Air-tightness tests on a Manthorpe Building Products GL250-03 loft hatch assembly

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27 August 2006

Test report number 231-637

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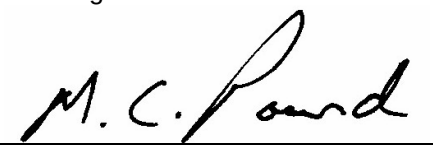
Date 27th August 2006

Signature 

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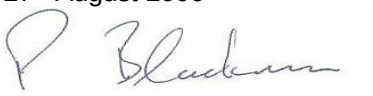
Date 27th August 2006

Signature 

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1 Introduction

At the request of Mr. M. Challinor, R and D Manager of Manthorpe Building Products, Manthorpe House, Brittain Drive, Codnor Gate Bussiness park, Ripley, Derbyshire, DE5 3ND, BRE issued proposal 117 384 on 9 August 2006. The proposal was accepted and BRE tested a specimen of GL250-03 loft hatch assembly on 9 August 2006.

The tests to methods in BS EN 13141-1: 2004[1] measures the air permeability of the loft hatch assembly. Interpretation of the results is based on guidance in BS 5250: 2002 for components in 'well sealed ceilings'. The methods and results are described herein.

The tests were carried out by M. C. Pound, BRE under the BRE Standard Terms and Conditions of Business as part of BRE Job number 231 637 in project number CV1054.

2 Objectives of the testing

The objective of the testing was to measure the air leakage through a GL250-03 loft access hatch.

There have been some recent changes to the Building Regulations designed to improve the energy efficiency of buildings. These changes have introduced new requirements for the air tightness of certain building types. For example, Part L2A states that a reasonable limit for the design air permeability of buildings is 10 $m^3/h.m^2$ at 50 Pa. Hence loft access hatch specifiers might need to know the leakage rate of loft hatches at a pressure of 50 Pa.

There have also been some recent changes to *BS 5250: 2002, the Code of Practice for control of condensation in buildings*. Amendment 16119, issued on 23rd December 2005 introduced a clause giving recommendations for air tightness of ceilings. This new clause, 8.4.1.2, gives some rules for producing a well sealed ceiling which includes a requirement for loft hatches as follows:

'*The air leakage rate through an access loft hatch, including its frame, when tested to BS EN 13141-1:2004, 4.3 is less than 1m^3/h at a pressure difference of 2Pa. It can be assumed that "push-up" wooden hatch covers in a frame, constructed in-situ, with continuous compressible seals, will meet this criterion provided the weight of the door is at least 5.5kg. Hatch covers should either be heavy enough to compress the seal or be clamped, with a closed cell compressible seal, or "O-ring" between it and the frame. Drop-down hatch covers are more difficult to seal; it is recommended that proprietary units with a supplied hatch cover in a frame are used. Manufacturers can provide third party evidence that the leakage criterion is met'.*

Thus, loft access hatch specifiers are also likely to need to know the air leakage rates at a pressure of 2 Pa.

3 Details of the testing and the test rig

BS 5250: 2002 specifies that loft access hatches should be tested to BS EN 13141-1: 2004. This standard is intended for testing the ventilation performance of externally and internally mounted air transfer devices of the following types:

- Devices with fixed opening(s)
- Devices with manually adjustable opening(s)
- Devices with pressure difference controlled opening(s)
- Window openings specifically designed to act as an air transfer device

It can be seen from the above list that this standard is intended for testing devices with openings. It was not intended for testing nominally sealed devices such as loft access hatches. This has some consequences when it comes to analysis of the results because the airflow through loft hatches, as might be expected, does not fit the equation for flow through an opening. However, the basic principles of the BS EN 13141-1: 2004 test will apply to loft access hatches.

The basic principle of the test is that a specimen is fixed into one face of an airtight box and the air pressure differential is then gradually increased (or decreased) in prescribed increments from 1 Pa to 100 Pa and the flow rate measured at each increment. The airflow was applied using a variable speed centrifugal fan and the mass flow rate was measured using a calibrated flow meter. The mass flow rate (kg/h) was converted to volume flow rate m^3/h taking account of the barometric pressure and temperature measured during the testing. A calibrated manometer was used to measure the air pressure differential across the specimen.

