NSAI Agrément Approval Scheme for

Certified Air Tightness Tester Scheme Master Document

to

I.S. EN ISO 9972:2015 - Thermal Performance of Buildings - Determination of Air Permeability of Buildings – Fan Pressurization Method.

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1.0 Introduction

NSAI has established a registration scheme that certifies air tightness testers to I.S. EN ISO 9972:2015 - Thermal Performance of Buildings – Determination of Air Permeability of Buildings – (Single or Single & Multi) Fan Pressurization Method.

Under revised building regulations which came into force in January 2008, air tightness testing is now mandatory for all dwellings. Further improvements to backstop performance levels have come into effect with the publication of the updated Technical Guidance Document Part L - Conservation of Fuel and Energy - Dwellings (2019) to the Building Regulations.

2.0 Scope

This scheme provides for initial evaluation and assessment of applicant and submitted airtight testing reports. Following successful registration the scheme provides for on-going surveillance of NSAI registered airtightness tester against the requirements set out in the following documents which are listed in order of precedence:

2.1 This document, *D-IAB-007 Air Tightness Testing Scheme Master Document Rev 7.docx*.

2.2 I.S. EN ISO 9972:2015 - Thermal Performance of Buildings – Determination of Air Permeability of Buildings – (Single or Single & Multi) Fan Pressurization Method.

2.3 ATTMA TSL 1 Issue 3.

2.4 ATTMA TSL 2 Issue 1.

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3.0 Definitions

3.1 **Air Leakage rate**, air flow rate across the building envelope.

3.2 **Internal volume**, deliberately heated, cooled or mechanically ventilated space within a building or part of a building subject to the measurement, generally not including the attic space, basement space and attached structures.

3.3 **Building envelope**, boundary or barrier separating the internal volume subject to the test from the outside environment or another part of the building.

$$\textbf{Air Leakage}\left(\frac{m^3}{\text{hr}}\right) = \frac{\text{Volume of air going through the fan at 50 Pa is m}^3}{\text{hr}}$$

3.4 **Air change rate at reference pressure**, air leakage rate per internal volume at the test reference pressure (50Pa) differential across the building envelope.

$$\textbf{Air Change Rate}\left(\frac{ac}{hr}\right) = \frac{Volume\ of\ air\ going\ through\ the\ fan\ at\ 50\ Pa\ is\ m^3}{hr.volume\ of\ the\ building\ (m^3)}$$

3.5 **Air permeability (q_{E50})**, air leakage rate per envelope area at the test reference pressure differential across the building envelope.

$$\textbf{Air Permeability}\left(\frac{m^3}{hr.m^2}\right) = \frac{Volume\ of\ air\ going\ through\ the\ fan\ at\ 50\ Pa\ is\ m^3}{hr.Envelope\ Area\ (A_E)}$$

3.6 **Specific leakage rate (q_{F50})**, air leakage rate per net floor area at the test reference pressure differential across the building envelope.

3.7 **ΔP0.1 and ΔP0.2** are the Zero-flow pressure differences at the beginning and end of either the pressurisation and depressurisation test cycle.

3.8 **ΔP0.1+** The average of positive values recorded over a minimum of 30 Seconds

3.9 **ΔP0,1-** The average of negative values recorded over a minimum of 30 seconds

3.10 **ΔP0,1** The average of all values recorded over a minimum of 30 seconds

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4.0 Scheme Requirements

4.1 NSAI Airtightness testing scheme requirements

4.1.1 I.S. EN ISO 9972:2015 standard describes three types of test method namely

a) Method 1 is the test of the building in use where the natural ventilation opening being closed and the whole building mechanical ventilation or air conditioning opening being sealed.

b) Method 2 is the test of the building envelope where all the intentional openings being sealed, the doors, windows, and trapdoors being closed.

c) Method 3 is the test of the building for a specific purpose, the treatment of the intentional openings being adapted to this purpose according to the standard or policy in each country.

The results from test Method 2 are entered in DEAP.

4.1.2 Test Method 2 must be performed for pressurisation and depressurisation tests and the overall air permeability shall be the mean of the q50 results for pressurisation and depressurisation tests (to 2 decimal places). The mean air permeability measured in this way, q50, expressed in cubic metres per hour per square metre of envelope area is divided by 20 for use in the DEAP software. Clause 1.5.4 of Technical Guidance Document (TGD) to Part L of the Building regulations requires a pressurisation and depressurisation measurement.

4.1.3 All vents must be sealed. The NSAI policy on controllable ventilator grills is that all vents if closable must be closed and not sealed. All vents that cannot be closed must be sealed across their face however the junction between the vent grill and the wall shall not be sealed.

