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Determining the airtightness of buildings by the fan-pressurisation method: BRE recommended procedure

by R K Stephen BSc

BUILDING
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Department of the Environment

DETERMINING THE AIRTIGHTNESS OF BUILDINGS BY THE FAN-PRESSURISATION METHOD: BRE RECOMMENDED PROCEDURE

by Roger K Stephen BSc

SUMMARY

This paper describes, in detail, a procedure to determine the airtightness of a building by using the fan pressurisation method. The topics covered include: The significance of the method and its use; the requirements of the equipment used; preparations for a test; test procedure; data analysis.

The paper was originally intended to be used as a "handbook" by those carrying out airtightness measurements under contract to the Building Research Establishment. However, interest in the technique is increasing rapidly in the United Kingdom and more tests are being carried out. The paper is therefore written in the form of a "code of practice" which will now be of interest to organisations such as Local Authorities, Architects, Energy Auditors/Consultants and those carrying out research into ventilation related aspects of buildings.

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1. FOREWORD

Ventilation of buildings is essential for the well being and comfort of occupants and for safeguarding the structure, but the "oil crisis" of the early seventies focussed attention on reducing ventilation rates in an attempt to save energy. It is now accepted that a balance must be struck between minimum ventilation rates for energy conservation and higher ventilation rates for maintaining adequate indoor air quality. To help achieve this balance a knowledge of how particular buildings behave in relation to ventilation is essential and several techniques are now available for direct and indirect ventilation measurements. This paper describes the fan-pressurisation method; an indirect technique which, because of its relatively low cost and ease of use, is increasingly finding favour with research organisations, builders, and local authorities engaged in refurbishment work.

As more organisations in the UK acquire fan pressurisation testing equipment, it has become clear that a consistent approach to site procedure and data analysis is essential if the "customers" for the tests are to make correct interpretations of the findings.

In several countries the technique has become widely used and standards have been issued specifying equipment performance and leakage measurement procedures. The Building Research Establishment has developed this recommended procedure to be compatible with those of other countries (References 1, 2, 3 & 4), but accommodating the special requirements of testing in the UK.

2. SCOPE

The method described covers the use of the fan pressurisation technique to measure the rate of air leakage through a defined envelope of a building, under an artificially applied positive or negative pressure difference.

Fan pressurisation testing can be carried out under all normal daytime outdoor temperatures encountered in the UK, but is restricted to certain wind speeds. The technique was originally developed for use in detached houses of up to three storeys, but the principles may also be applied to individual flats, non-detached houses, larger buildings and, if stack effects are small, to taller buildings. The results of a fan pressurisation test require particularly careful interpretation when the building under test is non-detached; in the case of buildings with party (separating) walls, a proportion of the measured air leakage, termed "cross-leakage", will be through the party (separating) wall. Methods of measuring cross-leakage will be the subject of a further paper.

The technique is intended to give a measure of the airtightness of a building envelope. However, the pressures naturally applied to buildings by the wind are much lower than, and different in nature to, those pressures applied in fan of room and hall layouts in buildings), then this must not affect the calibration or operation of the flow measuring device.

5.6 DOOR/WINDOW MOUNTING FRAME: a board, frame or other contrivance which can be easily and quickly sealed into an open doorway or window in the building envelope to be tested. The mounting frame shall be capable of being well sealed into the opening in the envelope and of having the apparatus air ducting sealed to it. This must permit both pressurisation and depressurisation.

5.7 TEMPERATURE MEASURING DEVICE: a device to measure air temperature with an accuracy of ±0.5 °C.

5.8 EQUIPMENT SAFETY: The apparatus must be safe to use. Guards must be fitted to the fan and/or ducting so that the fan blades and motor drive cannot be touched. The apparatus must be electrically safe, fuse protected, and preferably fitted with an earth leakage circuit breaker (also known as a residual current circuit breaker).

6. PREPARATIONS

6.1 Shortly before the day of the test, the arrangements should be confirmed with the occupant of the dwelling to be tested. Remind them not to have any coal, coke or wood fires burning on the test day.

6.2 On the day of the test, assess the wind strength according to the Beaufort Wind Scale (Figure 2) using the effects of the wind on smoke, trees, etc, as indicators. The test should not be carried out if the average wind strength is greater than Force 3 (however, 6.3 may be carried out to save time later). If the average wind strength is between Force 2 and Force 3 the test may be carried out but it will be more difficult to take readings and there will be greater uncertainty in the results.

