

**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

**SAMPLE TESTING REPORT**  
**AIR PERMEABILITY TESTING**

**11<sup>th</sup> MARCH 2008**

**ECONSTRUCTION PRODUCTS LIMITED**

**PROJECT REF:** B593-A-STR1-110308.doc  
**REPORT DATE:** 13<sup>th</sup> March 2008  
**AUTHORISED BY:** Andrew Lane  
**FUNCTION:** Director  
**SIGNED:** *Andrew Lane*

**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**  
**AIR PERMEABILITY TESTING**



**CONTENTS**

<b><u>Ref</u></b>	<b><u>Description</u></b>	<b><u>Page</u></b>
<b>1.0</b>	<b>Introduction and General Details</b>	<b>3</b>
<b>2.0</b>	<b>Samples to be Tested</b>	<b>3</b>
<b>3.0</b>	<b>Results &amp; Observations</b>	<b>6</b>
<b>4.0</b>	<b>Conclusions</b>	<b>7</b>
<b>Appendix 1</b>	<b>Test Data Sheets</b>	<b>8</b>

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation for Air Leakage Testing.

This report is prepared on behalf of BAT and does not constitute approval or endorsement of the building or product tested. BAT has no responsibility for the design, materials and workmanship employed in the execution of the works. By receiving the report and action on it, the client or any third party relying on it accepts that no individual is personally liable in contract, tort or breach of statutory duty. This report shall not be reproduced except in full without the written approval of BAT Limited and contains 16 pages.

**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**



**AIR PERMEABILITY TESTING**

**1.0 INTRODUCTION AND GENERAL DETAILS**

- 1.1 The air permeability of buildings is affected by the individual permeability of the layers used to form the building envelope. Currently UK Building Regulations require buildings to achieve an air permeability target of below 10 m<sup>3</sup>/hr.m<sup>2</sup>.
- 1.2 Econstruction have developed a Soy based insulation foam that can be sprayed onto the inside of a timber frame former that expands and becomes a sealed solid insulation panel.

**2.0 SAMPLES TO BE TESTED**

- 2.1 There are two different timber frame insulation samples using the Econstruction foam product that were tested, along with two simple alternative insulation samples to provide indicative results for comparison purposes.

	<b>Sample</b>
1	Stud frame of 150 x 50 sawn structural grade softwood. Voids completely filled with Biobased 501 spray applied soy-based insulation – foam allowed to cure and left projecting beyond face of stud frame. Gaps between timber sealed with PFC Fastight Airseal sealant.
2	Stud frame of 150 x 50 sawn structural grade softwood. Voids completely filled with Biobased 501 spray applied soy-based insulation – foam allowed to cure and trimmed back to finish flush with face of stud frame. Gaps between timber sealed with PFC Fastight Airseal sealant.
3	Stud frame of 150 x 50 sawn structural grade softwood. Voids between studs completely filled with rigid foil faced polyisocyanurate foam board.
4	Stud frame of 150 x 50 sawn structural grade softwood. Voids between studs completely filled with low density mineral wool roll.

**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**  
**AIR PERMEABILITY TESTING**



**Photograph 1 – Test Sample 1 Raw Applied Foam**



**Photograph 2 – Test Sample 2 Foam with surface trimmed level**



**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**  
**AIR PERMEABILITY TESTING**



**Photograph 3 – Test Sample 3 Foil Faced polyisocyanurate foam board**



**Photograph 4 – Test Sample 4 Low density mineral wool roll**



**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**  
**AIR PERMEABILITY TESTING**



**3.0 RESULTS & OBSERVATIONS**

- 3.1 The tests were undertaken in controlled laboratory conditions with the samples sealed into a test frame with an air reservoir to the rear.
- 3.2 For the foam samples the air supply was provided by an electric air compressor with the air supply flow rate measured via calibrated gas meter air flow units.

**Photograph 5 – Sample Test in frame**



- 3.3 A zero flow control test was also undertaken prior to each sample test to assess the permeability of the testing apparatus with the panel fully sealed with polythene and tape. This was deducted from the sample panel air permeability for each test.

