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ENVELOPE INTEGRITY TEST

Test House 1

PROJECT REF: Test House 1
REPORT DATE: April 2008

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1.0 EXECUTIVE SUMMARY

1.1 The building air leakage test of Test House 1 was undertaken on the morning of the 5th of April 2008. Weather conditions for the test were acceptable to allow readings of sufficient accuracy to be taken.

1.2 The building air leakage test undertaken to ATTMA TS1 determined that the building measured Air Permeability of 11.13 $m^3/hr/m^2$ envelope. This permeability is outside the Building Regs. The maximum permeability in these Regs will be 10 $m^3/hr/m^2$.

1.3.1 Pencil smoke testing was conducted after the leakage test. To determine the areas in the dwelling that was leaking air.

2.0 INTRODUCTION

2.1 Chevron was employed to undertake the building air leakage testing.
The dwelling is ventilated using a combination of passive vents and extract fans, the dwelling complies with building regulations part L'

2.2 The building air permeability and air leakage index were measured using the procedures detailed in ATTMA TS1 and BS EN 13829: 2000 with a view to establishing the performance for Building Regulations 2000 Part L2 Compliance. The test Method B as defined in BS EN 13829 was employed to test the building envelope thus allowing the designed ventilation openings to be sealed.

3.0 DESCRIPTION OF TEST

3.1 The air permeability testing was started at 11.00 hrs and was completed at 12.30 hrs.

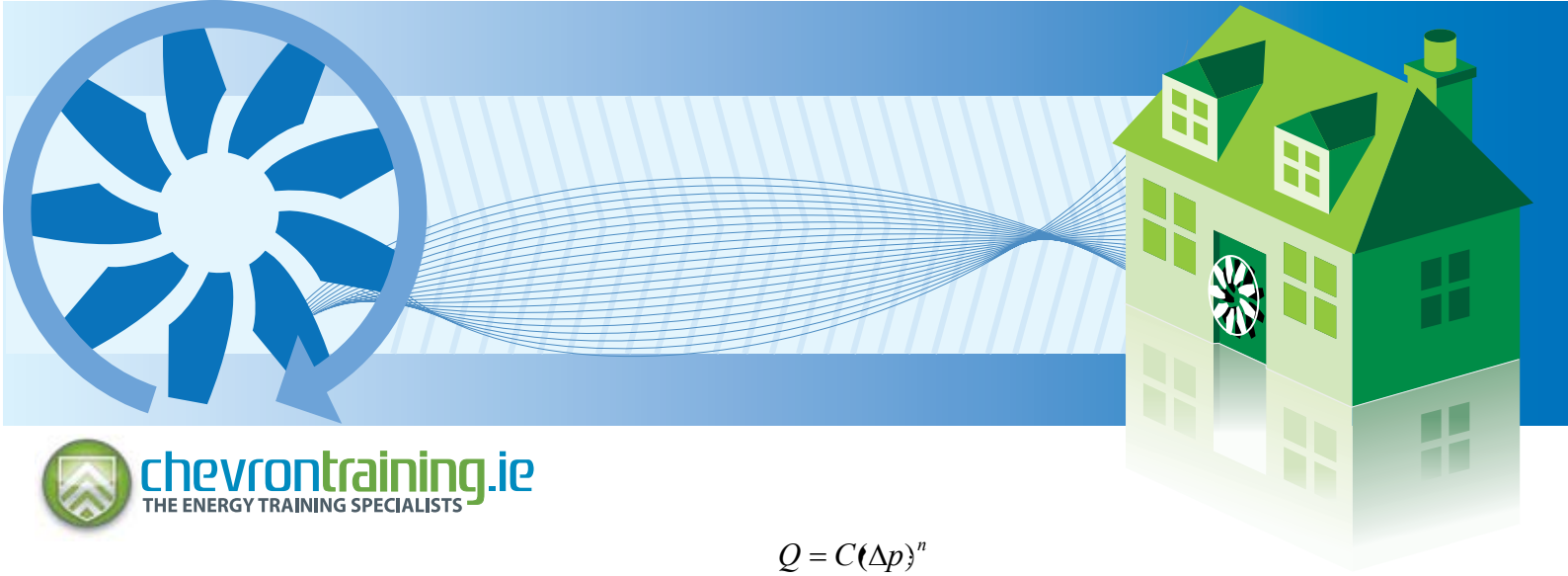
3.2 No unexpected pressure fluctuations occurred during the testing and the barometric pressure remained constant. Outside air temperature was logged for the duration of the testing.