6.3 Make general observations of the type, location and condition of the building. For consistency of observations, and so that important observations are not forgotten, it is recommended that a standard form is filled in at the time the observations are made. Figure 3 is a copy of the form used by the Building Research Establishment for scientific purposes. This includes space for recording details of the number, type and hanging of windows; number and type of doors; draughtproofing; floor, wall and roof construction; details of ventilation openings, etc.

Whilst the observations are being made the envelope to be tested should be defined. For the purposes of this procedure, the envelope contains the interior volume of the dwelling which is deliberately heated. It does not generally include the attic space, cellar, garage, porch or attached structures unless they are deliberately heated or cannot be isolated from the envelope.

Measure the internal volume of the envelope to be tested but do not subtract the volumes of any internal walls, cupboards, furnishings, etc. It is recommended that photographs are taken of all external elevations and unusual features of the building to serve as a reference for the dwelling details and as an "aide memoir".

6.4 Where a normal pressurisation test is being carried out, all adjustable ventilation openings in the envelope should be closed (although if reductive sealing, as described later, is being carried out they might initially be left open). These openings include airbricks with sliding shutters, adjustable trickle ventilators in window frames, extract fans with shutters, etc (NB most fan shutters can blow open during a test and so the fan grille should always be sealed with masking tape and polythene sheet). Mechanical ventilation supply and extract grilles should always be sealed with masking tape and polythene. Fixed ventilation openings may be left open or may be sealed, depending on the purpose of the test.

Check that all bath, sink and WC 'U' traps are filled with water and ensure that the loft hatch cover will not lift under pressure (a small weight may be placed on top of lightweight hatch covers). All chimneys and flues are normally sealed (with polythene sheet and masking tape) to prevent soot from being sucked down into the dwelling. Where a gas or solid fuel appliance is fitted into a flue or in a fire-place it is usually easier to seal over the appliance than to seal the chimney or flue. Open chimneys or flues can often be sealed by inflating a football bladder at some convenient point. All combustion appliances should be turned off for the duration of the test, and in most cases it is best to turn off any pilot lights as well. For safety reasons, the operation of all combustion appliances should be checked after the test by a competent person.

6.5 Set up, and switch on, all instrument to be used in the test. Be careful not to site pressure measuring instruments in the draught from the fan. If that is difficult, run an indoor pressure tube to an adjacent room.

6.6 Fit the appliance mounting frame or board in a convenient exterior door or window in the dwelling envelope. Use masking tape, if necessary, to make sure the mounting frame is well sealed to the door frame. Run the small bore (6mm maximum internal diameter) pressure difference measuring tube away from the mounting frame and, if possible, to a point about 10 metres from the building. If this is not possible (eg. terraced house with little or no garden) then it is best to run two tubes, one to the front wall and one to the back wall. These tubes shjould be manifolded together before connection to the micromanometer. Fit the rest of the apparatus to the mounting frame such that air is blown into the dwelling (pressurisation) and connect up all necessary power/signal cables and pressure tubes.

6.7 Make sure that all doors and windows in the dwelling envelope are properly closed. Open all doors internal to the envelope, except built in cupboard doors, to allow free air movement between rooms. If the door or window in which the apparatus is fitted does not open directly to outside (eg. inner front door in a lobby or the door of a flat opening into a corridor) then all doors which give access to outside should be wedged open for the duration of the test to permit free movement of air to or from the apparatus.

7. PROCEDURE

7.1 Check that all instruments have warmed up, stabilised, and have been levelled and zeroed as necessary. Note that the micromanometer should be zeroed with the external pressure tube disconnected.

7.2 Check that the average wind strength is still no more than Force 3 on the Beaufort Scale. If it is Force 4 or more then the test should be postponed (wind strength usually decreases toward evening). Record wind strength and direction, and measure outdoor temperature before and after the test. After connecting the external pressure tube to the micromanometer, and with the apparatus air duct temporarily blocked off (using polythene sheeting and masking tape), estimate and record the mean pressure difference due to the wind, as well as the maximum and minimum observed, over a period of two minutes.

7.3 Uncover the fan air duct and start the fan on its slowest speed or with the damper fully closed to prevent over pressurising airtight dwellings.

7.4 Adjust the airflow to provide a pressure difference of 55 to 60 Pascals between the inside and the outside of the building envelope. When the readings are stable (normally after a few seconds), record the air flow rate and the pressure difference. Where the pressure and flow measurements are made on instruments with only light damping of the small fluctuations which inevitably occur it is recommended that, at each test point and for each instrument, ten readings are taken and the arithmetic mean value of these is taken as the required reading.

