TECHNICAL INFORMATION

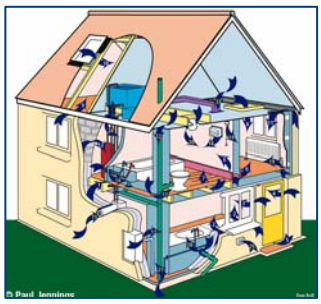
# Air Tightness Testing

## 1 What is air tightness testing?

An airtight building is one which does not lose either heated or cooled air to the outside in an uncontrolled manner. In practice no buildings are entirely airtight and it would not normally be desirable for this to be the case. However high performance levels are desirable for the reasons given in Section 2.

Air tightness testing is a method of measuring the extent to which heated or cooled air is lost through leaks in the building. Air tightness testing can also be referred to as air leakage or air pressure testing.

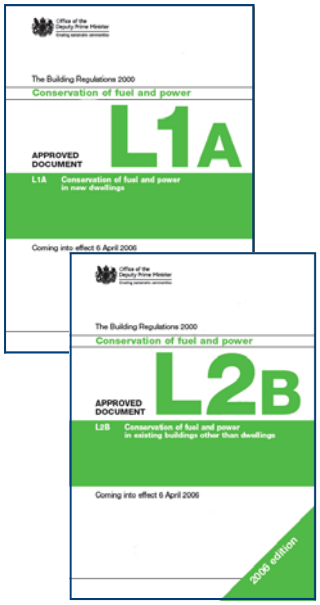
## 2 Why is air tightness testing important?



### 2.1 Cost

Energy is wasted by various means usually through a building's design and construction quality. Lack of attention to air tightness is one of the most costly factors, sometimes causing a doubling of fuel bills. With rapidly rising energy prices this is becoming an increasingly important issue.

### 2.2 Environmental



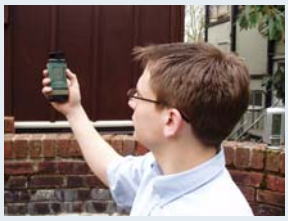
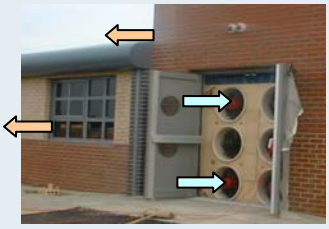

Burning fossil fuel to generate energy adds to carbon emission levels, which in turn is believed by most scientists to add to the Greenhouse Effect and its consequent problems for global climate change.

Clearly, using less energy by being more efficient is the best way of reducing carbon emissions. The Government is aiming to achieve a 60% reduction in carbon emissions by 2050. This is a hard target to achieve and is probably impossible without tackling the waste caused by leaky buildings.

To achieve this target, the government is introducing a range of regulations and initiatives, one of which is the amendment to Part L of the England and Wales Building Regulations, which came into effect on 6 April 2006. The changes within the regulations are seeking to reduce carbon emissions by 20% across all newly constructed buildings.

# 3 The air tightness testing process

The ATTMA (Air Tightness Testing Measurement Association) publication 'Measuring Air Tightness of Building Envelopes' specifies the test method which allows you to calculate the volume flow rate of air supplied per square metre of building envelope area* to achieve an internal to external pressure difference of 50 Pascal.

| | |
|---|---|
| a) Check the weather conditions - wind speed and humidity must be within permissible ranges. |   |
| b) Identify an appropriate opening in the building's envelope (normally the front entrance) and install a template to hold the fans. |   |
| c) Install the appropriate number of fans for the building size eg single fan for a house or 6 fans for a large commercial building. |   |
| d) The fans are used to create a 50 Pascal pressure difference between the inside and outside of the building (this can be done by blowing air into the building or drawing air out). Most works can continue while the building is being tested. Internal doors must be held open to allow air to pass freely through the building. |   |
| e) Air flow measurements are taken at a range of pressure differentials. The quantity of air being supplied to or drawn from the building to maintain pressure levels will be equal to the air quantity escaping from the building through gaps and therefore reflects the air leakage rate. |  |
| f) All the measurements are entered into a specially-designed software package which calculates the air flow rate in $m^3/h/m^2$ of envelope area at 50 Pascal. As a minimum, this must be equal to or less than 10 $m^3/h/m^2$. Often, a higher performance will be set as part of the SAP 2005/SBEM calculations. An indicative result should be available immediately. |  |

# 4 What performance level must be achieved?

A general minimum level for design air permeability has been set at $10m^3/h/m^2$. There are one or two exceptions where a lower performance is acceptable and these are explained in the sections below.

However, it will often be the case that a higher performance will be set by the designer in order to reach the overall carbon emission rate. At the end of the process all the elements making up the carbon emission rate will be tested / checked to ensure that the target emission rate has been achieved / exceeded.