3.3 The building envelope surface area was calculated by Chevron Training on site

4.0 TEST PROCEDURE

4.1 The Building Pressure test follows the procedures set out in ATTMA TS1 using an air pressurisation technique. Air is supplied to the building at varying rates and the resultant building static pressure differential measured using calibrated differential pressure devices.

4.2 The pressure differential generated by the air supplied is related by the equation:



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$$Q = C(\Delta p)^n$$

Where:

Q	Air flow rate supplied to the building m³/s
Δp	Differential pressure across the building Pa
C	Air Leakage coefficient
n	A derived power coefficient

4.3 The air flow rate is measured using a purpose designed Minneapolis blower door fan calibrated to UKAS standards.

4.4 External wind speed of less than 6m/s measured using a cup anemometer.

4.5 The building pressure is measured using a Furness Controls Type FCO332 differential transmitter pressure with internal and external sensing tubes with tee terminations located appropriately out of the airstream generated by the fan unit. This differential pressure transmitter is also calibrated by the manufacturers to UKAS requirements.

4.6 The building internal and external temperature is monitored using logging sensors with an accuracy of ±0.5°C throughout the duration of the test. Results are averaged for the period of the test to normalise the supplied air volume to Standard Temperature and Pressure.

4.7 The stack effect can be significant if there is a large enough temperature difference between the inside and outside of the structure during the test and a temperature difference of less than 10°C are desirable. Normal corrections are made for internal external temperature variations; however, if the temperature falls outside this 10°C range then further corrections need to be applied.

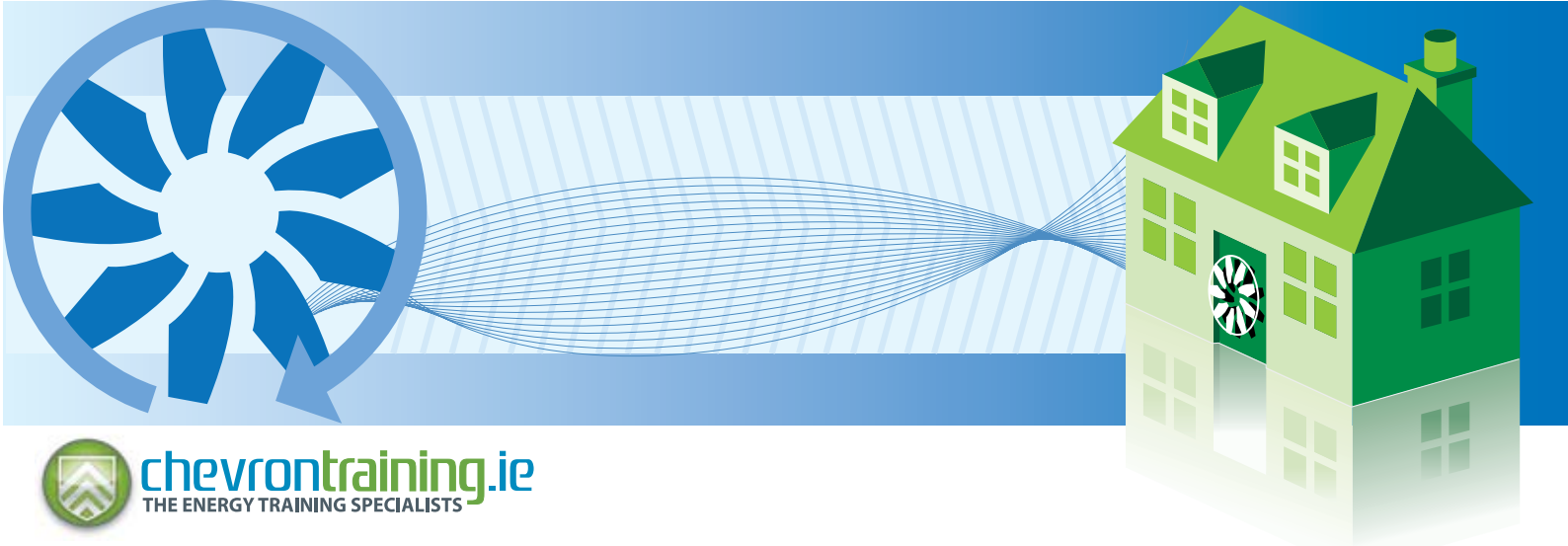
4.8 In order to achieve meaningful results in accordance with ATTMA TS1, the fan pressurisation equipment needed to generate a pressure difference in the building of 50Pa.