**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**



**AIR PERMEABILITY TESTING**

3.4 The results sheets for each test are included in Appendix 1 and are summarised as follows:

	<b>Test Sample</b>	<b>Air Permeability @ 50Pa</b>	<b>Notes</b>
1.	Test Sample 1 Raw Applied Foam	0.028m <sup>3</sup> /hr.m <sup>2</sup>	Timber frame joints sealed with mastic.
2.	Test Sample 2 Foam with surface trimmed level	0.075m <sup>3</sup> /hr.m <sup>2</sup>	As above.
3.	Test Sample 3 Foil Faced polyisocyanurate foam board	201.9m <sup>3</sup> /hr.m <sup>2</sup>	The material itself was substantially airtight, however the air flow measured was through gaps between insulation boards and at edges.
4.	Test Sample 4 Low density mineral wool roll	401.1m <sup>3</sup> /hr.m <sup>2</sup>	The pressure in the sample reservoir was low due to the excessive permeability of the material and it is highly likely that the flows through the material were greater in front of the fan unit.

3.5 The Biobased 501 spray applied soy-based insulation foam performed exceptionally well and was only slightly more permeable to air than the sealed polythene used to undertake the zero-flow check.

3.6 The foil faced insulation was expected to have performed well due to the nature of the material, however the normal installation process inherently introduces gaps at both the board joints and at some of the side junctions.

3.7 Mineral wool insulation is by its nature very permeable, performing by trapping a layer of air between the fibres and this low density roll performed worse than expected. The final measurement of flow was likely to be quite conservative since it was apparent that flow through the sample was greater directly in front of the fan unit.

**4.0 CONCLUSIONS**

4.1 The Biobased 501 spray applied soy-based foam formed a tight air seal over the whole of the inside of the test panel which performs to a similar standard or better than any separately applied vapour barrier since the vapour barrier would incorporate joints.

4.2 Any opinions and interpretations expressed herein are outside the scope of UKAS accreditation for building air permeability testing.

- - - End - - -

**SAMPLE TESTING REPORT**  
**ECONSTRUCTION PRODUCTS LIMITED**  
**AIR PERMEABILITY TESTING**



**APPENDIX 1 – TEST DATA SHEETS**



# Air Permeability Test Data Sheet

## Air Leakage Test



**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference No:** B593-1

**Date:** 11/03/2008

**Project:** Econstruction Sample 1  
Raw Biobased 501 spray applied soy-based insulation

**Eng:** AJL

**Client:** Econstruction Limited

<b>Test Start Time:</b>	15:00	<b>Test Finish time:</b>	
<b>Wind speed at start:</b>	0 m/s	<b>Wind speed at finish:</b>	0 m/s
<b>Barometric pressure start:</b>	1013 mbar	<b>Barometric pressure finish:</b>	1013 mbar
<b>External Temp Start:</b>	20 °C	<b>External Temp Finish:</b>	20 °C
<b>Average External Temp:</b>	20 °C	<b>Test Standard</b>	m <sup>3</sup> /hr/m <sup>2</sup>

### Internal Temp Sensors

Reference:	Temp at start time	Temp at finish	Mean Logged Temp
1. Ground Floor			20.0°C
2. First Floor			
3. Second Floor			
4. Third Floor			
5. Fourth Floor			
<b>Average Internal Temp:</b>			<u>20.0°C</u> Ave

### Average External Temp (Logged):

<b>Pressurisation Test:</b>	Y	<b>De-pressurisation Test:</b>	N
<b>Fan Off, Mean pressure difference before test:</b>			0 Pa
<b>Fan Off, Mean pressure difference after test:</b>			<u>0 Pa</u>
			<u>0 Pa</u> Ave

<b>Envelope Area</b>	1.188 m <sup>2</sup>	
<b>Zero flow Air volume (Sealed box)</b>	5.179 l/min	
<b>Measured Air Volume @<sub>50</sub>Pa</b>	5.736 l/min	9.55936E-05 m <sup>3</sup> /s
<b>Supplied Air Volume (Q<sub>50</sub>)</b>	0.557 l/min	9.27889E-06 m <sup>3</sup> /s
<b>Air Permeability (Q<sub>50</sub>/S<sub>T</sub>)</b>	0.028 m <sup>3</sup> /hr.m <sup>2</sup>	

