

LABSS INFORMATION PAPER INFOP47

Low Pressure Pulse (LPP) Testing – Domestic Mandatory Standard 6.1, 6.2.and 3.14 Annex 6D – Further guidance on pre-completion airtightness testing

Information for Verifiers

This information paper has been produced by the Scottish Building Standards Hub (SBSH) on behalf of Local Authority Building Standards Scotland (LABSS).

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Purpose

This information paper provides information for verifiers in applying the guidance first introduced within the Domestic Technical Handbook in February 2023. It supplements the guidance contained in Annex 6D for domestic buildings on the interpretation and use of air-permeability evidence at both warrant and completion stages.

The paper focuses on the increasing use of low-pressure pulse testing (LPP) and the implications that arise where measured air-permeability results differ from the design rates assumed within SAP submissions.

This information paper applies only to domestic buildings assessed under the Domestic Technical Handbook. It does not apply to non-domestic buildings or assessments undertaken using SBEM or other methodologies.

Background Information

Recent queries from local authority verifiers have highlighted a developing issue where dwellings are being tested using the Low-Pressure Pulse (LPP) method, which reports airtightness at 4 Pa, while the associated SAP calculations may have been submitted using blower-door testing at 50 Pa.

It is important to note that the value shown on a pulse test certificate must be appropriately extrapolated to an equivalent 50 Pa result to allow the domestic ventilation strategy to be validated.

Any discrepancy between the designed and tested airtightness may invalidate the approved ventilation strategy and trigger the need for an amendment to warrant.

Conclusion

Airtightness results have a direct impact on ventilation design, so it is essential that pulse measurements taken at 4 Pa are correctly interpreted and extrapolated to a 50 Pa equivalent where required.

Verifiers should ensure that any changes affecting airtightness or ventilation are reflected in the as-built SAP assessment so that compliance with mandatory standards can be confirmed prior to accepting a Completion Certificate submission.

Further information

SAP Methodology

Design-stage SAP calculations submitted with a building warrant application for a dwelling are prepared using the architect's drawings and supporting specifications. At this stage, the energy assessor selects whether airtightness testing will be carried out using the blower-door or Low-Pressure Pulse method, this sets the design airtightness target and designs the ventilation strategy accordingly.

The airtightness value entered within the design-stage SAP assessment is an assumed or target value, as the dwelling cannot be tested until the building is complete. For repeating designs, such as proposed by national house builders, this value will be based on previous airtightness testing outcomes.

Within Scotland's pre-emptive building warrant system, differences between the design-stage value and the final measured airtightness value may be encountered.

The purpose of the as-built SAP assessment is to replace design assumptions with measured performance data and confirm compliance of the completed dwelling. Where the measured airtightness value affects the suitability of the approved ventilation strategy, or any other aspect of compliance, then further checks should be undertaken, and where necessary, an amendment to warrant should be submitted.

Verifiers should remain alert to any subsequent changes, as alterations to the building specification or design can significantly affect the predicted performance of the dwelling. Changes to building dimensions, window sizes, orientation, mechanical or electrical systems, or airtightness values must be fully assessed. Such changes can materially affect compliance with the standards, and the original energy assessment may no longer be valid and an amendment to the building warrant may therefore be required to demonstrate compliance, this may also delay the formal issue of the Acceptance of Completion Certificate.

Infiltration changes are particularly critical, as they may directly affect the suitability of the proposed ventilation strategy. Any variation must therefore be checked to ensure the dwelling continues to comply with Guidance Clause 3.14.2- Ventilation of Dwellings, Table 3.8 – Ventilation solutions for design infiltration levels of the Domestic Technical Handbook.

Understanding Air Permeability Test Reports Using the Low-Pressure Pulse Method

Pulse test certificates typically include a results table which shows the measured airtightness at 4 Pa and an extrapolated air-permeability value at 50 Pa. Including this 50 Pa equivalent enables verifiers to assess the ventilation strategy efficiently and with confidence.

Where a certificate does not provide an equivalent 50 Pa value, the verifier should request this from the submitter of the report. Where such information is not forthcoming, the verifier may calculate the value independently using the TM23 power-law equation, which is the recognised method for converting airtightness results from 4 Pa to 50 Pa in accordance with CIBSE TM23. In either case, the verifier should be aware of the principles of converting airtightness testing results.

The conversion to 50Pa ensures that the airtightness value used for compliance assessment is fully aligned with, and consistent with, the airtightness figure entered in the design SAP calculation.