4.1.4 Mechanical (ducted) vents in bathrooms or cooker hoods should be sealed at the fan intake location within the room and not at its extract location externally. In adopting this approach, "un-designed" air leakage in the form of infiltration or exfiltration resulting from imperfections in the ductwork, shall be included for in the final air permeability of the building. When the above approach is not practical e.g. for commercial buildings with fully ducted ventilation systems with multiple intake and extract locations, where accesses to intake duct location is restricted, it may be more practical to seal at the external extract and intake location only. Either way, the method employed must be recorded in the airtight test report.

4.1.5 A chimney balloon must be inserted and inflated in the flue of the open fire place. Where obstructions restrict the use of a chimney balloon it may be necessary to cover over the full fireplace opening with an airtight membrane and seal this membrane to the edges on the fireplace surround.

4.1.6 Standard stoves, wood burners, balanced flue or gas stoves with controllable ventilator grills that take air from the room should be closed and not sealed. If the ventilator grill cannot be closed then in should be temporarily sealed.

4.1.7 Standard stoves and room sealed stoves with a designated ducted fresh air supply and no requirement to draw supply air from the room, no additional sealing measure will be required.

4.1.8 Hot press door must remain open.

4.1.9 Toilets and traps must be sealed.

4.1.10 When testing semi-detached, terraced houses or apartments, the status of openings in adjoining units must be recorded in the airtight test report. Best practice is to ensure that the pressure difference across the envelope area is uniform. In the case of buildings which abut adjoining buildings (i.e. semi-detached, terraced houses or apartments), the windows in the adjoining building should be opened to ensure the building envelope is as close to atmospheric pressure as is possible. The status of the adjoining properties window (open/closed) must be recorded on the airtight test report.

4.1.11 Envelope areas and volumetric calculations taken from plans must be validated by on-site dimensions. The location of on-site dimensional checks must be recorded in the airtight test report. At a minimum the substantive ground floor and overall height dimensions should be checked.

4.1.12 The internal pressure tube should be located at the centre of the floor area closest to the geometric centre of the building. The tester needs to select a location away from narrow corridors or pinch points.

4.1.13 For dwellings greater than 10m or 3 stories in height, a second internal tube is required which should run to the centre of the top floor. The tubes should be located so as to accurately measure and confirm equal internal pressure distribution throughout the building.

4.1.14 It is advisable for airtight testers to where possible "cordon off" outside the door where the fan is fitted to prevent anyone from interrupting the running and accuracy of the test.

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4.2 Calibration certificates

4.2.1 We require INAB, UKAS or similar approved calibration for both fan and manometer. Both pieces of equipment require annual calibration.

4.2.2 I.S. EN ISO 9972:2015 requires that air flow measuring devices measure air flow within ±7% of the actual reading.

4.2.3 The calibration certificate for the barometer does not need to be INAB, UKAS or similar approved. A barometer should have an accuracy of ± 5 mbar in the range 950 - 1050 mbar.

4.2.4 The calibration certificate for the thermometer does not need to be INAB, UKAS or similar approved. The accuracy of temperature measurement must have an accuracy of ±1°C within the range of -20°C to + 40°C.

4.2.5 There is no requirement to have the anemometer calibrated as wind speed does not form any part of the calculation.

4.2.6 Laser measures do not require calibration as long as a number of checks are performed on a sample on significant measurements using a steel tape. The location of these checks should be noted.

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4.3 Airtightness Test requirements

4.3.1 If the zero flow pressures exceed 5 Pascals the test is invalid.

4.3.2 The minimum pressure difference reading shall be 10 Pa or five times the zero-flow pressure difference.

4.3.3 The measured pressure range shall have a minimum of 7 points, with intervals between pressures being no greater than 10 Pa. The recommended number of readings taken in wind speeds of 0-3m/s shall be 10 and for higher wind speeds of 3-6m/s, 15 reading is advisable.

4.3.4 It is recommended that the measured pressure range be in increments of 5Pa such that if a single erroneous reading is observed, this reading can be removed from the data range and the interval between the two adjacent reading remains within 10Pa.

4.3.5 For a valid test, the highest-pressure difference (corrected) across the building envelope must be greater than 50 Pa.

4.3.6 Readings taken at low pressures will be more adversely affected by environmental conditions and any conclusions drawn from such a report should be treated with caution.

4.3.7 It is advisable to check that the condition of the building envelope has not changed during each test, for example that sealed openings have not become unsealed or that doors, windows or dampers have not been forced open by the induced pressure. It is considered good practice that initial and final readings are taken at the same pressure. There should be a good correlation between their respective measured flow readings. If there is a significant difference between these two reading, this generally indicates that conditions have changed over the test cycle. The test must be repeated once the source of the discrepancy has been identified and rectified.