### Test Data

#### Notes

1. Tested using compressed air supply and air flow meter.
- 2.

Test Operator: A. Lane  
Director: A. Lane

Signed: Andrew Lane  
Signed:

# Air Permeability Test Results Sheet

## Air Leakage Test



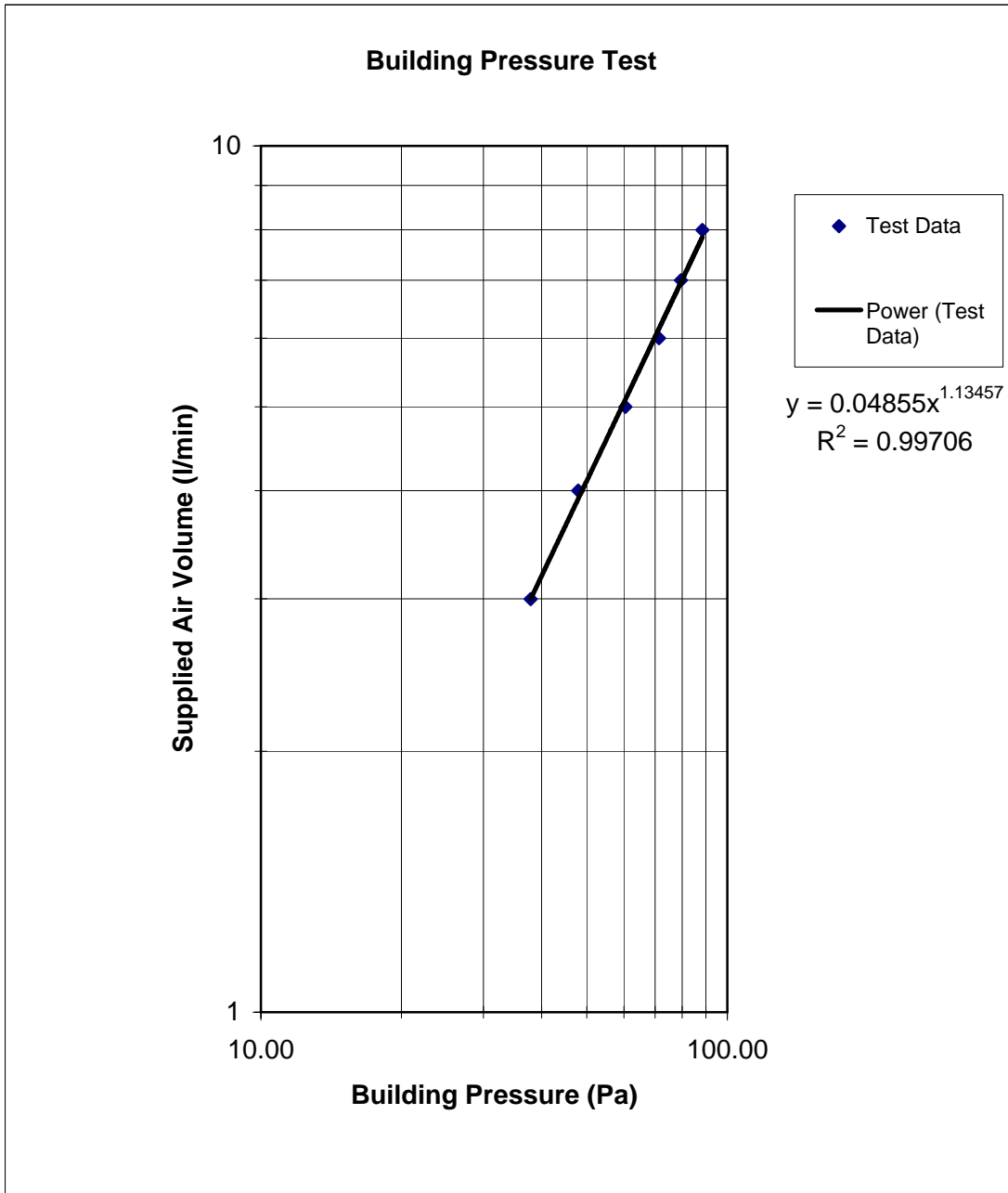
**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference Number:** B593-2-0  
**Project:** Econstruction Sample 2 - Zeroflow  
Cut Biobased 501 spray applied soy-based insulation