It will save time and prevent measurements being omitted if a standard form is used to write down the readings as they are taken. This should include all the wind and temperature readings as well as the pressure and flow rate data. Figure 4 is a copy of the form used by the Building Research Establishment for this purpose.

Now adjust the flow rate to give another pressure difference and take readings as before. The air flow rate should be recorded at a number of envelope pressure differences, such as at 55, 50, 45, 40, 30, 20, 10 and 5 Pascals. The pressure difference across the building envelope should be maintained uniform within a range ±10% of the measured average value at each test point.

The size and the airtightness of the envelope affect leakage measurements and so the full range of pressure differences may not actually be achieved. Where the dwelling is unusually large or unusually leaky, and only if a pressure difference of 35 Pascals is achieved, a restricted range covering at least five different, well spaced, pressure differences down to less than 10 Pascals will be acceptable. This relaxation is intended to allow for exceptional circumstances and not to allow the use of apparatus with generally insufficient capacity.

Measure and record indoor and fan duct air temperatures at least twice during the test, as well as before and after, to give an average. Indoor temperatures should be measured in more than one room (eg. in the living room downstairs and a bedroom upstairs) but not in the room in which the apparatus is installed. It is essential during the test, especially at the greater pressure differences, to check the sealing of chimneys, flues and heating appliances. Check also that the loft hatch cover has not lifted.

7.5 When the purpose of the test is to identify the rate of air leakage from different components in the same envelope, reductive sealing should be carried out; ie. one component (eg. an external door or an air brick) or a group of components (eg. all openable windows) are sealed with masking tape and measurements repeated according to section 7.4. The next component can then be sealed in addition to that which has already been sealed, the measurements repeated, and so on until all the desired components have been sealed and measurements made.

7.6 Rearrange the apparatus such that air is being extracted from the dwelling (depressurisation) and repeat 7.4 above. When reductive sealing has been carried out, the components should be progressively unsealed and measurements made, but in reverse order to that in which they were sealed.

8. DATA ANALYSIS

8.1 Calibration temperature correction

If the flow measurement device in the apparatus has not been calibrated to allow for variations in air temperature, then a flow rate correction should be applied. Strictly this should be a calibration air density correction but the efect of variation in barometric pressure is small compared with the effect of temperature. Also, few buildings in the British Isles are at sufficient altitude to warrant a correction for the variation in barometric pressure with altitude.

For orifice plates, venturis, conical inlets and pitot tubes linked to a pressure measuring device which reads in volumetric units of flow the correction will be:

$$q_k = q_r \left(\frac{T_d + 273}{T_c + 273} \right)^{0.5}$$

where q_k = calibration corrected flow rate, m³/h

q_r = flow rate reading, m³/h

T_d = temperature of air flowing through apparatus, °C

T_c = temperature at which the apparatus was calibrated, °C

If the above devices are used with a pressure measurement device reading in pressure units then the correction will be made by using the apparatus air flow temperature in the flow rate calculation.

8.2 Indoor/Outdoor temperature correction

If the difference between indoor and outdoor air temperature is greater than 2.5 °C then an air temperature correction must be applied. The correction made depends upon whether the reading is for a pressurisation or depressurisation test.

8.2.1 Indoor positive pressure - pressurisation

In this case the outside air passes through the apparatus into the dwelling. When this air mixes with the inside air, its temperature and volume may change.

If the indoor temperature is higher, then the volume increases and the volume flow out through the envelope is greater than the measured incoming flow. The correction is therefore:

$$q_{v_{out}} = q_k \left(\frac{T_i + 273}{T_o + 273} \right)$$

where $q_{v_{out}}$ = leakage air flow rate of the envelope, m^3/h

q_k = calibration corrected flow rate, m^3/h

T_i = mean indoor air temperature, °C

T_o = mean outdoor air temperature, °C

8.2.2 Indoor negative pressure - depressurisation

In this case indoor air passes out through the apparatus and the air flowing into the dwelling from outside might be at a temperature different from that inside. The air flow rate correction in this case is therefore:

$$q_{v_{in}} = q_k \left(\frac{T_o + 273}{T_i + 273} \right)$$

where $q_{v_{in}}$ = leakage air flow rate into the dwelling, m^3/h

8.3 Curve fitting and extrapolation of results

Treating the positive and negative pressure results separately, carry out least squares power curve fits ($q = K\Delta p^n$) on the corrected results, using leakage flow rate (q) as the dependent variable and pressure difference (Δp) as the independent variable. The product moment correlation coefficient (r) for the two curve fits should also be calculated.