The test rig for these tests is shown in Figure 1. The rig has an opening of about 860 mm x 800 mm into which the test specimen is clamped. The opening has strips of closed cell foam around the perimeter to give an airtight seal. Figure 2 shows a loft hatch clamped into the rig. Note that the specimen is mounted so that the hatch faces into the box.

BS EN 13141-1 requires that the test rig has a background leakage rate lower than 1 litre/s at 100 Pa (= 3.6 m^2/h). The background leakage of the test rig was measured under both positive and negative pressures by using a 1 m^2 sheet of mdf clamped on to the test rig. This background leakage was subtracted from all measured test results. Table 1 shows the background leakage rate of the test rig, which is well within the specified requirements of BS EN 13141-1.

Table 1 Background air leakage rate from test rig

	Differential Pressure (Pa)											
	1	2	4	8	10	15	20	30	40	60	80	100
Air leakage (m3/h)	0.01	0.02	0.03	0.07	0.09	0.11	0.14	0.18	0.22	0.29	0.37	0.51
	Differential Pressure (Pa)											
	-1	-2	-4	-8	-10	-15	-20	-30	-40	-60	-80	-100
Air leakage (m3/h)	0.01	0.02	0.03	0.08	0.10	0.13	0.16	0.20	0.25	0.3	0.41	0.56