**Date:** 11th March 2008  
**Eng:** AJL

**Client:** Econstruction Limited



Test Operator: A. Lane  
Director: A. Lane

Signed: *Andrew Lane*  
Signed: \_\_\_\_\_

# Air Permeability Test Data Sheet

## Air Leakage Test



**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference No:** B593-2

**Date:** 11/03/2008

**Project:** Econstruction Sample 2  
Cut biobased 501 spray applied soy-based insulation

**Eng:** AJL

**Client:** Econstruction Limited

<b>Test Start Time:</b>	15:00	<b>Test Finish time:</b>	
<b>Wind speed at start:</b>	0 m/s	<b>Wind speed at finish:</b>	0 m/s
<b>Barometric pressure start:</b>	1013 mbar	<b>Barometric pressure finish:</b>	1013 mbar
<b>External Temp Start:</b>	20 °C	<b>External Temp Finish:</b>	20 °C
<b>Average External Temp:</b>	20 °C	<b>Test Standard</b>	m <sup>3</sup> /hr/m <sup>2</sup>

### Internal Temp Sensors

Reference:	Temp at start time	Temp at finish	Mean Logged Temp
1. Ground Floor			20.0°C
2. First Floor			
3. Second Floor			
4. Third Floor			
5. Fourth Floor			
<b>Average Internal Temp:</b>			<u>20.0°C</u> Ave

### Average External Temp (Logged):

<b>Pressurisation Test:</b>	Y	<b>De-pressurisation Test:</b>	N
<b>Fan Off, Mean pressure difference before test:</b>			0 Pa
<b>Fan Off, Mean pressure difference after test:</b>			<u>0 Pa</u>
			<u>0 Pa</u> Ave

<b>Envelope Area</b>	1.188 m <sup>2</sup>	
<b>Zero flow Air volume (Sealed box)</b>	4.109 l/min	
<b>Measured Air Volume @<sub>50</sub>Pa</b>	5.596 l/min	9.32662E-05 m <sup>3</sup> /s
<b>Supplied Air Volume (Q<sub>50</sub>)</b>	1.487 l/min	2.4779E-05 m <sup>3</sup> /s
<b>Air Permeability (Q<sub>50</sub>/S<sub>T</sub>)</b>	0.075 m <sup>3</sup> /hr.m <sup>2</sup>	

### Test Data

#### Notes

1. Tested using compressed air supply and air flow meter.
- 2.

Test Operator: A. Jefferis  
Director: A. Lane

Signed: Andrew Lane  
Signed:

# Air Permeability Test Results Sheet

## Air Leakage Test



**BIAT**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference Number:** B593-2

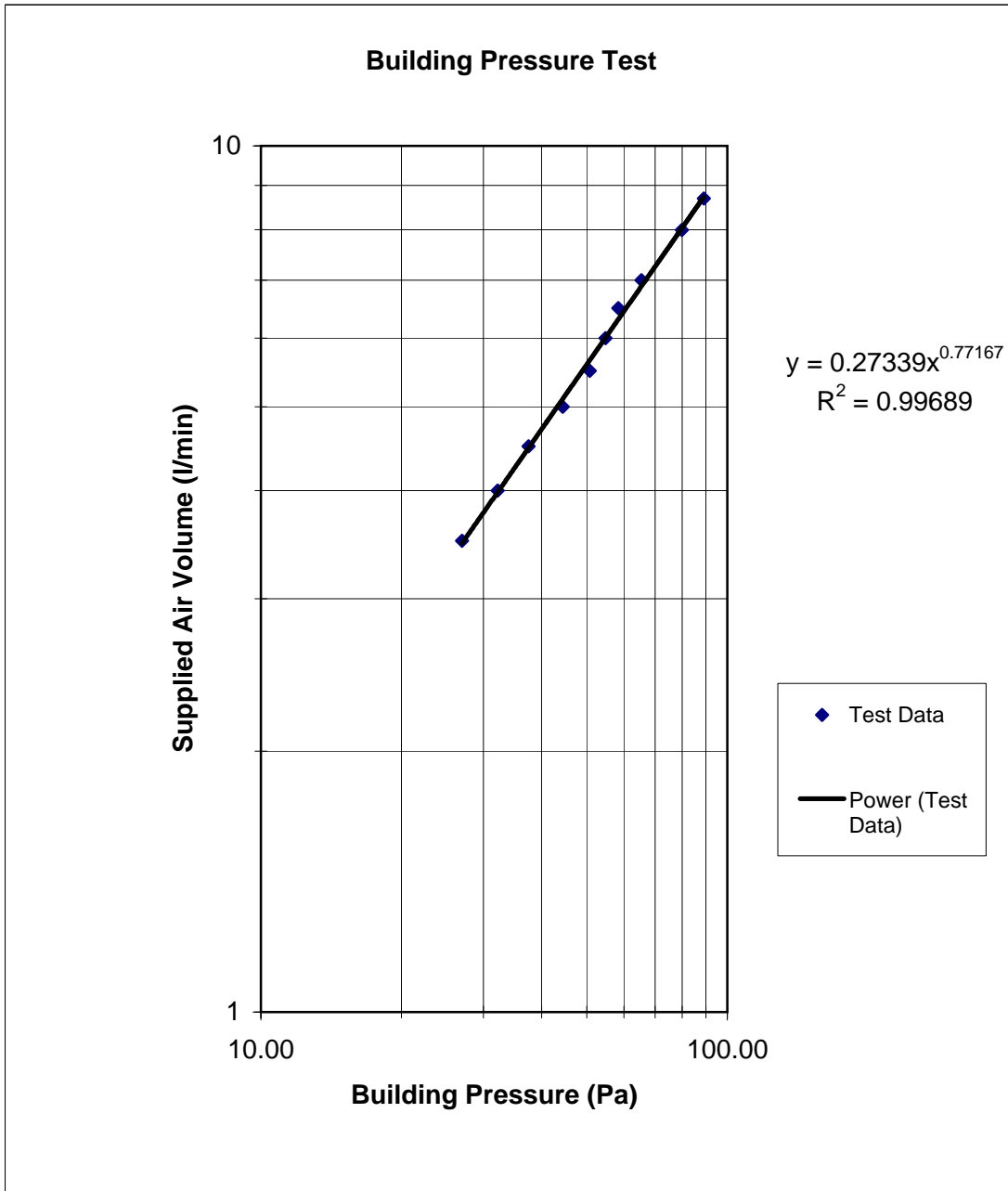
**Date:** 11/03/2008

**Project:** Econstruction Sample 2

**Eng:** AJL

Cut biobased 501 spray applied soy-based insulation

**Client:** Econstruction Limited



Test Operator: A. Jefferis  
Director: A. Lane

Signed: *Andrew Lane*  
Signed: \_\_\_\_\_

# Air Permeability Test Data Sheet

## Air Leakage Test



**BIAT**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference No:** B593-3

**Date:** 11/03/2008

**Project:** Econstruction Sample 3  
Cut foil faced polyisocyanurate foam insulation

**Eng:** AJL

**Client:** Econstruction Limited

<b>Test Start Time:</b>	16:30	<b>Test Finish time:</b>	
<b>Wind speed at start:</b>	1 m/s	<b>Wind speed at finish:</b>	1 m/s
<b>Barometric pressure start:</b>	1013 mbar	<b>Barometric pressure finish:</b>	1013 mbar
<b>External Temp Start:</b>	20 °C	<b>External Temp Finish:</b>	20 °C
<b>Average External Temp:</b>	20 °C	<b>Test Standard</b>	0 m <sup>3</sup> /hr/m <sup>2</sup>

### Internal Temp Sensors

Reference:	Temp at start time	Temp at finish	Mean Logged Temp
1. Ground Floor			20.0°C
2. First Floor			
3. Second Floor			
4. Third Floor			
5. Fourth Floor			
<b>Average Internal Temp:</b>			<u>20.0°C</u> Ave

