: **440 m³**
 Total envelope area, A_{T BAT} **485 m²**
 Building exposure to wind: **Partially protected building**
 Estimated % error of measurements: **5%**
 Date of construction: **1960s**

Testing Details

Equipment Used: **Fan Retrotec 2000/H01674**
Gauge DM-2/200542

Depressurize set

Date: **2014-03-04** from: **10.30** to

Environmental Conditions:

Barometric Pressure: **98.3KPa** from **Direct measurement.**

Wind speed: **1: Light air**

Temperature: Initial: indoors **13 °C** outdoors **6 °C**
 Final: indoors **13 °C** outdoors **6 °C**.

Test Data:

10 bias pressures taken for **10** sec each.

10 induced pressures taken for **20** sec each.

Bias pressures

Bias, initial [Pa]	-1.10	-1.10	-1.20	-1.50	-1.90	-1.30	-1.20	-1.00	-0.90	-0.80		
Bias, final [Pa]	-2.20	-1.18	-2.80	-2.41	-1.10	-1.61	-1.00	-2.00	-2.00	-1.20		

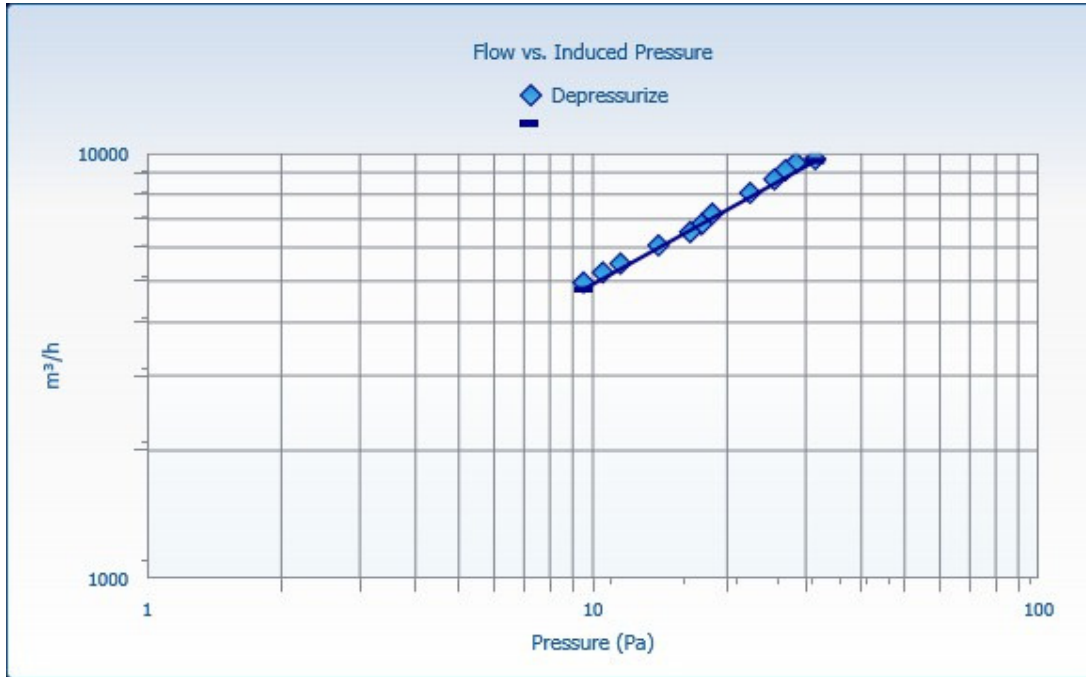
Building Test Pressure [Pa]	-33.0	-30.0	-28.5	-27.0	-24.0	-20.0	-19.0	-18.0	-15.5	-13.0	-12.0	-11.0
Door Fan Pressure, [Pa]	101	97	89.5	81	70	56	50	46	40	33	30	27
Total flow, V _i [m ³ /h]	9688.0	9488.7	9117.3	8676.2	8063.1	7203.8	6805.1	6524.1	6072.9	5503.1	5241.0	4965.4
Corrected flow, V _{env} [m ³ /h]	9470	9276	8912	8481	7882	7042	6652	6377	5936	5380	5123	4854
Error [%]	-1.1%	2.6%	1.7%	0.1%	0.0%	0.1%	-2.4%	-3.2%	-0.9%	0.7%	1.1%	1.5%

Bias pressure Averages:

initial [Pa] ΔP_{01} **-1.20**, ΔP_{01-} **-1.20**, ΔP_{01+} **0.00**

final [Pa] ΔP_{02} **-1.75**, ΔP_{02-} **-1.75**, ΔP_{02+} **0.00**

Induced Pressure vs. Flow



Depressurize Test Results

	Results				Results	95% Confidence		Uncertainty
			95% confidence limits					
Correlation, r [%]	99.75	95% confidence limits		Air flow at 50 Pa, V_{50} [m^3/h]	12650	12250	13050	+/-3.2%
Intercept, C_{env} [$m^3/h.Pa^n$]	1295	1185	1410	Air changes at 50 Pa, n_{50} [/h]	28.70	27.00	30.41	+/-5.9%
Intercept, C_L [$m^3/h.Pa^n$]	1304.5	1200	1420	Permeability at 50 Pa, q_{50} [$m^3/h.m^2$]	26.041	24.497	27.585	+/-5.9%
Slope, n	0.5803	0.5511	0.6096	Specific Leakage at 50 Pa, w_{50} [$m^3/h.m^2$]	68.640	64.570	72.710	+/-5.9%

