

# Envelope Airtightness Test Results Shire Hall Museum (Whole Building), High West Street, Dorchester

Carried out for Historic England

Report CAT-HIS01-NA001-SHI01-010925-673166

Tested by J Askem

1 September 2025



This page is intentionally left blank

# Envelope Airtightness Test Results Shire Hall Museum (Whole Building), High West Street, Dorchester

Carried out for: Historic England  
Accounts Payable  
Rm 2/60 The Engine House  
Fire Fly Avenue  
Wiltshire  
SN2 2EH


Contract: 106887  
Report: CAT-HIS01-NA001-SHI01-010925-673166

Issued by: **BSRIA Limited**  
Old Bracknell Lane West  
Bracknell  
Berkshire  
RG12 7AH  
UK

Telephone: +44 (0)800 5871000

Email: compliance@bsria.co.uk  
Website: www.bsria.com/uk/

## Quality Assurance

Issue	Date	Compiled by:	Approved by:	Signature
Final	19-Sep-2025	J Askem	T Rossington	



## DISCLAIMER

*This Document must not be reproduced except in full without the written approval of an executive director of BSRIA. It is only intended to be used within the context described in the report.*

*This Document has been prepared by BSRIA Limited, with reasonable skill, care and diligence in accordance with BSRIA's Quality Assurance and within the scope of our Terms and Conditions of Business.*

*This Document is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the Document at its own risk.*

## CONTENTS

1	INTRODUCTION .....	5
2	METHODOLOGY.....	5
3	TEST SUMMARY.....	6
	3.1 Test Details.....	6
	3.2 Deviations & Observations.....	6
4	TEST CONDITIONS .....	7
	4.1 Building Information .....	7
	4.2 Building Preparation .....	7
5	TEST EQUIPMENT .....	8
6	SUMMARY OF RESULTS .....	9
	6.1 Calculated Results .....	9
	6.2 Environmental Conditions .....	9
	6.3 Test Measurements .....	10
	6.4 Figures.....	11
	APPENDIX A.....	12

# 1 INTRODUCTION

This report presents the results of the air permeability test, undertaken 01 September 2025, on the Shire Hall Museum (Whole Building) in Dorchester, to determine the air permeability of the existing building.

# 2 METHODOLOGY

Air leakage testing measures the air leakage through a test area at a given induced pressure normalised against the test envelope. The test area may comprise a whole building or part thereof.

The reported test(s) utilised the fan pressurisation or 'blower door' method. This method is undertaken by mounting a fan (or series of fans) in a suitable aperture (typically a door) in the structure to pressurise the test area. An internal/external pressure difference is created across the test area, in line with the requirements of the test standard. The fan speed is varied to induce different pressures across the structure. At each fan speed the air volume flow rate through the fan and the pressure across the structure envelope is recorded, and the air leakage coefficient calculated from the equation:

$$Q=C_L (\Delta p)^n$$

Where:

- Q is the air flow rate supplied to the building  $m^3.s^{-1}$
- $\Delta p$  is the pressure differential across the building Pa
- $C_L$  is the air leakage coefficient  $m^3.s^{-1}.Pa^{-n}$
- n is an exponent normally between 0.5 and 1.0

From the above equation the air flow rate, Q50 required to pressurise the building to 50Pa can be calculated.

The test procedure and calculation were carried out in accordance with the requirements of the appropriate ATTMA Standard (TSL1, TSL2, TSL3 or TSL4), CIBSE TM23:2022, ISO 9972:2015 Method B, and is UKAS accredited. The relevant equations and correction factors applied to the data can be found within the same test standard.

The results presented within this report are only applicable to the specified test area and the measurements recorded at the time of the test.

Opinions and interpretations expressed within this report are outside the scope of our UKAS accreditation. Smoke tests are not covered by our UKAS accreditation for airtightness testing of buildings.

Unless otherwise stated, the envelope areas and/or volumes used in producing the presented results were calculated by BSRIA Ltd.

### 3 TEST SUMMARY

#### 3.1 TEST DETAILS

Site Address:	Shire Hall Museum High West Street Dorchester Dorset DT1 1UY
Building:	Shire Hall Museum
Test Area:	Whole Building
Test Regulation/Specification:	Part L2A of The Building Regulations

Design Air Leakage Criteria	Air Permeability @ 50Pa	25.00 m <sup>3</sup> .h <sup>-1</sup> .m <sup>-2</sup> @ 50Pa
Measured Air Leakage	Air Permeability @ 50Pa	10.71 m <sup>3</sup> .h <sup>-1</sup> .m <sup>-2</sup> @ 50Pa

The Shire Hall Museum achieved an air leakage rate of 10.71 m<sup>3</sup>.h<sup>-1</sup>.m<sup>-2</sup> @ 50Pa.