### Average External Temp (Logged):

<b>Pressurisation Test:</b>	N	<b>De-pressurisation Test:</b>	Y
<b>Fan Off, Mean pressure difference before test:</b>			0 Pa
<b>Fan Off, Mean pressure difference after test:</b>			<u>0 Pa</u>
			<u>0 Pa</u> Ave

<b>Envelope Area</b>	1.2 m <sup>2</sup>
<b>Ground Floor Area</b>	m <sup>2</sup>

<b>Envelope Volume</b>	m <sup>3</sup>
<b>Target Air Volume (Q<sub>50</sub>)</b>	0.00 m <sup>3</sup> /s
<b>Supplied Air Volume (Q<sub>50</sub>)</b>	0.07 m <sup>3</sup> /s

**Air Permeability (Q<sub>50</sub>/S<sub>T</sub>)** 201.90 m<sup>3</sup>/hr/m<sup>2</sup>

### Test Data

#### Notes

1. Tested using Energy Conservatory Fan unit Model 3 110V with restrictor ring D.
- 2.

Test Operator: A. Lane  
Director: A. Lane

Signed: Andrew Lane  
Signed:

# Air Permeability Test Results Sheet

## Air Leakage Test



**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

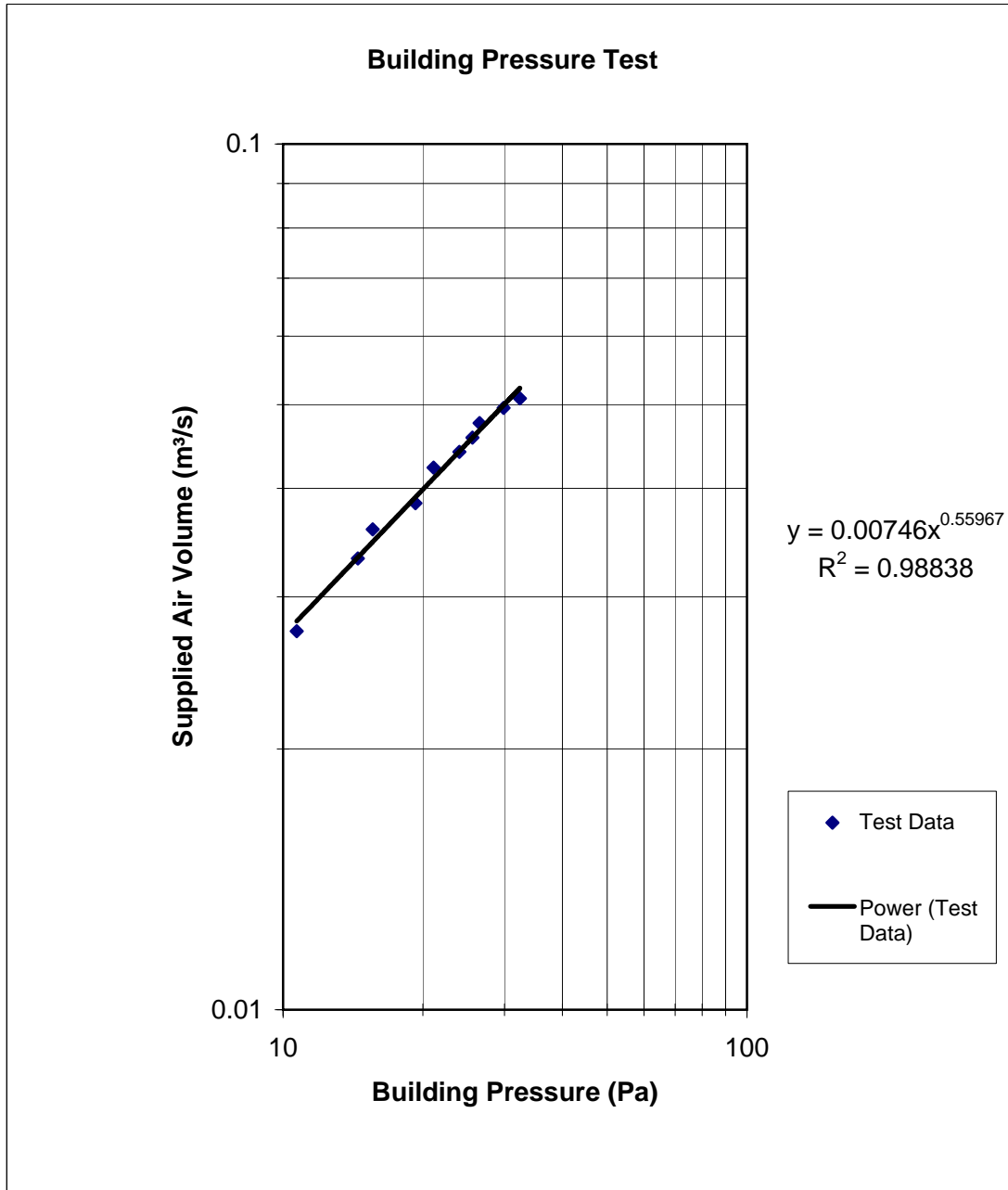
**Test Reference No:** B593-3

**Date:** 11th Mar 08

**Project:** Econstruction Sample 3  
Cut foil faced polyisocyanurate foam insulation

**Eng:** AJL

**Client:** Econstruction Limited



Test Operator: A. Lane  
Director: A. Lane

Signed: *Andrew Lane*  
Signed: \_\_\_\_\_

# Air Permeability Test Data Sheet

## Air Leakage Test



**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

**Test Reference No:** B593-4

**Date:** 11th Mar 08

**Project:** Econstruction Sample 4  
Mineral Wool Roll