4.3.8 The selection of most suitable opening, to install the fan test equipment, will depend on the unobstructed proximity to the centroid of the building i.e. acceptable route for the

air to flow from the fans to equalise pressure throughout the test enclosure. If two equally suitable opening are available then the more airtight opening should be selected to house the fan unit.

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4.4 Test report

4.4.1 Airtight test reports when issued in softcopy shall be issued in PDF format.

4.4.2 The full title of the standard (i.e., I.S. EN ISO 9972:2015 - Thermal Performance of Buildings - Determination of Air Permeability of Buildings – Fan Pressurization Method) should appear on the test report. Furthermore, the type of test method (i.e., test Method B) should be clearly stated on the report.

4.4.3 All details necessary to identify the dwelling tested i.e., address and estimated date of construction of the dwelling.

4.4.4 Dwelling description, single story, two story, detached, semi-detached, with/without basement, line of attic insulation on slope or at ceiling level etc.

4.4.5 Status of test report, "***provisional***" or "***final test report for inclusion in BER***" should be clearly stated on the report. The result of a test shall remain valid provided dwelling envelope changes (such as area changes or replacement of exposed elements) have not occurred since the test was performed.

4.4.6 Any deviation from I.S. EN ISO 9972:2015 or the NSAI scheme document should be clearly identified on the airtight test report.

4.4.7 If necessary, a description of which parts of the dwelling were subject to the test must be described in the report.

4.4.8 The minimum pressure difference reading shall be 10 Pa or five times the zero-flow pressure difference.

4.4.9 The general status of openings on the dwelling envelope, latched, sealed, open etc. should be contained within the report.

4.4.10 Detailed description of temporarily sealed openings must be described in the report.

4.4.11 A summary of all equipment used during the test must be included in the airtight test report. The summary should list the equipment type (i.e., fan, manometer, weather station, thermometer, barometric pressure gauge, laser range finder etc.), serial numbers, calibration certificate number and period of time that the calibration certificate remains valid (if appropriate, see Clause 0 above).

4.4.12 The zero-flow pressure differences $\Delta P0,1+$, $\Delta P0,1-$, $\Delta P0,2+$, $\Delta P0,2-$, $\Delta P0,1$ and $\Delta P0,2$ for pressurisation and depressurisation test must be clearly recorded on the test report.

4.4.13 The temperature and barometric pressure before and after each pressure test cycle i.e., before and after pressurized test and again before and after depressurized test, must be recorded on the report along with the mean for each reading for each cycle. If there is a large difference between outside and inside temperatures, then the fan should be run for a period before the test to allow internal and external temperatures to equalize. The external temperature should be taken at the location of the external pressure tube.

4.4.14 A table of induced pressure differences and corresponding air flow rates.

4.4.15 A graph of the logarithm of the corrected pressure difference V's the corrected airflow rate for pressurisation/depressurisation.

4.4.16 The correlation coefficient (r^2) must be clearly identified on the airtight test report. For a building air leakage test an r^2 value of greater than 0.98 must be attained.

4.4.17 Scan/copy of dimensions taken and calculations performed on building dimensions to allow checking of volume and surface area calculations must be retained. It is not necessary to include calculation records/rough work in the final test report however records must be retained for annual audits or dispute resolution.

4.4.18 The design ventilation strategy for the tested building should be stated on the airtight test report.

4.4.19 The report must record the location of the test equipment within the dwelling/building.

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4.5 Quality Assurance Manual

4.5.1 Provide the company's Quality Assurance (QA) document which outline the company's testing procedure for single fan (and multi fan) airtight testing of a building.

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4.6 Health & Safety statement

4.6.1 Provide the company's Health & Safety Statement.

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5.0 Application form/Request a quotation

5.1.1 To apply/request a quotation, use the following link, download the Word version of the "Request for Quotation" document, complete, and return to Patricia Walsh.

https://www.nsai.ie/images/uploads/certification/Request_For_Quotation_Rev._26_.docx

Under the Standard/Scheme section of the "Request for Quotation" document enter

a) "I.S. EN ISO 9972:2015 Airtight testing scheme (Single)",
b) "I.S. EN ISO 9972:2015 Airtight testing scheme (Single and Multi)",
c) "I.S. EN ISO 9972:2015 Airtight testing scheme (Adding Multi Fan to Single Fan)",

in the "Other" field.

NSAI will issue a quotation and a contract for signing. Upon receipt of signed contract and acceptance of quotation by the applicant, NSAI will assign a file number to the company and an auditor will be in touch to arrange an audit.