5.0 DATA COLLECTION AND ANALYSIS

5.1 The measurements required to complete the data analysis were taken on site before, during and after the test as appropriate. Results were recorded on site in the software run on a laptop computer.

5.2 The pressure and volume data from the flow grid and the building differential pressure transducers were recorded simultaneously at 1 second intervals via logging hardware and software directly into the laptop computer.

5.4 The results of site measurements were checked at site to determine whether any incidents had occurred during the measurement process that caused anomalous results to be recorded. This could be an occurrence such as a door or window being pushed open by the air as the building pressure was increased.



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5.4 The building pressure and the measured volume were plotted on a chart using log-log scales and the slope determined using a regression analysis. The constants C and n are determined and used in the equation in 4.2 above to generate the Q50 flow rate which is the air flow associated with a pressure of 50Pa.

5.6 Once off site, further data analysis is undertaken to correct the results for the actual environmental conditions encountered at site. The first step accounts for differences in density that affects the supplied air volume between the test day and the day on which the equipment was calibrated. The second step adjusts the leakage air volume to account for temperature changes between that supplied by the fan and the internal air temperature. If the indoor air temperature is higher than that supplied, then the volume of the air increases as it is mixed and the amount of air expelled through the building façade is slightly higher than the measured volume.

5.7 Once the data has been corrected a third step generates Q50, which is standardised to STP and is used to establish the final Building Air Permeability. The building air permeability Q50/S ($m^3/hr/m^2$), which is the air flow associated with a pressure of 50Pa normalised with respect to the envelope area S, can be widely compared with other buildings.

6.0 RESULTS AND OBSERVATIONS

6.1 Building Air Permeability Test

6.1.1 The Building Air Permeability Test was undertaken in accordance with TS1 and the methodology detailed in Clauses 4.0 and 5.0 above.

6.1.2 The off-site analysis of the results and corrections for temperature and pressure generated a final test result of 11.13 $m^3/hr/m^2$.

6.1.3 A second test was undertaken which gave the same results.

7.0 Conclusion

7.1 The Building Air Permeability test undertaken to ATTMA TS1 determined that the building has a measured Air Permeability of 11.13 $m^3/hr/m^2$ envelope.

7.2 The vent systems were closed for the duration of the test.

7.3 The permeability of 11.13$m^3/hr/m^2$ is outside parameters that are out lined in the buildings regulations

7.4 The dwelling was erected in the 1980s and the remedial work that should carried out is extensive, all windows have poor draft stripping. This is the main permeability issue, also poor sealant work on the areas where electrical wires and pipes breach the thermal envelope of the dwelling

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APPENDIX 1 - AIR PERMEABILITY TEST DATA SHEET & RESULTS SHEET

Date of Test: 5/03/08
Test File: Test 1

Technician:

Customer: TEST
TEST
TESTTEST

Phone: TEST
Fax:

Building Address:

Test Results at 50 Pascals:

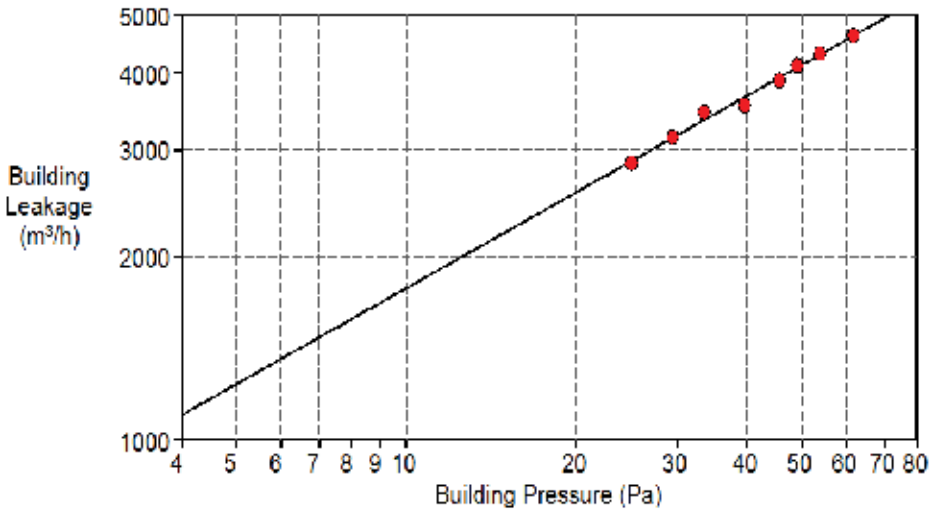
V50: Airflow (m^3/h)	4139 (+/- 0.7 %)
n50: Air Changes per Hour (1/h)	413.87
w50: $m^3/(h*m^2)$ Floor Area	24.03
q50: $m^3/(h*m^2)$ Surface Area	11.13

Leakage Areas: 1986.2 cm^2 (+/- 3.4 %) Canadian EqLA @ 10 Pa or 5.34 cm^2/m^2 Surface Are
1185.0 cm^2 (+/- 5.5 %) LBL ELA @ 4 Pa or 3.19 cm^2/m^2 Surface Area

Building Leakage Curve:
Air Flow Coefficient (Cenv) = 525.1 (+/- 8.6 %)
Air Leakage Coefficient (CL) = 532.1 (+/- 8.6 %)
Exponent (n) = 0.524 (+/- 0.023)
Correlation Coefficient = 0.99442

Test Standard: EN 13829 Test Mode: Depressurization
Type of Test Method: Regulation complied with:
Equipment: Model 4 (230V) Minneapolis Blower Door

Inside Temperature:	14 °C	Volume:	10 m^3
Outside Temperature:	12 °C	Surface Area:	372 m^2
Barometric Pressure:	101325 Pa	Floor Area:	172 m^2
Wind Class:	0 Calm	Uncertainty of Building Dimensions:	2 %
Building Wind Exposure:	Highly Protected Building	Year of Construction:	1980
Type of Heating:			
Type of Air Conditioning:			
Type of Ventilation:	None		



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Comments

Data Points: Depressurization

Nominal Building Pressure (Pa)	Fan Pressure (Pa)	Nominal Flow (m^3/h)	Temperature Adjusted Flow (m^3/h)	% Error	Fan Configuration
-2.0	n/a				
-63.4	46.5	4641	4622	0.1	Open
-55.7	40.6	4337	4319	0.4	Open
-50.9	37.1	4146	4128	0.7	Open
-47.4	33.0	3914	3898	-1.1	Open
-41.5	27.5	3569	3554	-3.0	Open
-35.4	170.0	3477	3463	3.1	Ring A
-31.4	140.0	3159	3146	0.2	Ring A
-26.8	115.1	2867	2855	-0.8	Ring A
-1.7	n/a				

Test 1 Baseline (Pa): p01- = -2.0 p01+ = 0.0 p02- = -1.7 p02+ = 0.0