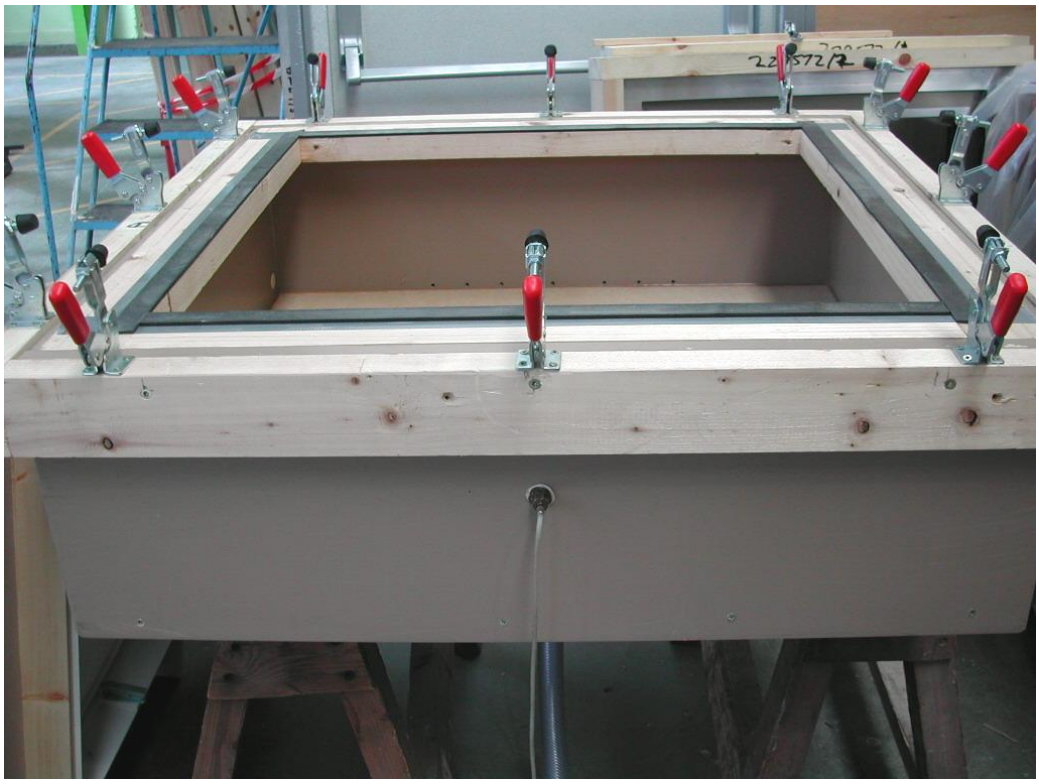

Figure 1. The test rig without the test specimen

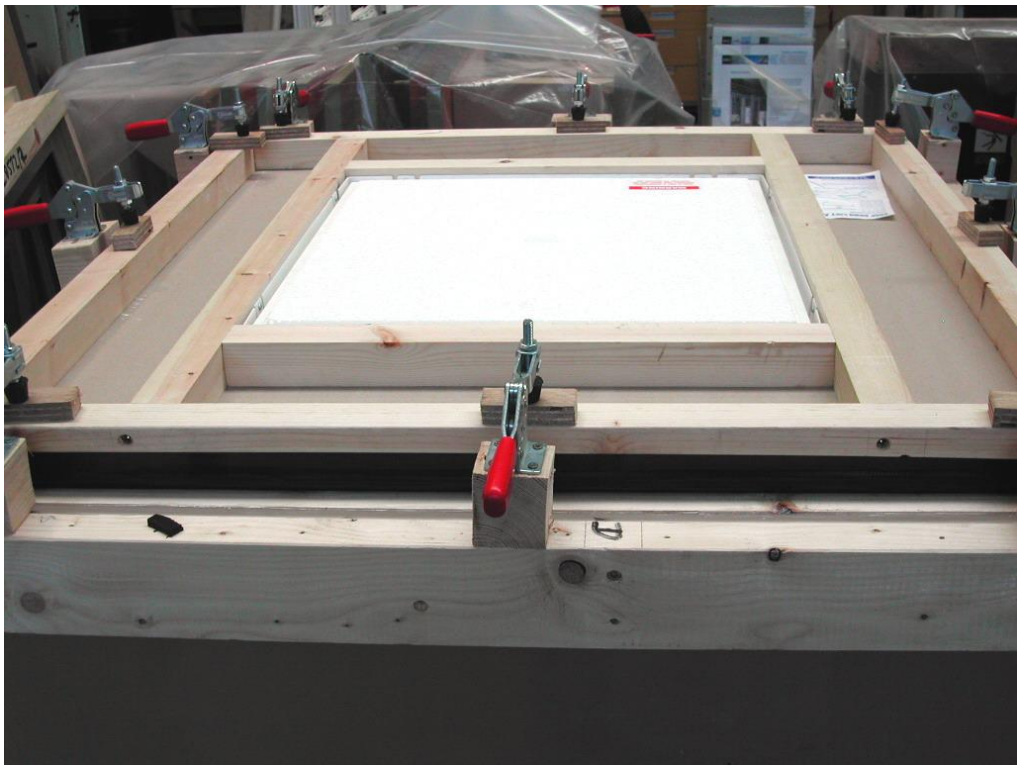

Figure 2. The test rig with the test specimen in place

4 Test Specimen

A new GL250-3 loft hatch assembly was supplied by Manthorpe Building Products and mounted into a 1 m x 1 m section of 12 mm thick plasterboard sheet with stiffening timber battens representative (in stiffness) of a typical ceiling. The specimen with surround was clamped on to the test rig as shown in Figure 2. All exposed edges of the plasterboard were sealed to minimise air leakage from them. The specimen was tested as supplied with no modifications or adjustments being made by BRE.

Product	Hatch and overall areas; m²	Type
Manthorpe GL250-03	0.371 and 0.54	Drop down hatch – hinged at one edge and with a central turn catch at the opposite edge

Table 2. Details of the test specimen

Photographs of the loft access hatch are shown in Annex A

5 Test results

The BS EN 13141-1: 2004 test procedure only requires testing under positive differential pressure, i.e. for loft hatches this would be a positive pressure on the indoor face of the hatch (not on the roof space side). However, because the performance of the hatch was expected to be different under positive and negative pressure, the test was repeated for negative applied pressure.

The air leakage rates in m^3/h for the positive and negative pressure tests are shown in Table 3.

Positive differential air pressure Pa	Air permeability of GL250-3 m^3/h	Negative differential air pressure Pa	Air permeability of GL250-3 m^3/h
1	0.38	-1	0.54
2	0.78	-2	0.93
4	1.36	-4	1.52
8	2.02	-8	2.14
10	2.30	-10	2.66
15	2.73	-15	3.14
20	3.21	-20	3.81
30	3.99	-30	4.92
40	4.67	-40	6.17
60	5.72	-60	8.41
80	6.62	-80	10.36
100	7.27	-100	12.22

Table 3 Air leakage rates (m^3/h) for positive and negative differential pressures

From Table 3 it can be seen that the GL250-03 drop down hatch gives a lower air leakage rate under positive pressure than under negative pressures. This is because the hatch is forced up on to the seals under positive pressure, whereas for negative pressures compression of the seals is reduced.

Plots of leakage rate versus pressure differential are given in Figure 3 below.