#### 3.2 DEVIATIONS & OBSERVATIONS

Deviations from Test Measurement Requirements:

- None

Deviations from Required Building Conditions:

- None

Identified air leakage paths (further leakage paths - Appendix A):

- Although naturally ventilated, the boiler room was closed. There was some air leakage into the room from service penetrations and at the foot of the door.
- Some of the vents / air bricks in the cells area were leakage paths. There was some leakage into the 'display cells' via the open viewing hatch but these rooms were not accessed to investigate further.
- The flue from the staff area fireplace.

## 4 TEST CONDITIONS

### 4.1 BUILDING INFORMATION

Type of building	Please Select
Estimated year of construction	1797
Primary heating	Unknown
Primary ventilation	Unknown
Primary air conditioning	Unknown

### 4.2 BUILDING PREPARATION

All external doors closed

All external windows closed

All internal doors open

All drainage traps filled with water

Lift doors closed, and not sealed

Boiler Room door closed (boiler room naturally ventilated via roof vent).

Easily accessible vents sealed. Toilets, kitchen extract and other flat roof ducts.

High level ceiling vents and ducts were not sealed.

Gas meter room door closed (vents not sealed).

## 5 TEST EQUIPMENT

Equipment Used	Identifier	Calibration Expiry Date
<b>Flow Meter(s)</b>		
Retrotec Blower Door	BF06-01	21/11/2025
Retrotec Blower Door	BF06-02	21/11/2025
Retrotec Blower Door	BF06-03	22/11/2025
<b>Micromanometer(s)</b>		
TEC DG700	MO30	25/11/2025
TEC DG700	MO34	20/11/2025
<b>Thermometer(s)</b>		
Testo 110 Temperature Probe	TP15	11/11/2025
<b>Barometer(s)</b>		
Testo 511	INS38-1	15/11/2025

## 6 SUMMARY OF RESULTS

### 6.1 Calculated Results

Variable	Notation	Units	Value
Footprint	-	m <sup>2</sup>	691.80
Volume	V	m <sup>3</sup>	n/a
Envelope area	S <sub>p</sub>	m <sup>2</sup>	2386.60
Leakage coefficient	C <sub>L</sub>	m <sup>3</sup> .h <sup>-1</sup> .Pa <sup>-n</sup>	2698.312
Air flow coefficient	C <sub>env</sub>	m <sup>3</sup> .h <sup>-1</sup> .Pa <sup>-n</sup>	2721.27
Flow index	n	-	0.575
Correlation coefficient	r <sup>2</sup>	-	0.995
Air flow rate at 50Pa	Q <sub>50</sub>	m <sup>3</sup> .h <sup>-1</sup>	<b>25565</b>
Equivalent leakage area (approximate)	Q <sub>50</sub> /5.57	m <sup>2</sup>	1.27
Air changes per hour at 50Pa	N <sub>50</sub> (Q <sub>50</sub> /V)	m <sup>3</sup> .h <sup>-1</sup> .m <sup>-3</sup>	n/a
Leakage per m <sup>2</sup> of envelope at 50Pa	AP <sub>50</sub> (Q <sub>50</sub> /S <sub>p</sub> )	m <sup>3</sup> .h <sup>-1</sup> .m <sup>-2</sup>	<b>10.71</b>