**Eng:** AJL

**Client:** Econstruction Limited

<b>Test Start Time:</b>	16:30	<b>Test Finish time:</b>	
<b>Wind speed at start:</b>	1 m/s	<b>Wind speed at finish:</b>	1 m/s
<b>Barometric pressure start:</b>	1013 mbar	<b>Barometric pressure finish:</b>	1013 mbar
<b>External Temp Start:</b>	20 °C	<b>External Temp Finish:</b>	20 °C
<b>Average External Temp:</b>	20 °C	<b>Test Standard</b>	0 m <sup>3</sup> /hr/m <sup>2</sup>

### Internal Temp Sensors

Reference:	Temp at start time	Temp at finish	Mean Logged Temp
1. Ground Floor			20.0°C
2. First Floor			
3. Second Floor			
4. Third Floor			
5. Fourth Floor			
<b>Average Internal Temp:</b>			<u>20.0°C</u> Ave

### Average External Temp (Logged):

<b>Pressurisation Test:</b>	N	<b>De-pressurisation Test:</b>	Y
<b>Fan Off, Mean pressure difference before test:</b>			0 Pa
<b>Fan Off, Mean pressure difference after test:</b>			<u>0 Pa</u> Ave

**Envelope Area** 1.2 m<sup>2</sup>  
**Ground Floor Area** m<sup>2</sup>

**Envelope Volume** m<sup>3</sup>  
**Target Air Volume (Q<sub>50</sub>)** 0.00 m<sup>3</sup>/s  
**Supplied Air Volume (Q<sub>50</sub>)** 0.13 m<sup>3</sup>/s

**Air Permeability (Q<sub>50</sub>/S<sub>T</sub>)** 401.11 m<sup>3</sup>/hr/m<sup>2</sup>  
**Air Leakage Index (Q<sub>50</sub>/S)** m<sup>3</sup>/hr/m<sup>2</sup> (For information Only)

### Test Data

#### Notes

- Sample tested using Energy Conservatory Fan unit Model 3 110V with restrictor ring D.
- 