Where the maximum building envelope pressure difference achieved is less than 50 Pa and greater than 35 Pa (see 7.4) the curve fit can sometimes be used to extrapolate the results to 50 Pa. The conditions for this are that the pressure difference exponent (n) lies between 0.5 and 0.7, and the correlation coefficient squared (r^2) is greater than 0.990. Extrapolated results must be clearly marked as such on all tables, graphs and reports in which they are used.

8.4 Presentation of results

The corrected and uncorrected results should be presented in a table. Figure 5 shows the format used by the Building Research Establishment for scientific purposes. The corrected results should also be presented graphically, with indoor/outdoor pressure difference along the horizontal axis and leakage air flow rate along the vertical axis, as shown in the example Figure 6 (NB: this can be in log-log form if preferred). Curves for both the positive and negative pressure tests are drawn together so that a comparison between the two can be made. There is usually a small difference between the positive and negative results because of the flow characteristics of complex flow paths and small movements of some building components under pressure.

To give a measure of airtightness which can be used for comparison with other buildings, the mean leakage flow rate at 50 Pascals, calculated from the two curve fits, may be converted to an air change rate using the expression:

$$a = \frac{q}{V}$$

where a = air change rate at 50 Pa pressure difference, air changes per hour

q = mean air leakage rate at 50 Pa pressure difference, m^3/h

V = internal volume of the building envelope, m^3

The values of a, q, and V should be quoted both below the table and on the graph of results.

Further measures of airtightness may be calculated if required. For example, q may be divided by total envelope surface area or by outside wall area, etc.

8.5 Air leakage to adjacent dwellings

Where a test is carried out in a detached house the results are a measure of the whole house air leakage to or from outside. However, in semi-detached and terraced houses and in flats a proportion of the measured air leakage will be to or from the adjacent dwelling(s). This leakage to adjacent dwellings is becoming known as cross-leakage. Measurement of the magnitude of cross-leakage can only be done with some difficulty and with extra equipment. It is therefore outside the scope of this procedure.

9. REPORT

The test report should include the following information:

1) date of test and date of report.

2) test conditions: indoor and outdoor temperatures, wind strengths and directions, mean pressures due to the wind with the fan switched off and covered.

3) a description of the building including its location, construction, condition, date built, internal volume, etc; see figure 3.

4) a sketch of the plan of each floor in the dwelling and photographs of the building.

5) the table of results.

6) the graph of results.

7) the mean value of air leakage expressed in air changes per hour at 50 Pascals applied pressure difference.

Further information should be given according to the purpose of the test, eg. major air leakage paths, comparison of the measured air leakage with other dwellings, comparison with leakage before draught-proofing, etc.

10. ACCURACY

The accuracy of this method is dependent on the instruments and apparatus used, on the ambient conditions under which the data are taken and on the skill of the person using the equipment and taking readings. It is therefore difficult to give definite limits of accuracy but a reasonable estimate of the uncertainty at a given pressure difference is about ±8% or less.

It is easiest to take data at high pressure differences, therefore special care should be exercised when measurements are being taken at low pressure differences.

11. ACKNOWLEDGEMENTS

This work draws on the experience of many researchers from both the UK and abroad, mostly through their published papers. In thanking them all, the author wishes to acknowledge the useful suggestions and comments made by David Etheridge of British Gas and John Palmer of Databuild. The work described forms part of the research programme of the Building Research Establishment of the Department of the Environment and is published by permission of the Director.

12. REFERENCES

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3) ASTM Standard E779-81; Standard practice for measuring air leakage by the fan-pressurisation method; 1981; American Society for Testing and Materials; USA; 1981.

4) CGSB Standard 149-GP-10M; Standard for determination of airtightness of buildings by the fan-depressurisation method (fifth draft); 1983; Canadian General Standards Board.