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6.0 Scheme Costs

Certified Air Tightness Tester Scheme - Registration Fees			
	Initial Application Fee[1]	**Annual Registration Fee[2]**	**Initial Audit/ Annual Audit**
Single Fan	Waived	€500	€1,250
Add additional Single Fan registered tester from the same company[3]	€375[4]	-	Annual Surveillance Audit included for original registered tester[5]
Single & Multi Fan	Waived	€500	€1,875[6] (€1,250+€625)
Adding Multi Fan to Single Fan registration	Waived	-	€1,250 (or €625[7])

[1] Year one only
[2] Applies year two and onwards
[3] Companies who have successfully completed a full Single Fan registration audit may apply to add 3 additional (4 in total) airtight testers from that company subject to the following restrictions. Additional airtight testers must operate in accordance with the registered companies Quality Assurance (QA) manual. Additional airtight testers must submit a sample airtight test report in accordance with I.S. EN ISO 9972:2015 and the companies QA manual.
[4] Desktop review
[5] Annual Surveillance Audit for additional testers will be combined with the Annual Surveillance Audit of the original registered tester from that company.
[6] For combined Single & Multi fan registration the Audit must take place on a Multi fan airtight test.
[7] Adding Multi Fan post single fan registration will necessitate an additional audit however if this audit is coupled with an annual audit the cost will be reduced to €625.
[8] The initial audit fee of €1,250 for single fan and €1,875 for multi fan covers one pre audit submission of documents, audit and one subsequent satisfactory post audit submission.

All rates are Excl. VAT

Certified Airtight testers will be subject to an annual audit. Results of all tests must be retained for future inspection during annual audit.

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7.0 Audit Requirements

Prior to arrange a witnessed audit; please provide the following documentation/clarifications at your earliest convenience. A copy of our latest "Audit Report Template", which may assist you in compiling your company documents, is available upon request.

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7.1 Pre audit

7.1.1 Sample airtight test report in accordance with I.S. EN ISO 9972:2015.

7.1.1.1 Please clarify if the Pressure difference and Air flow volume readings recorded in the sample Airtight Test Report are actual reading or the corrected values.

7.1.2 Copy and summary of calibration certificate for all equipment used. The summary should list the equipment type (i.e. fan, manometer, weather station, thermometer, barometric pressure gauge, laser range finder etc.), serial numbers, calibration certificate number, and period of time that the calibration certificate remains valid.

7.1.3 Company QA document for testing procedure covering domestic and non-domestic buildings.

7.1.4 Copy of companies Health & Safety statement.

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7.2 Post Audit

7.2.1 Airtight test report covering witnessed airtight test.

7.2.2 Scan of dimensions taken and calculations performed on dimensions.

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7.3 Annual Surveillance audit

7.3.1 The registered airtight tester must develop and maintain a register of all completed airtight test reports both provisional and final. This register should identify who performed the test, the date the test occurred and the job name, as a minimum.

7.3.2 The airtight tester must maintain records to allow for easy retrieval of both electronic and/or hardcopy files of any selected airtight test report as requested during an annual surveillance audit or any other time that the NSAI makes such a request.

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7.4 Sample Annual Surveillance Audit Agenda

1. Review the register of completed airtight tests performed since registration.
2. Review QA procedures document to establish if there have been any changes to same since certification.
3. Select and review 3 representative airtight test reports,
   a. Check records for dimensional calculations.
   b. Check recorded values in one report.
   c. Check content of one report against the audit document.
4. Check calibrations certificates are valid.
5. Review and discuss scheme document.
6. AOB

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8.0 Building regulations

8.1 TGD to Part L 2019 - Conservation of Fuel and Energy - Dwellings

8.1.1 TGD Part to L 2019 requires an air tight performance level of 5 $m^3/(h.m^2)$ as a reasonable upper limit for air permeability. Where lower levels of air permeability are achieved it is important that purpose provided (or "designed") ventilation is maintained. For this reason, Technical Guidance Document F also provides guidance for buildings with lower air permeability.

8.1.2 It has been empirically determined that building air permeability calculated at a pressure differential of 50 Pascals is approximately 20 times the air change rate at normal conditions.

8.1.3 Air pressure testing should be carried out on all dwellings to demonstrate that an air permeability value less than the backstop value of 5 $m^3/(h.m^2)$ has been achieved.

8.1.4 If satisfactory performance is not achieved in a test, then remedial measures to improve the dwellings level of airtightness must be carried out, the dwelling should then be retested post the remedial measures to demonstrate that an air permeability value less than the backstop value of 5 $m^3/(h.m^2)$ has been achieved.

