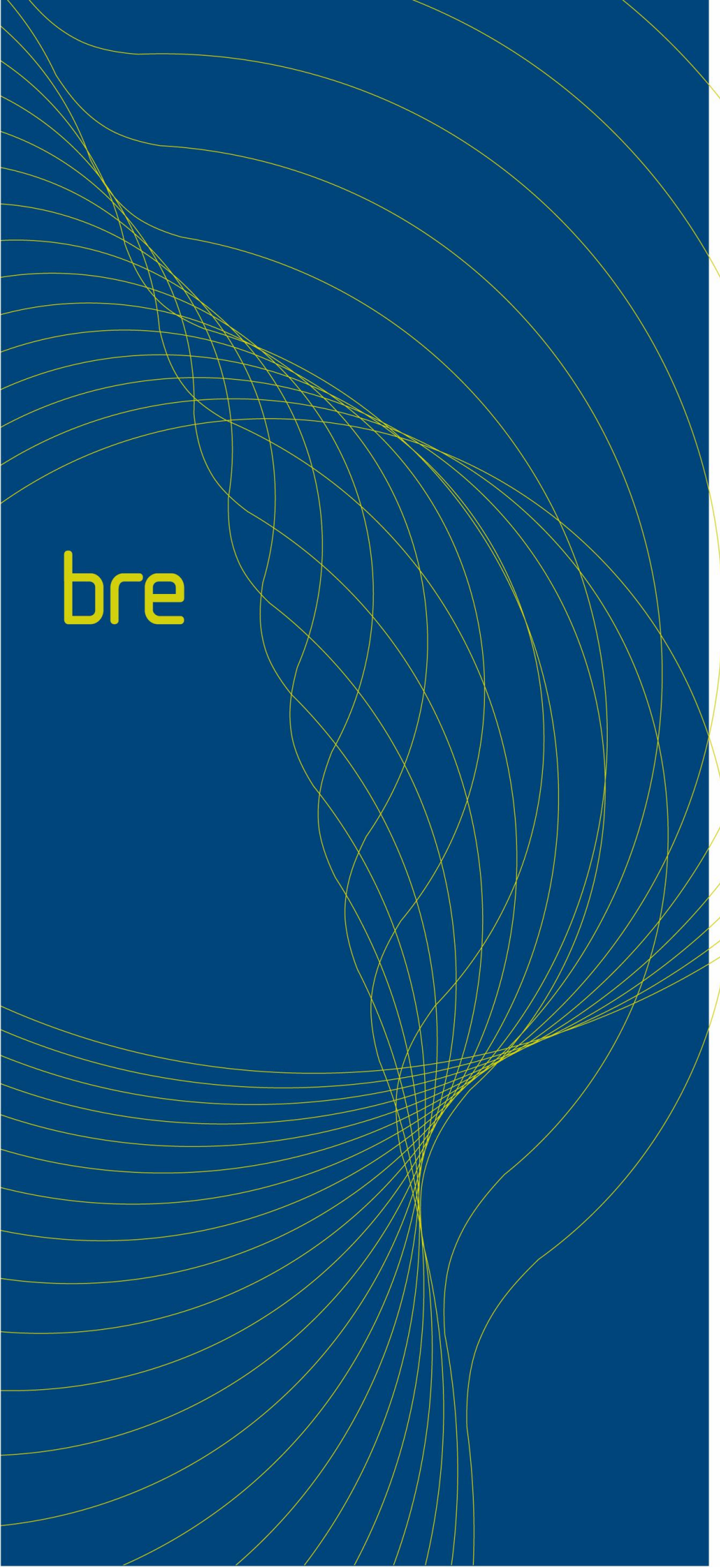

Air-tightness tests on a Manthorpe Building Products GL280F loft hatch assembly

Prepared for: Mr M Challinor,
R and D Manager
Manthorpe Building Products

11 December 2006

Test report number 233677

Prepared by

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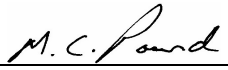
Position	Laboratory Manager and Senior Consultant, Actions, Centre for materials and Engineering
Date	11th December 2006
Signature	

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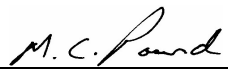
Signature	

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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 118979 on 24 November 2006. The proposal was accepted on 29 November and BRE tested a specimen of GL280F loft hatch assembly on 7 December 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 233677 in project number CV1531.

2 Objectives of the testing

The objective of the testing was to measure the air leakage through a GL280F 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 hatch assemblies 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 1 also a loft hatch assembly 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.

Positive first, then negative	Differential air pressure. Pa.											
	1	2	4	8	10	15	20	30	40	60	80	100
Air leakage m^3/h	0	0	0.01	0.08	0.11	0.13	0.14	0.20	0.25	0.37	0.53	0.67
Air leakage m^3/h	0	0	0.01	0.08	0.11	0.13	0.14	0.20	0.25	0.37	0.53	0.67

Table 1. Background air leakage rate from test rig

Figure 1. (Left) The test rig with the specimen GL280F in place.

Figure 2. (Below) The GL280F loft access hatch assembly – viewed from 'below the ceiling'

4 Test Specimen

A new GL280F loft hatch assembly was supplied by Manthorpe Building Products, mounted into a 1m x 1m section of mdf 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 1. The specimen was tested as supplied with no modifications or adjustments being made by BRE.

Product	Hatch and overall areas; m²	Type
Manthorpe GL280F	0.36 and 0.43	Metal framed with an insulated drop down hatch – hinged at one edge and with a central turn catch at the opposite edge. The overall size is 578 mm x 746 mm Hatch is 521 mm x 690 mm x 100 mm thick Opening joint length is 2.42 m An open cell foam seal is mounted on the hatch door and compressed by the closing action of the hatch.