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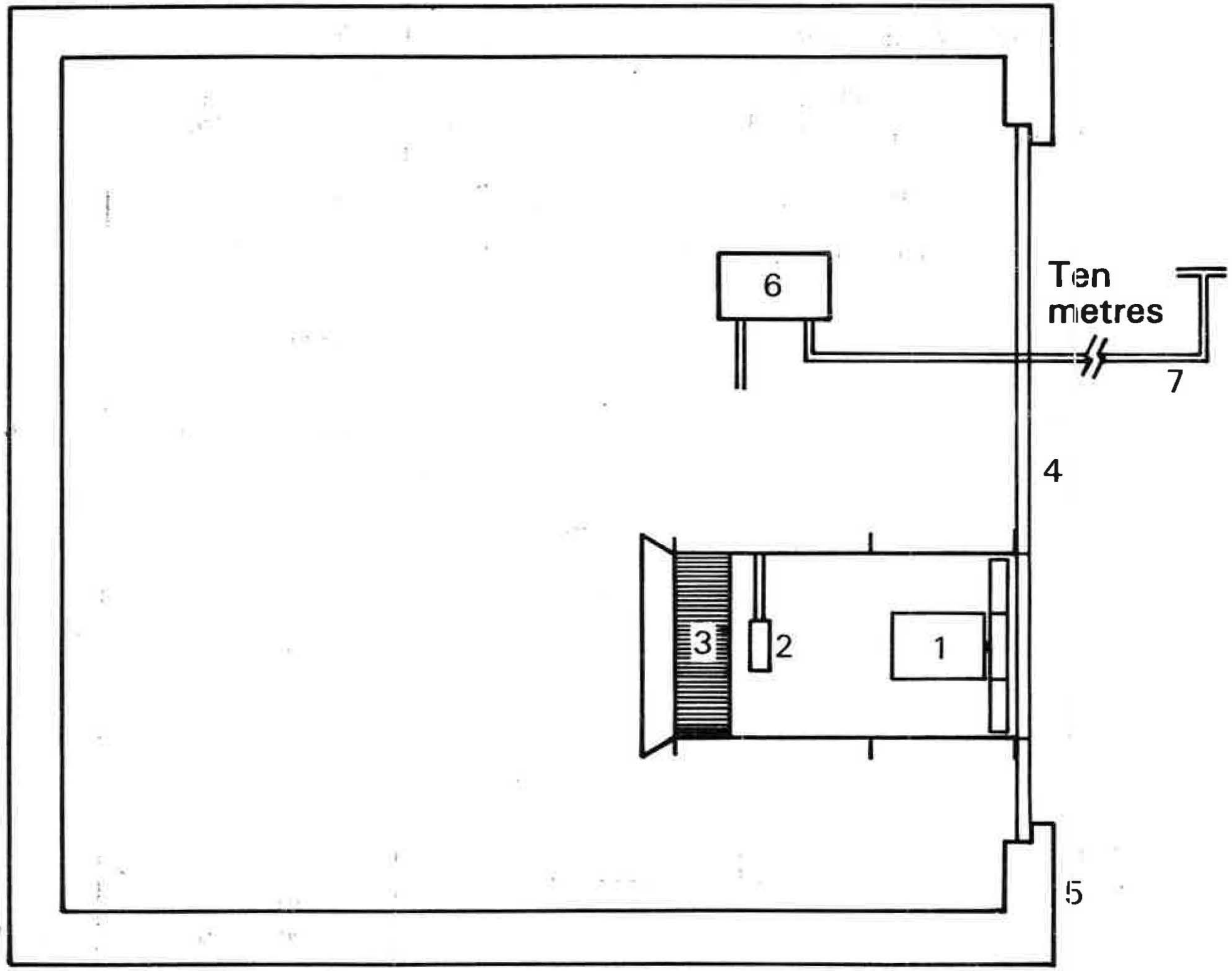


Key:

1. Fan
2. Air flow measuring anemometer head
3. Honeycomb flow straightener
4. Mounting board
5. Building envelope
6. Pressure difference micromanometer
7. Pressure difference tube

Figure 1 Schematic general arrangement of pressurisation unit installed in a building (Shown depressurising)

FIGURE 2 - THE BEAUFORT SCALE

Beaufort range	Equivalent speed 10 m above ground. m/s	Description of wind	Specifications for use on land
0	0.0 - 0.2	Calm	Calm; smoke rises vertically.
1	0.3 - 1.5	Light air	Direction of wind shown by smoke drift but not by wind vanes.
2	1.6 - 3.3	Light breeze	Wind felt on face; leaves rustle; ordinary vane moved by wind.
3	3.4 - 5.4	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	5.5 - 7.9	Moderate breeze	Raises dust and loose paper; small branches are moved.
5	8.0 - 10.7	Fresh breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	10.8 - 13.8	Strong breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	13.9 - 17.1	Near gale	Whole trees in motion; inconvenience felt when walking against wind.
8	17.2 - 20.7	Gale	Breaks twigs off trees; generally impedes progress.
9	20.8 - 24.4	Strong gale	Slight structural damage occurs (chimney pots and slates removed).
10	24.5 - 28.4	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	28.5 - 32.6	Violent storm	Vary rarely experienced; accompanied by widespread damage.
12	≧ 32.7	Hurricane	

(From: Meteorological Office "Observers Handbook". HMSO London (1969)

Figure 3 FAN PRESSURISATION TESTING : DWELLING CHARACTERISTICS

On pages 1 and 3 of this form the details should be entered by ringing the appropriate item. On pages 5,6 and 7 just enter the code numbers in the preceding grids. If you wish to mark any item as "don't know" just leave it blank.