8.2 TGD to Part F 2019 - Ventilation

8.2.1 TGD to Part F 2019 gives guidance on ventilation design for dwellings including natural ventilation and mechanical ventilation with heat recovery.

8.2.2 TGD to Part F 2019 advises that where the air permeability is greater than 3 $m^3/(h.m^2)$ and lower than 5 $m^3/(h.m^2)$, natural ventilation can be considered as one acceptable ventilation solution for a dwelling. When the air permeability is lower than 3 $m^3/(h.m^2)$ natural ventilation is no longer acceptable and some form of mechanical ventilation system must be considered.

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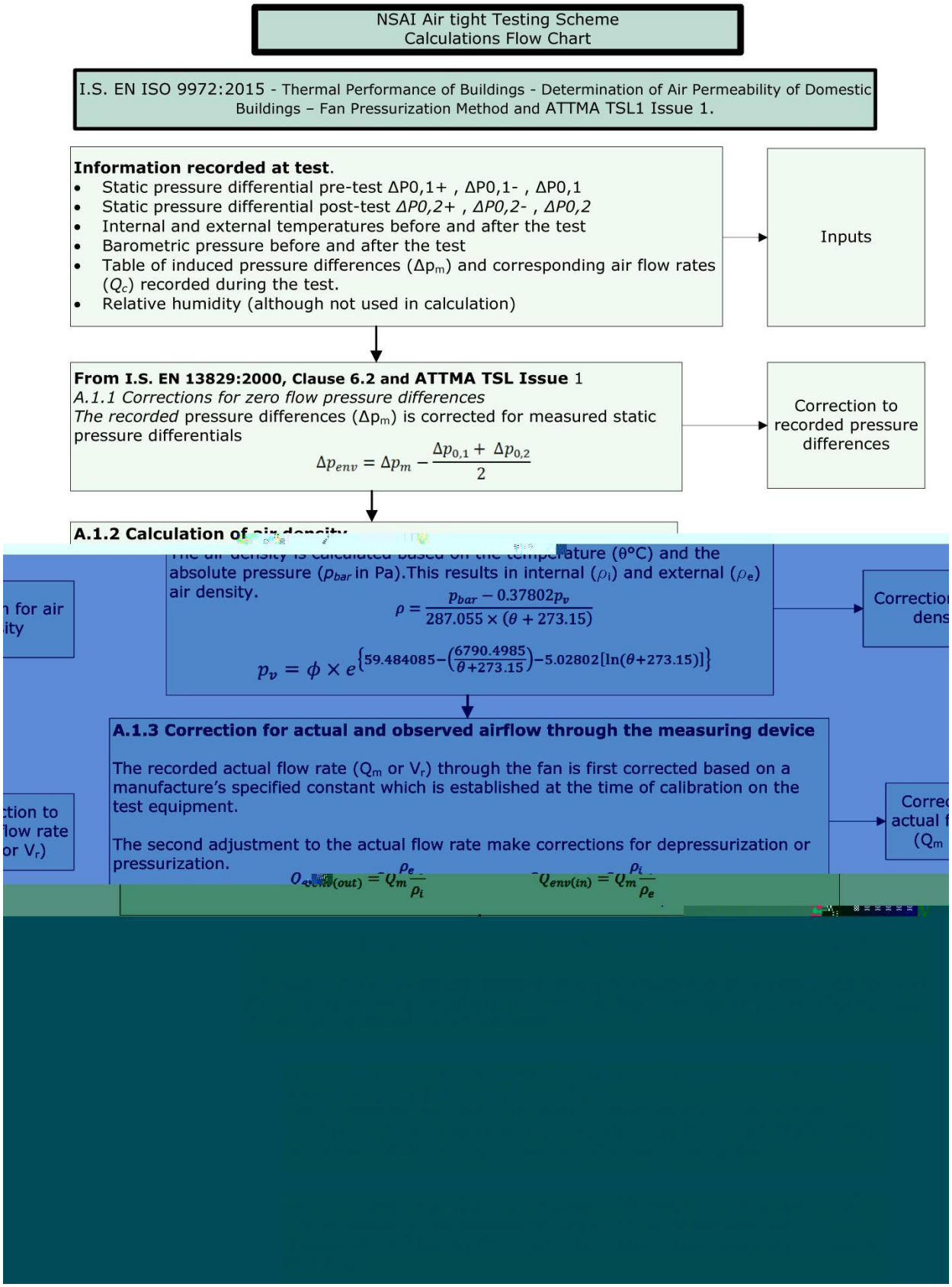
9.0 Calculation Flow chart



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