Table 2. Details of the test specimen

A photograph of the loft access hatch is 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 GL280F m^3/h	Negative differential air pressure Pa	Air permeability of GL280F m^3/h
1	0.24	-1	0.30
2	0.48	-2	0.37
4	0.77	-4	0.73
8	1.12	-8	1.00
10	1.21	-10	1.21
15	1.57	-15	1.57
20	1.86	-20	1.78
30	2.20	-30	2.20
40	2.53	-40	2.58
50	2.77	-50	2.71
60	3.00	-60	2.88
80	3.43	-80	3.33
100	3.82	-100	3.80

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

From Table 3 it can be seen that the GL280F drop down hatch gives about the same air leakage rates under positive and negative test pressures. This is because the hatch is sufficiently stiff to withstand the loads applied without bending and reducing compression of the seals and allowing more air to leak passed under negative test pressures.

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

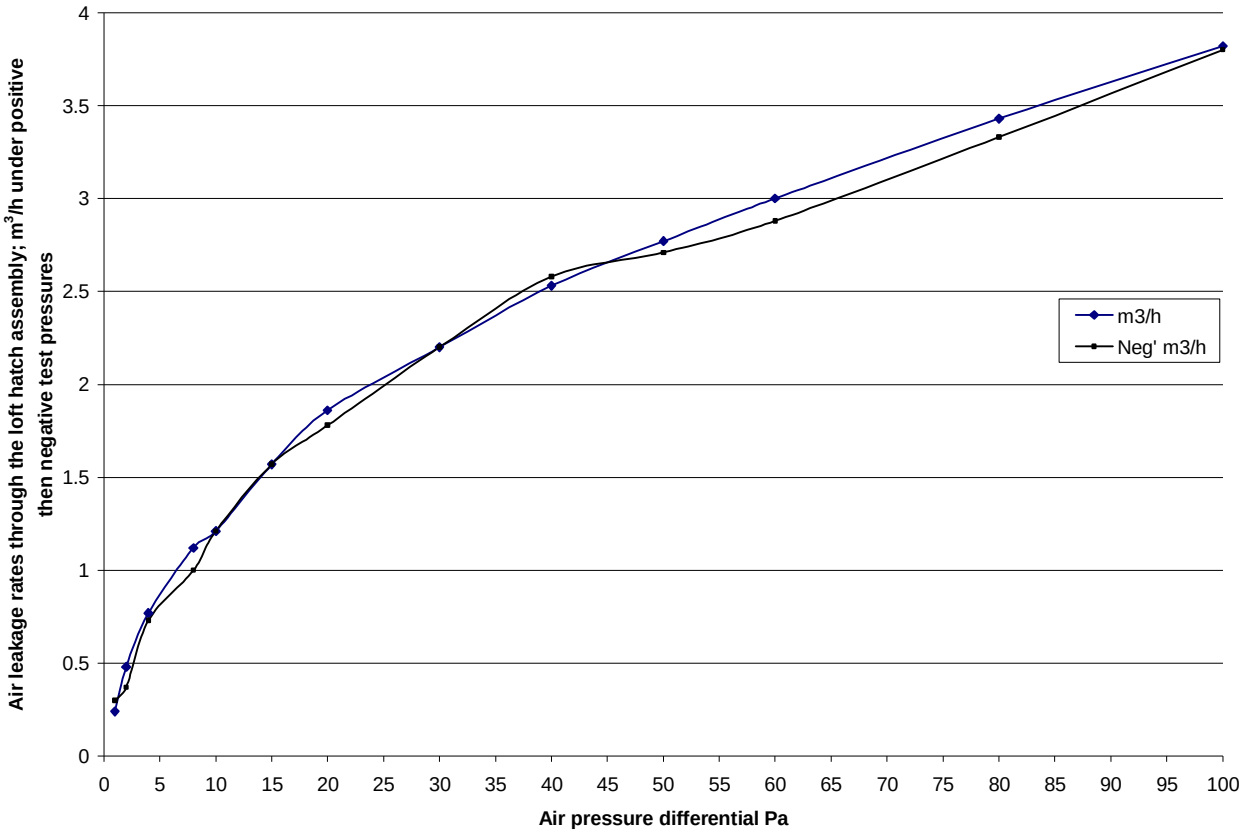
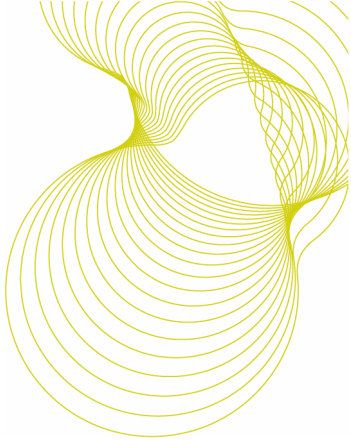


Figure 3. GL280F - Comparison of air permeability under positive and negative test pressures

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 GL280F product meets this requirement with a leakage rate of 0.48 m^3/h.

At a positive test pressure of 50 Pa the air leakage rate is 2.77 m^3/h; The units given for leakage rate in Part L2A of the Building Regulations are $m^3/h.m^2$. 2.77 m^3/h equates to 6.42 $m^3/h.m^2$. The specimen GL280F loft hatch assembly is therefore within the Part L2A 'reasonable limit' of 10 $m^3/h.m^2$ for the design air permeability of buildings.



6 Summary

The Manthorpe Building Products loft access hatch assembly Model GL280F 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 - Photograph of the loft hatch assembly

Figure A1 – Manthorpe Building Products GL280F loft access hatch assembly

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