BRS Database number (to be filled in later)

Testing carried out by: Name

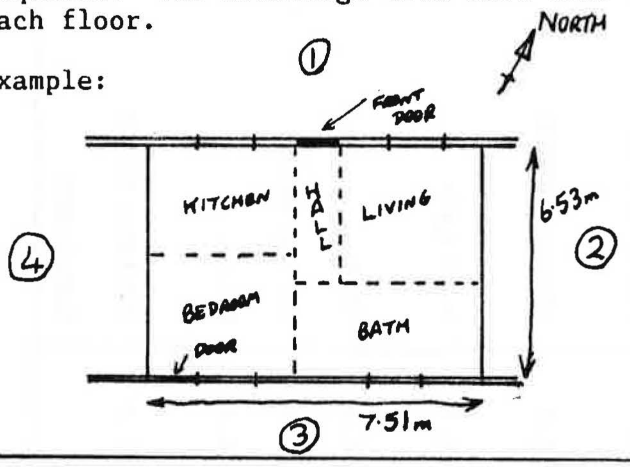
Organisation

Address of dwelling:

Terrain: 1 Sheltered 2 Normal 3 Exposed	Which way does the front wall face (compass direction):
Year of construction:	Number of storeys in whole building:
Age when tested:	If flat or maisonnette, what floor level(s):
Dwelling type: 1 Centre terrace house 2 End terrace house (NB: Treat maisonettes as flats) 3 Semi detached house 4 Detached house 5 Purpose built flat 6 "Converted flat" 9 Other	Number of rooms on Ground Floor: First Floor: Second Floor: Does the dwelling have a porch, conservatory or modification (Note details below): 1 Yes 2 No

Sketch floor plan of dwelling on back of this sheet. Only rough sketches are required. For dwellings with more than one storey, a sketch is required for each floor.

Example:



Use double line to show external walls. Mark overall dimensions as measured internally to allow calculation of internal volume.

Number the four facades on the plan in a clockwise direction. The front wall is on facade 1

Show internal room layout - one sketch for each floor will be required.

NOTES:

Figure 3 (continued) DWELLING CHARACTERISTICS - Page 2

Floor plan sketches. Show external walls with double lines and mark on the internal dimensions.

Ceiling heights (m): Ground floor First floor Second floor	Ground floor area (m^2): External wall area (m^2):
Total height of building to apex (m):	Total envelope area (m^2):
Total height of building to eaves:	Internal volume tested (m^3):

NOTES:

CONSTRUCTION DETAILS

Wall type: 1 Masonry - solid 2 Masonry - cavity 3 Timber frame - brick clad 4 Timber frame - tile/timber clad 5 Precast concrete 9 Other (give details)	Number of main roof slopes: (ignore dormers) 0 Flat roof 1 One 2 Two 3 Three 4 Four 9 Other
Wall insulation: 1 All external walls 2 None 3 Some external walls 9 Other (give details)	Roof insulation: 1 All 2 None 3 Some 9 Other (give details)
Ground floor type: 1 Solid 2 Suspended timber 3 Suspended concrete 9 Other (give details)	Fitted carpets to ground floor: 1 All 2 None 3 Some

NOTES:

Figure 3 (continued) DWELLING CHARACTERISTICS - Page 4

WINDOW AND DOOR DETAILS

Elevation	Room	Reveal		Opening light		Sketches and remarks
		Width m	Height m	Width m	Height m	

SUMMARY DATA - WINDOWS

Elevation	1	2	3	4
Number of windows				
Window Type(s)				
Glazing type(s)				
Window frame material(s)				
Window surround material (if different)				
Total area of window reveals (m²)				
Number of opening lights				
Total crack length of openable lights (m)				
Draughtproofing				

CODES:

Window frame material: 1 Wood 2 Metal 3 Plastic 9 Other	Glazing type: 1 Single 2 Double 3 Secondary double 9 Other
Window surround material: 1 Wood 2 Metal 3 Plastic 9 Other	Draughtproofing: 1 All 2 None 3 Some
Window type: 1 Casement 2 Pivot 3 Sliding 4 Louvre 5 Rooflight 9 Other	Are windows recent replacements: 1 All 2 None 3 Some