Example Pulse Test Report Showing Measured 4 Pa Airtightness and Extrapolated 50 Pa Equivalent

Air Permeability Test Report

		Whole Building		Air Permeability @ 4Pa 0.61 m ³ /h.m ²		
Report Date 23 February 2026		Unique Reference				
Test Date	23 Feb 2026 - 12:18		Test Method	Low Pressure Pulse		
Test Reference	15 lochend cres G611EA					
Test Type	Air Pressure Test – CIBSE TM23 (LPP)					
Test Purpose						
Building Info	House	'2012-2023)				
Openings Preparation	-	Floor Area	-			
Ventilation Preparation	-	Envelope Area	202.8 m ²			
Geometry Source	-	Volume	187.2 m ³			
Result						
	Measured @ 4Pa			Extrapolated @ 50Pa		
Air Leakage Rate	Q ₄	124	m ³ /h	Q ₅₀	674	m ³ /h
Air Permeability	AP ₄	0.61	m ³ /h.m ²	AP ₅₀	3.32	m ³ /h.m ²
Air Changes per Hour	N ₄	0.66	1/h	N ₅₀	3.60	1/h
Equivalent Leakage Area		0.0149	m ²		0.0149	m ²
Calculation Uncertainty		0.27	±%		1.64	±%

Converting Pulse 4 Pa to 50 Pa Using the TM23 Power-Law Equation

Using the example result from the certificate:

Formula: $AP_{50} = 5.2540 \times (AP_4)^{0.9241}$

Given $AP_4 = 0.61 \text{ m}^3/(\text{h} \cdot \text{m}^2)$

Step 1: $0.61^{0.9241} = 0.633$

Step 2: $5.2540 \times 0.633 = 3.32$

Equivalent 50 Pa air permeability: $AP_{50} = 3.32 \text{ m}^3/(\text{h} \cdot \text{m}^2)$

Test Validity Criteria-TM23

When reviewing an airtightness test carried out using the Low-Pressure Pulse (LPP) method, verifiers should refer to Mandatory Standard 6.2, Annex 6D of the Domestic Technical Handbook, and CIBSE TM23:2022 Section 4.4.4, which set out the requirements and validity criteria applicable to airtightness testing.

For a pulse test to be acceptable for building regulatory purposes, all applicable validity criteria must be satisfied.

For pulse testing, these validity requirements include:

- The test is carried out using the recognised Low-Pressure Pulse (LPP) methodology.
- Testing is undertaken under suitable environmental conditions, including wind speeds within acceptable limits (normally below 6 m/s meteorological wind speeds). Further guidance is provided in Annex 6D.11 of the Domestic Technical Handbook, which advises that suitable preparations should be made before testing, including consideration of prevailing weather conditions and weather forecasts
- The building demonstrates stable tank pressure behaviour, meaning a smooth and repeatable pressure response and decay following each pressure pulse.
- The test has been carried out by a competent, appropriately registered tester.
- The test software has confirmed that all internal validity checks required by the pulse method have been satisfied and a valid result produced.
- The reported airtightness value is derived from a valid pulse test outcome and is suitable for use in compliance calculations.

Where the test certificate itself indicates that any pulse validity requirement has not been met, for example, where wind speeds exceeding TM23 limits are reported, the test cannot be accepted for regulatory purposes.

Failure to meet any applicable TM23 Pulse test validity requirement renders the test result invalid and unsuitable for demonstrating compliance with building regulations. Where a test result is deemed invalid, the building will require to be re-tested.

Weather conditions can influence test validity, and verifiers should be aware of the limitations identified within TM23 and the recommendations contained in Annex 6D.11.

Where testing has been undertaken during a notable weather event, or where the reported conditions appear inconsistent with the prevailing weather at the location and time of testing, it may be appropriate to make further enquiries.

A check of the test date, location and prevailing weather conditions may assist in determining whether the submitted result can be relied upon for compliance purposes

Calibration Requirements

CIBSE TM23 recognises that the Low-Pressure Pulse (LPP) method is not currently governed by a national or international standard. As a result, calibration and servicing requirements follow the equipment manufacturer's specifications and the tester's certification scheme requirements.

For pulse testing equipment, the following would be expected of a competent person:

- calibration of the measurement system at defined intervals (typically every 24 months), and
- inspection and servicing of the pressure vessel in accordance with manufacturer servicing requirements.

Responsibility for ensuring that pulse test equipment is correctly calibrated, serviced, and suitable for use rests with the tester and their certification scheme.

Pulse test certificates are issued on the basis that all equipment used met the applicable calibration and servicing requirements at the time of testing.