### 6.2 Environmental Conditions

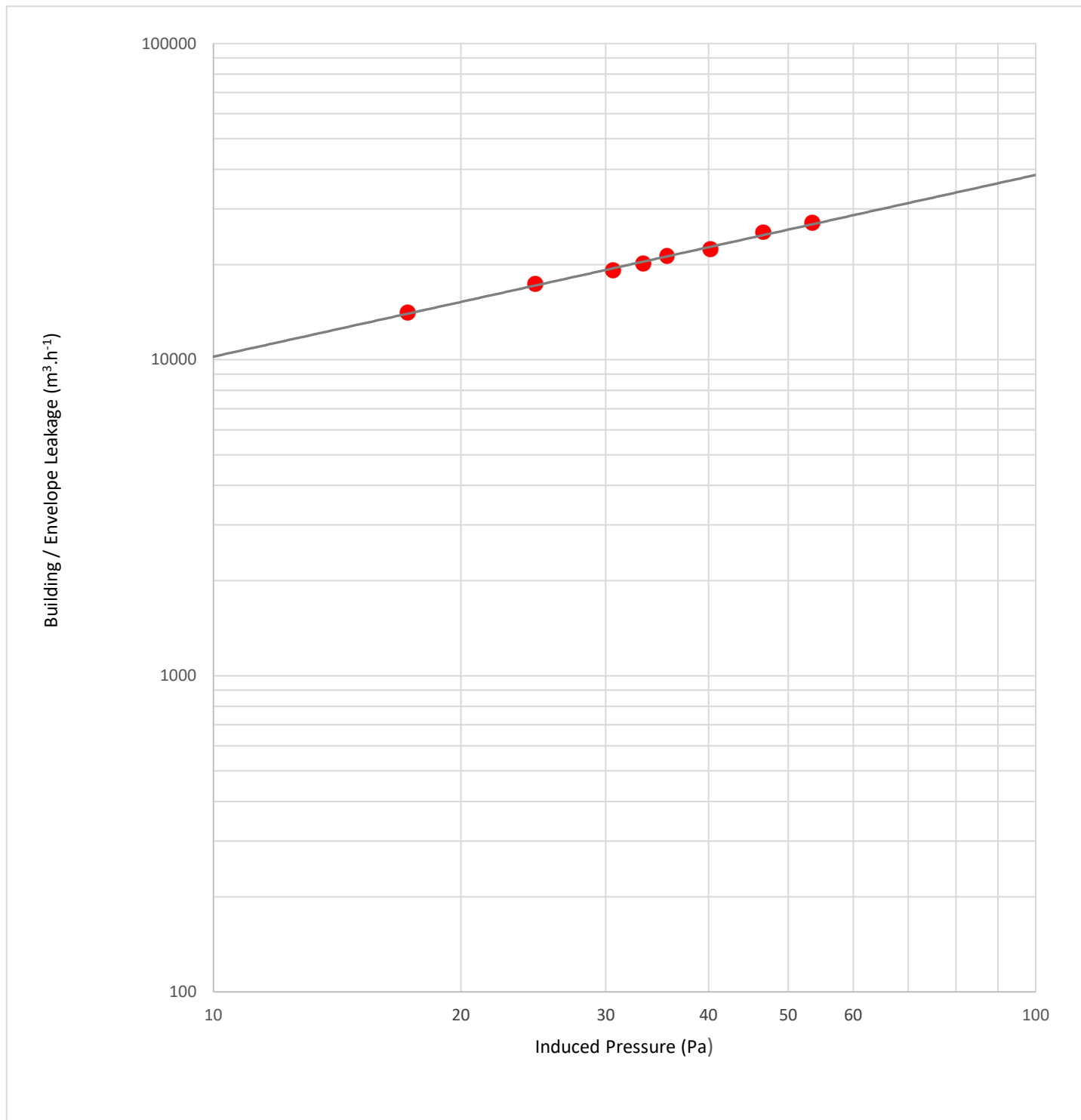
	Pre-Test		Post Test		Average
<b>Windspeed (Beaufort Scale)</b>	1 - Light Air		1 - Light Air		n/a
<b>Barometric Pressure (mbar)</b>	997		997		997
<b>Average Internal Temperature (°C)</b>	21.0		21.0		21.0
<b>Average External Temperature (°C)</b>	22.0		22.0		22.0
<b>Zero Flow Building Pressure Differential (Pa)</b>	<b>ΔP<sub>0,1+</sub></b>	1.79	<b>ΔP<sub>0,2+</sub></b>	1.93	n/a
	<b>ΔP<sub>0,1-</sub></b>	0.00	<b>ΔP<sub>0,2-</sub></b>	0.00	n/a
	<b>ΔP<sub>0,1</sub></b>	1.79	<b>ΔP<sub>0,2</sub></b>	1.93	1.86

### 6.3 Test Measurements

Corrected Differential Building Pressure (Pa)	Air Flow Rate (m <sup>3</sup> .h <sup>-1</sup> )
24.64	17363
17.24	14086
33.34	20082
40.24	22363
46.64	25265
53.54	27036
35.64	21244
30.64	19198

## 6.4 FIGURES

Figure 6.1: 16:10, 1 September 2025. Whole Building, Shire Hall Museum



## APPENDIX A

Figure A.1 Air leakage path



The upper window in the shop area was slightly twisted/open

Figure A.2 Air leakage path



The window in staff area which had a gap at the meeting rail. The upper sash may have been slightly open. Not all windows were checked and there may be others in a similar state. Some windows had secondary glazing units fitted.

**Figure A.3** Air leakage path



Gap around loft hatch for ladder/handle.

**Figure A.4** Air leakage path



The unducted ceiling vent to the court room was open to loft space. The other ceiling vents were ducted to small MVHR units but were not temporarily sealed for the test.

End of Report