**Test Operator:** A. Lane  
**Director:** A. Lane

**Signed:** *Andrew Lane*  
**Signed:** \_\_\_\_\_

# Air Permeability Test Results Sheet

## Air Leakage Test



**B|A|T**

BUILDING ANALYSIS & TESTING LIMITED

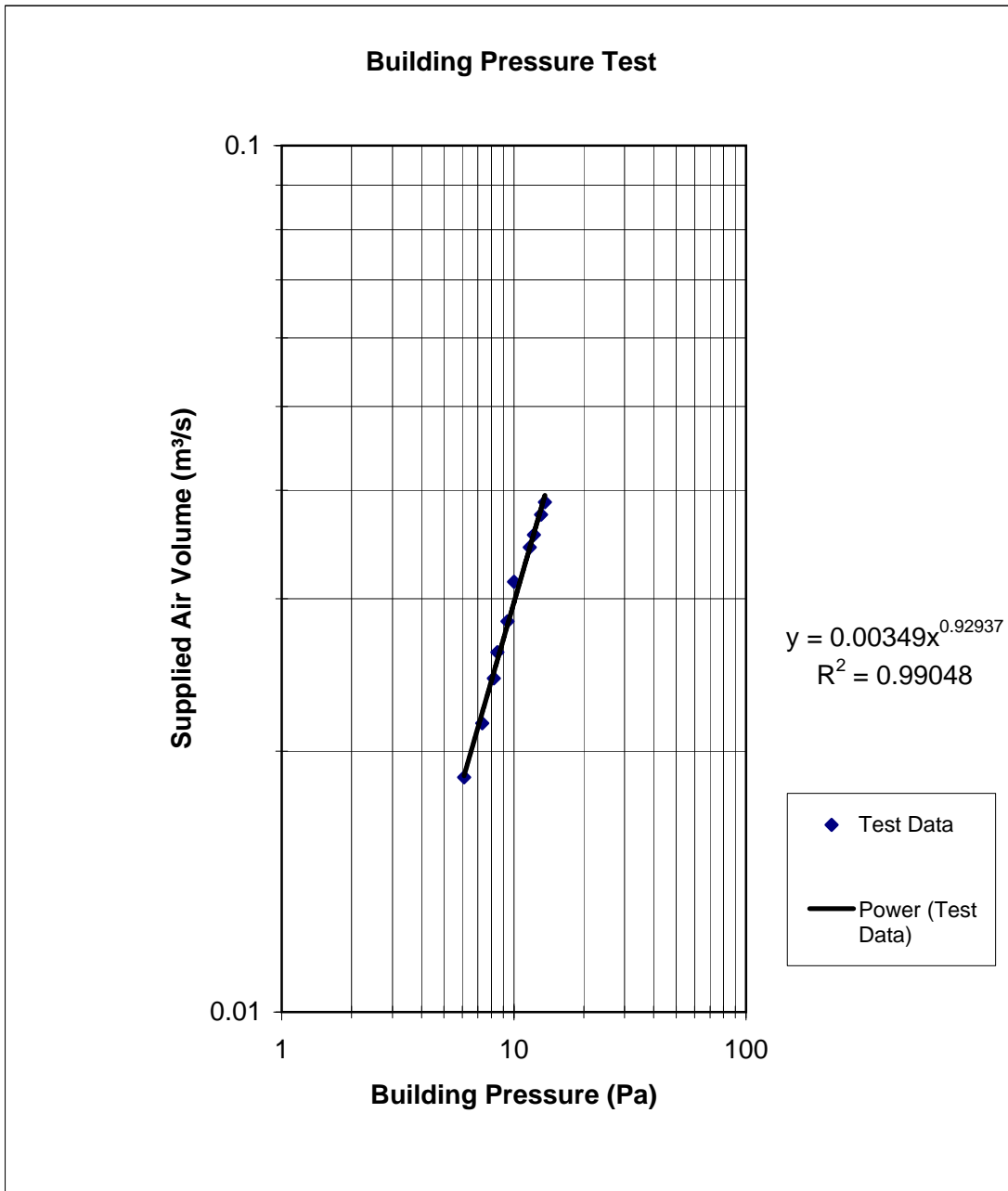
**Test Reference Number:** B593-4

**Date:** 11th Mar 08

**Project:** Econstruction Sample 4  
Mineral Wool Roll

**Eng:** AJL

**Client:** Econstruction Limited



Test Operator: A. Lane  
Director: A. Lane

Signed: *Andrew Lane*  
Signed: \_\_\_\_\_