If the intention was to achieve an air permeability rate of $7m^3/h/m^2$ and on testing it is found to be $8m^3/h/m^2$, this need not be a problem / fail provided that some other element in the equation has improved sufficiently to compensate for this. If there is no compensating factor then it will constitute a fail.

* The external envelope is made up of floors, walls, ceilings etc. that separate the internal (conditioned/heated) environment from the external (unconditioned) environment (including lift shafts and plant rooms).

# 5 Part L air tightness regulatory requirements

Under the 2006 Revision to Part L, it is a **regulatory requirement**, not just guidance, to conduct air tightness testing. Building Control will not be able to provide a Completion Certificate without the necessary air tightness testing results.

## 5.1 Sampling regimes

### 5.1.1 Non-dwellings

Every non-dwelling building is required to be tested, with some exceptions:

- Buildings under 500m$^2$ may wish to accept a poor default value of 15m$^3$/h/m$^2$. However, there will be a cost somewhere else in the process to pay for this trade-off.
- Factory-made modular buildings may prove their performance using an independent approved test body to conduct test programmes both in the factory and on site
- Large and / or complex buildings will sometimes find it impossible to test and will therefore need to engage an independent person to undertake a detailed programme of design development, component testing and site supervision to provide the necessary confidence.

All extensions to existing non-dwellings are treated as for new build, providing they are:

- greater than 100m$^2$
- greater than 25% of the total useful floor area

### 5.1.2 Dwellings

Where the **'Approved Construction' details have been adopted** one test should be carried out on each dwelling type on each development. Separate blocks of flats are treated as separate developments. Each of the following constitutes a change of **dwelling type**:

- Change in method of construction eg timber frame and brick & block
- Ground floor, mid floor & top floor flats
- End of terrace & mid terrace
- Semi-detached & detached
- Significant changes in building floor area

Where the **'Approved Construction' details have not been adopted** then each dwelling type is to be tested as above but with an increased sampling regime as follows:

| No. of instances of dwelling type | No. of tests to be carried out on dwelling type |
|---|---|
| 4 or less | One test of each dwelling type |
| Greater than 4, but equal to or less than 40 | Two tests of each dwelling type |
| More than 40 | At least 5% of the dwelling type, unless the first 5 units of the tested type that achieve the design air permeability, when the frequency can be subsequently reduced to 2%. |

For **developments with one or two units**, one unit must be tested (or two if they are dissimilar in arrangement or construction type). The only exceptions are if:

- The identical construction has been built by the same builder within the last 12 months and successfully passed the air tightness test.
- A poor default value of 15m$^3$/h/m$^2$ is accepted in the SAP 2005 calculations.

## 6 In the case of dwellings, who chooses the units to be tested?

The Building Control Body will select the units which are to be tested according to the defined sampling regime in Part L. On larger developments, units will be chosen from the first completed batch, to ensure that mistakes can be rectified and lessons applied to later batches.

## 7 What happens if the tested air permeability performance is unsatisfactory?

In the case of **non-dwellings** the contractor will need to undertake remedial work and commission further testing to confirm that the required performance is achieved.

In the case of **dwellings**, the contractor will need to undertake remedial work and then commission a re-test on the same unit as well as an additional test on another unit. Testing and re-testing will continue until the tests prove that the performance is satisfactory.

## 8 Who should perform the air tightness testing?

To give Building Control Bodies the confidence they need to sign off the Completion Certificates, we advise contractors to appoint independent test providers who are registered by the British Institute of Non-destructive Testing. In this case, Building Control only need to receive a simple certificate.

It is permissible to use a non-registered test provider. However, it makes the responsibility for signing off the Completion Certificate more burdensome for the Building Control Body. This is because, in this instance, they are required to receive a full test report, rather than just a certificate, and to satisfy themselves that the test methods and calculations have been undertaken correctly and that the results are acceptable.

## 9 How can Chiltern Dynamics help?

- **Testing**
  To the ATTMA testing procedures
- **Design review**
  To ensure that design details are right from the start
- **Pre-test site inspection**
  To avoid costly remedial works later
- **Training** (public and in-house)
  To ensure that all your key staff understand how to build airtight buildings. Please contact our training department on 01494 569620 or email training@chilterndynamics.co.uk for further details.

## Contact


**Graham Tomic**

**t:** 01494 569830

**e:** gtomic@chilterndynamics.co.uk



**Chiltern Dynamics**
Stocking Lane
Hughenden Valley
High Wycombe
HP14 4ND

**t:** + 44 (0) 1494 569800

**f:** + 44 (0) 1494 564895

**w:** www.chilterndynamics.co.uk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