Total dwelling window area (m²)	
Total openable window area (m²)	
Total crack length of openable areas (m)	

Notes:

SUMMARY DATA - DOORS

Elevation	1	2	3	4
Number of doors				
Door type(s)				
Door material(s)				
Door frame material(s)				
Door surround material (if different)				
Total crack length around doors (m)				
Draughtproofing				

CODES:

Door type:	1 Casement 2 Sliding 9 Other	Door frame material:	1 Wood 2 Metal 3 Plastic 9 Other
Door material:	1 Wood 2 Metal 3 Plastic 4 Wood + glass 5 Metal + glass 6 Plastic + glass 9 Other	Door surround material:	1 Wood 2 Metal 3 Plastic 9 Other
Draughtproofing:	1 All 2 None 3 Some		

Notes:

CHIMNEYS AND FLUES

Write down the location and type of all chimneys and flues in the dwelling.

Type codes are:
1 Open chimney
2 Sealed chimney
3 Chimney with gas fire, 'Parkray', etc
4 Boiler flue
5 Natural ventilation duct
9 Other

VENTILATION OPENINGS

Elevation	1	2	3	4
Number of ventilation openings				
Airbrick type(s)				
Window ventilator type(s)				

CODES:

Airbrick type: 1 Fixed opening 2 Adjustable opening 9 Other	Window vent type: 1 fixed trickle vent 2 Adjustable trickle vent 3 fixed in window 4 adjustable in window

Write down dimensions of ventilators and airbricks plus any other notes:

VENTILATING FANS

Elevation	1	2	3	4
Number of ventilating fans				
Type of ventilating fans				

CODES:
1 In wall extract
2 Cooker hood
3 Mechanical ventilation system
4 In window extract
5 Stairway supply
9 Other

Write down the Make, Model, Size and location of fans, plus any notes.
Describe any kind of whole house mechanical ventilation system.

Figure 4 Detailed test results

Address:

Date: Time:

Before Test:		After Test:	
Wind Speed:	m/s	Wind Speed:	m/s
Wind Direction:		Wind Direction:	
External Temperature:	°C	External Temperature:	°C

Temperature Sensor Location	Temperature °C					Comments
	Before				After	
System						
Fan Off Mean Pressure Difference				**Pa**		
Maximum				**Pa**		
Minimum				**Pa**		

	Air Flow m³/h	Pressure Diff Pa		Air Flow m³/h	Pressure Diff Pa		Air Flow m³/h	Pressure Diff Pa		Air Flow m³/h	Pressure Diff Pa
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
5			5			5			5		
6			6			6			6		
7			7			7			7		
8			8			8			8		
9			9			9			9		
10			10			10			10		
M			M			M			M		
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
5			5			5			5		
6			6			6			6		
7			7			7			7		
8			8			8			8		
9			9			9			9		
10			10			10			10		
M			M			M			M		

P R E S S U R I S A T I O N   O R   D E P R E S S U R I S A T I O N

Type of test: Normal/Special- (give details)

Figure 5 _ Summary test results

Address: ______________________________

____

Date of Test: ______________ Pressurisation Fan Type: ______________

Interior Volume of Building: ______________ Pressurisation Fan No: ______________

Type of Test: (if not 'NORMAL') ______________ Calibration Temperature, Tc ______________

A. PRESSURISATION

Mean Wind Speed: ______

Mean Wind Direction: ______

Mean Outside Temperature, To: ______ °C

Mean Inside Temperature, Ti: ______ °C

Mean System Temperature, Td: ______ °C

Fan Off Pressure Difference:

Mean ______ **Pa**

Maximum ______ **Pa**

Minimum ______ **Pa**

	q_r	q_k	$q_{v_{out}}$	Δp
	m^3/h	m^3/h	m^3/h	**Pa**
1				
2				
3				
4				
5				
6				
7				
8				

Curve Fit parameters ($q_{v_{out}} = K\,\Delta p^n$)

K = ______ q_{50} = ______ m^3/h

n = ______

r^2 = ______ a = ______ ach

B. DEPRESSURISATION

Mean Wind Speed: ______

Mean Wind Direction: ______

Mean Outside Temperature, To: ______ °C

Mean Inside Temperature, Ti: ______ °C

Mean System Temperature, Td: ______ °C

Fan Off Pressure Difference:

Mean ______ **Pa**

Maximum ______ **Pa**

Minimum ______ **Pa**

	q_r	q_k	$q_{v_{in}}$	Δp
	m^3/h	m^3/h	m^3/h	**Pa**
1				
2				
3				
4				
5				
6				
7				
8				

Curve Fit parameters ($q_{v_{in}} = K\,\Delta p^n$)

K = ______ q_{50} = ______ m^3/h

n = ______

r^2 = ______ a = ______ ach

C. MEAN VALUES

q_{50} = ______ m^3/h

a = ______ ach

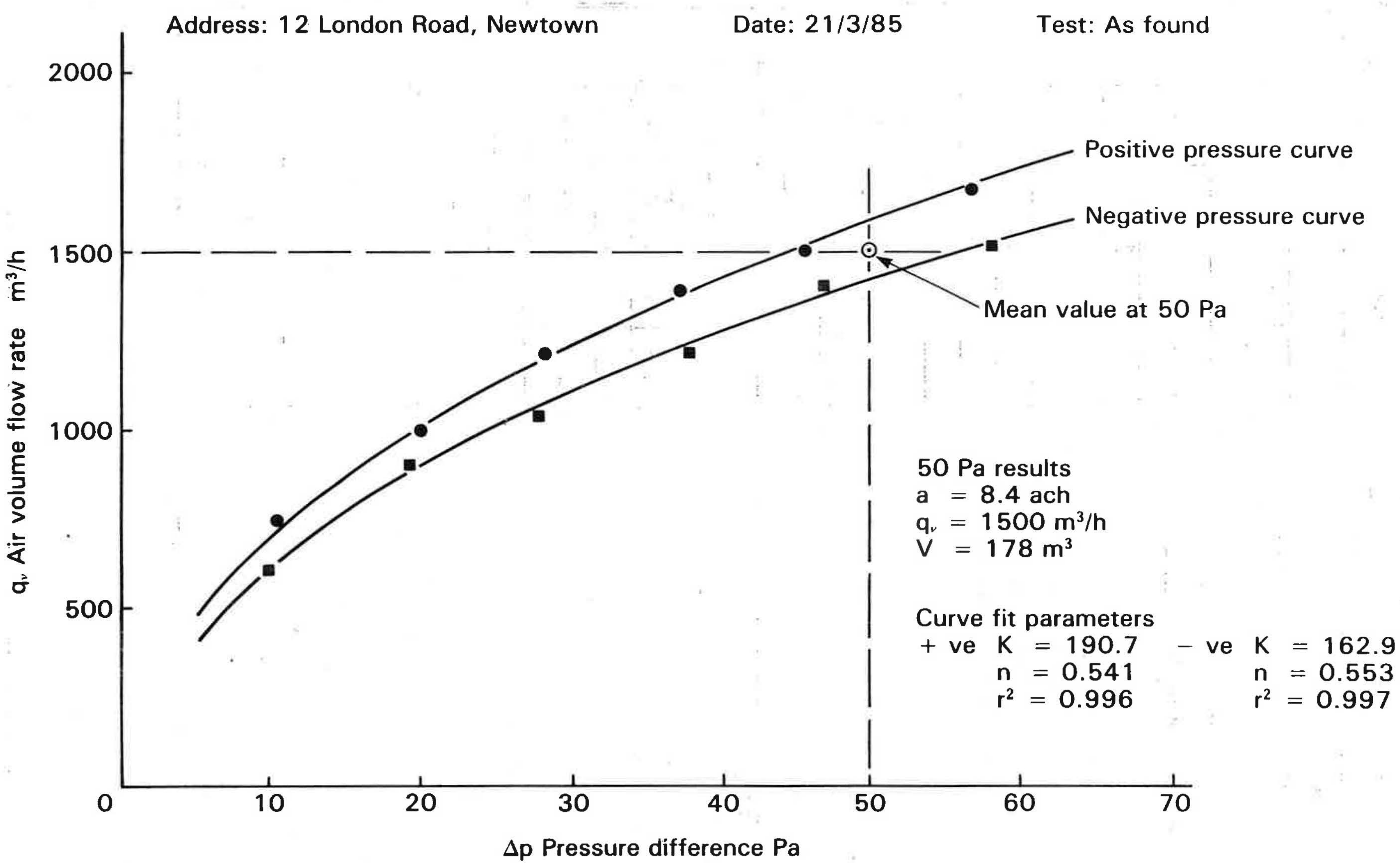


Figure 6 Example of graphical presentation of results (ficticious data)