Combined Test Data

	Results	95% Confidence Interval		Uncertainty
Air flow at 50 Pa, V_{50} [m^3/h]	12650	12250	13050	+/-3.2%
Air changes at 50Pa, n_{50} [/h]	28.70	27.00	30.41	+/-5.9%
Permeability at 50 Pa, q_{50} [$m^3/h.m^2$]	26.041	24.497	27.585	+/-6.0%
Specific leakage at 50 Pa, w_{50} [$m^3/h.m^2$]	68.640	64.570	72.710	+/-6.0%

Test Notes:

Door fan was in front door.

Temporary seals:

- Vents
- Extractor fans

All external windows and doors were closed, except for the opening holding the fan equipment.

All internal room doors were open, including the **hot** press door.

Ventilation Type – Natural ventilation with some mechanical extracts

Heating Type – oil boiler with radiators

As 50Pa pressure difference was not achieved during the test, for official purposes this test is not valid and can be considered indicative only.

Appendix A - Understanding The Blower Door Test

The blower door test is performed using a calibrated fan machine to move a measured amount of air through a dwelling. The air can be sucked from the house (depressurized) or pushed into the house (pressurized), or both.

The test is performed in accordance with the Irish & European Standard IS EN13829:2000, so that the results should be able to be replicated and also compared across dwellings.

Greenbuild is one of only a small number of companies in the country audited by the National Standards Authority of Ireland (NSAI), so you can be assured of the quality of our service.

As part of the NSAI scheme, we also take account of the UK ATTMA standard. This is not required in Ireland generally, but may be specified in some cases.

Whilst the fan is running, the air pressure inside will be different to the air pressure outside. Readings are recorded and the results are plotted on a graph. The reading on the graph at 50 Pascal pressure difference between the inside and the outside is then taken as the final result for the building. If the building has been both pressurized and depressurized then the 50 Pascal result for each is added and the final result is the average of the two readings.

In Europe generally, the result is expressed in terms of the volume of air being moved through the fan relative to the volume of the building. This is called the Air Change rate, or Air Leakage rate, or the n50.

In Ireland and Britain, the result is usually expressed in terms of the volume of air being moved through the fan relative to the area of the building envelope (ground floor, external walls and upper ceilings), measured in square metres. This is called the Air Permeability rate, or the q50.

People often speak of these two results as equivalent, but it is important to note that they depend on the shape of the building and can be quite different.

Greenbuild provides both the Air Permeability and Air Leakage rate results for tests undertaken.

Example

Take a bungalow of 100 square metres, with 8ft ceilings (2.4m).

The volume of the house is thus $100 \times 2.4 = 240$ cubic meters.

The envelope of the house depends on whether it is long and narrow, or square etc., but let's say it has an envelope area of:

Floor	100m ²
Ceilings	100m ²
Walls	20m Long, 5m wide = 120m ²

Thus the envelope of the sample house is 320m².

If the volume of air going through the fan at 50 Pa is 1600m³, then:

Air Leakage is $1600/240 = 7$ Air changes per hour

Air Permeability is $1600/320 = 5$ m³/(hr.m²)

Appendix B - Equipment used

PRESSURE TESTING

Retrotec 2000 fan – **Retrotec 2000/H01674**

Calibrated to 16th January 2015 (Manufacturer's Calibration- Valid 3 Years)

DM2 Mark II Gauge. - **DM-2/200542**

Calibrated to 3rd Sept 2014 (Manufacturer's Calibration- Valid 1 Year)



AIR TIGHTNESS
TESTING

ISO 9001:2009

NSAI Certified

OTHER DEVICES

Kestrel 4000 – Windspeed, Humidity, Atmospheric Pressure.

SN: 540810 - Calibrated to 29th July 2014, INAB Accredited Laboratory

Dwyer 471-3 – Hot wire anemometer

Fluke 51 – Thermometer

Fan Calibration Details

Retrotec 2000 H01674						
Range	N	K	K1	K2	K3	K4
Open(22)	0.5214	519.618	-0.07	0.8	-0.115	1
A	0.503	264.996	-0.075	1	0	1
B	0.5	174.8824	0	0.3	0	1
C8	0.5	78.5	-0.02	0.5	0.016	1
C6	0.505	61.3	0.054	0.5	0.004	1
C4	0.5077	42	0.009	0.5	0.0009	1
C2	0.52	22	0.11	0.5	-0.001	1
C1	0.541	11.9239	0.13	0.4	-0.0014	1
L4	0.48	4.0995	0.003	1	0.0004	1
L2	0.502	2.0678	0	0.5	0.0001	1
L1	0.4925	1.1614	0.1	0.5	0.0001	1

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