Calibration or servicing issues would normally only be apparent to verifiers where explicitly flagged on the test certificate itself, for example within:

- comments or remarks,
- warnings or advisories, or
- a qualified validity or compliance statement.

Calibration documentation is not normally included with pulse test certificates, and verifiers are not expected to request calibration or servicing records where a valid TM23-compliant certificate has been submitted.

However, where the certificate itself indicates equipment limitations, calibration concerns, or other conditions outside TM23 or manufacturer requirements, the test result cannot be accepted for regulatory purposes.

Competent person – airtightness and pulse testing

Verifiers should ensure that airtightness testing is carried out by a competent person with recognised credentials appropriate to the test method used.

Competence may be demonstrated where the tester:

- holds current membership of a recognised airtightness testing scheme (such as ATTMA or Elmhurst), or holds UKAS accreditation; and
- is authorised under that scheme to undertake the specific test method used (fan pressurisation or Low-Pressure Pulse).

Evidence of competence is normally demonstrated through:

- the tester details and scheme registration shown on the airtightness test certificate; and
- confirmation that the tester is approved to undertake the relevant test methodology.

Where these conditions are met, the tester may be regarded as competent to carry out either blower door or pulse testing. Verifiers are not expected to assess individual training records, calibration arrangements, or internal test procedures unless concerns are explicitly identified on the submitted certificate.

Recognition of competence through these routes aligns with the approach set out in Annex 6D of the Domestic Technical Handbook.

Regulatory Procedure

A revised as-built SAP must reflect the actual airtightness test method and value, as required by SAP conventions and referenced within the Technical Handbook Section 6 (Energy).

An updated as-built SAP assessment must always be completed to ensure that the final building is accurately modelled. All changes made during construction, including any alterations to the fabric, building services, ventilation systems, or airtightness, must be fully incorporated into the assessment.

This ensures that the EPC produced at completion is accurate, legally valid, and can be correctly lodged on the EPC register.

Example - A dwelling designed with natural ventilation and intermittent extract fans based on a design air permeability of $5 \text{ m}^3/(\text{h}\cdot\text{m}^2)$ @ 50 Pa or greater may, following completion testing, achieve a significantly lower air permeability. Where the measured result falls below the threshold applicable to the approved ventilation strategy, the dwelling will require a revised ventilation solution to maintain compliance with Guidance Clause 3.14.2 and Table 3.8. In such circumstances, the verifier may reasonably conclude that an amendment to warrant is required to allow the revised design to be reviewed and verified.

SAP and Requirements for Completion acceptance

SAP conventions require the actual test method used, and the measured airtightness value be entered when producing the as-built EPC.

This is a straightforward process and is carried out by re-opening the calculation, selecting the correct test methodology (blower door or pulse test), entering the measured result, and regenerating the output document.

Important:

SAP software will not generate a warning/red flag where an airtightness result crosses a ventilation threshold that requires a redesigned ventilation strategy. While it is the responsibility of the relevant person to comply with the requirements of building regulations and competently submit a Completion Certification, it is important for the verifier to be able to highlight potential concerns and request appropriate action.

Increasing airtightness fundamentally alters how a dwelling must be ventilated. Clause 3.14.2 and Table 3.8 explicitly link lower design infiltration rates to the need for enhanced or mechanical ventilation systems, ensuring indoor air quality is maintained as airtightness improves.

Extract from Guidance Clause 3.14.2 (Table 3.8), including an added 4 Pa equivalent column – Domestic Applications Only

Ventilation Strategy Table		
Ventilation Type	Suitable for infiltration rate 50Pa	Equivalent Pulse infiltration 4Pa
Natural ventilation (with intermittent mechanical extract)	$\geq 5 \text{ m}^3/(\text{h} \cdot \text{m}^2) @50\text{Pa}$	$\geq 0.97 \text{ m}^3/(\text{h} \cdot \text{m}^2) @4\text{Pa}$
Continuous Mechanical Extract Ventilation (MEV)	$\geq 3 \text{ m}^3/(\text{h} \cdot \text{m}^2) @50\text{Pa}$	$\geq 0.58 \text{ m}^3/(\text{h} \cdot \text{m}^2) @4\text{Pa}$
Continuous Mechanical Supply & Extract (MVHR)	Any	Any

Summary

Lower levels of airtightness fundamentally alter how a dwelling must be ventilated. Clause 3.14.2 and Table 3.8 link lower infiltration rates to the need for enhanced or mechanical ventilation systems to ensure indoor air quality is maintained.

Consistent interpretation of pulse test evidence supports consistent decision-making by verifiers and promotes confidence in the use of Low-Pressure Pulse testing within domestic projects.

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