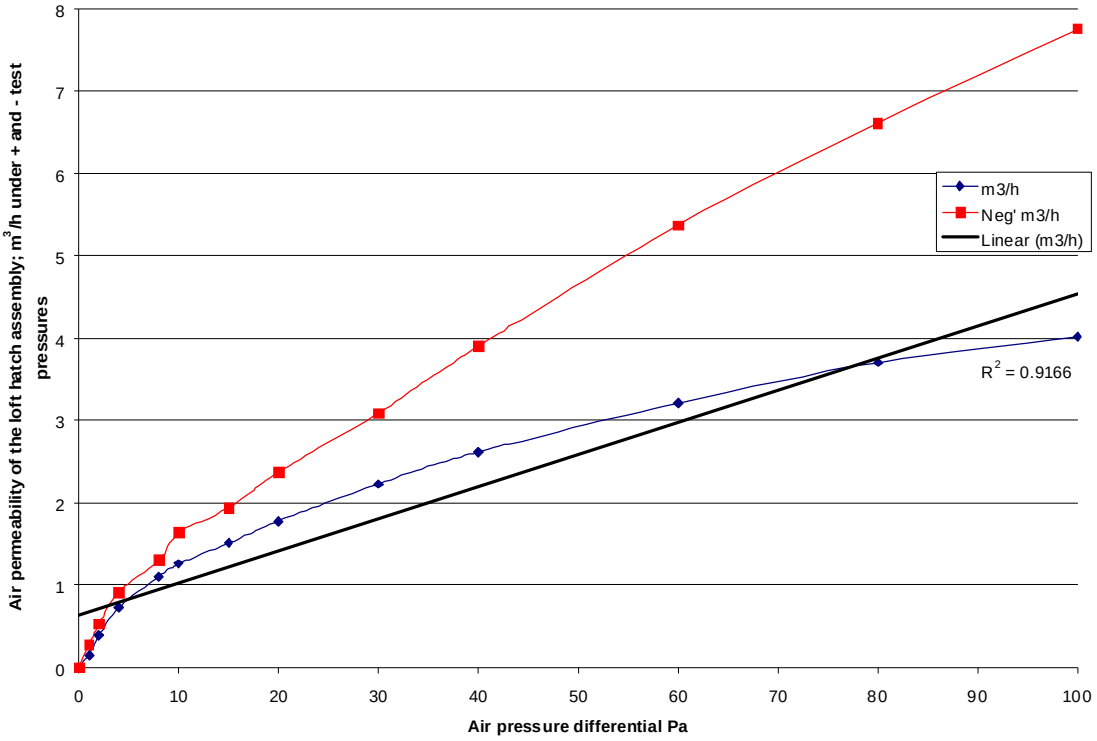

Figure 3. GL250- 03 Comparison of air permeability under positive and negative test pressures

The BS 5250 maximum recommended air leakage rate for loft hatches in sealed ceilings is 1 m^3/h at a positive pressure differential of 2 Pa. The air leakage rates at 2 Pa are highlighted in the Table 3 where it can be seen that the GL250-03 product meets this requirement with a leakage rate of 0.78 m^3/h.

At a positive test pressure of 50 Pa the air leakage rate is between 4.73 m^3/h and 5.82 m^3/h; In the region of 5.28 m^3/h. The units given for leakage rate in Part L2A of the Building Regulations are *m^3/h.m^2.*

It can be seen that the GL-250-03 loft hatch assembly is within the Part L2A 'reasonable limit' for the design air permeability of buildings, at 9.78 m^3/h.m^2 at 50 Pa.

6 Summary

The Manthorpe Building Products loft access hatch Model GL-250-03 met the BS 5250: 2002 recommendation for a leakage rate of <1m^3/h at a pressure differential of 2 Pa.

It also met the Building Regulations Part L2A 'reasonable limit' for the design air permeability of buildings of10m^3/h.m^2 at 50Pa.

It should be noted that the above requirements are only best practice recommendations or guidance and are not pass/fail criterion. Products that don't meet these requirements can still be sold but it is likely that the new trend towards well sealed ceilings will mean that specifiers will increasingly want products that comply with the requirements of BS 5250: 2002.

Annex A - Photographs of the loft hatch

Figure A1 – Manthorpe Building Products GL-250-03 loft access hatch

==========REPORT ENDS==========