

Qualification Process for Air Tightness Testers in the UK



1

Government Framework

The English and Welsh governments released a framework in December 2014 for the air tightness testing industry known as the MTC

Minimum Technical Competence for Air Tightness Testing in Buildings for England and Wales

The MTC defines the following:

- Tester levels
- Minimum knowledge and understanding for each level
- Routes to gaining and progressing levels

Northern Ireland and Scotland also adopted this framework



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Tester Levels



Level 1

- Building up to a gross volume of 4000m³
- Building must be tested as a single entity
- Building must be tested with a single fan



Level 2

- Any building where the entirety of it is tested
- Large non-domestic building extensions can be tested
- Multiple fans can be used



Level 3

- Complex buildings tested as zones

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Minimum Knowledge & Understanding



The MTC identifies National Occupational Standards (NOS) associated with each tester level.



The NOS are organised into key functions associated with both undertaking a test and running an air tightness testing service

Each NOS has performance criteria that demonstrate competence and minimum knowledge and understanding needed to meet this criteria

There are 7 NOS that apply to all levels and then an individual NOS specifically for each tester level

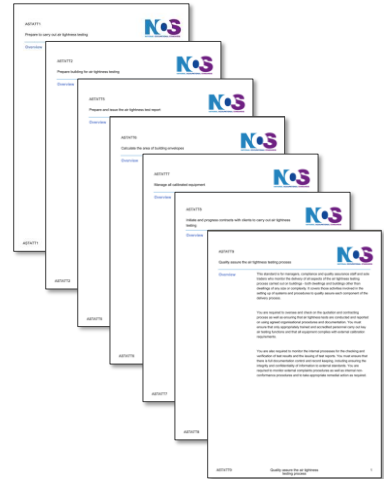


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NOS for all tester levels

NOS	Key Function
ASTATT1	Prepare to carry out air tightness testing
ASTATT2	Prepare a building for air tightness testing
ASTATT5	Prepare and issue air tightness test report
ASTATT6	Calculate the area of building envelopes
ASTATT7	Manage all calibrated equipment
ASTATT8	Initiate and progress contracts with clients
ASTATT9	Quality assure the air tightness testing process



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Routes to Gaining and Progressing Levels



Training and Assessment

Attend a course and pass the exams:

- Practical exam assessing if the tester undertake a test
- Theory exam of understanding testing, the test standard and building regulations
- Envelope area exam where drawings are provided for a building

Provide Evidence of Competence

The tester has experience of testing and can demonstrate it:

- Technical review of 5 previous tests including envelope area calculations
- Pass a technical interview
- Pass a witnessed test

NVQ or Other Recognised Qualification

This route is listed but does not exist



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Competent Person Schemes



There are currently 2 competent person schemes in the UK for air tightness testing



Both schemes use the MTC and NOS to assess competence of their members

Both schemes are named in the building regulations of each country in the UK although it is not mandatory for testers to join a competent person scheme

Each of the schemes maintain separate databases of tests and they are not publicly available

ATTMA currently has 443 registered testers

This is on average 615 tests per day

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Competent Person Schemes



Building Regulation 43 states the following:

“ A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by Elmhurst Energy Systems Limited or the Air Tightness Testing and Measurement Association in respect of pressure testing for the air tightness of buildings. ”

With this wording it means that it is not mandatory to be a member of a competent person scheme to do air tightness testing in the UK

Being a member of a competent person scheme does stop a lot of questions being asked by Building Control or Verifiers (Scotland)

Certificates can be issued instead of a full report if a tester is a member of a competent person scheme due to the wording in both the ATTMA test standards and CIBSE TM23

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Authorised Training Providers



ATTMA operates a network of Authorised Training Partners (ATP).

The courses of an ATP are audited to make sure all the content in the NOS included to initially gain approval and then every 3 years to maintain this status.

UK



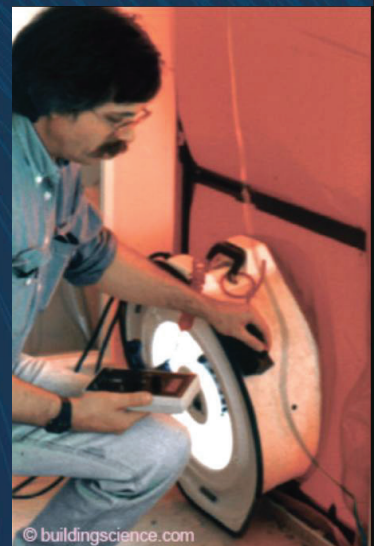
International



Elmhurst Energy Systems Ltd accepts course certificates from all ATPs in the UK. They do run their own air tightness testing courses but they have not applied to become an ATP so delegates have to use the provide evidence of competence route rather than the training and assessment route to join ATTMA.

History

- 1970's & 1980's – Blower doors and super suckers started being used to identify and quantify air leakage



Air Barrier Requirements

Original Barrier Performance Requirements

Air Barrier Material - the big pieces $0.02 \text{ L}/(\text{s}\cdot\text{m}^2)$ @ 75 Pa pressure difference (ISO 14857 ASTM E2178)

Air Barrier Accessory – tapes, strips, caulking, etc. $0.02 \text{ L}/(\text{s}\cdot\text{m}^2)$ @ 75 Pa pressure difference (ASTM E2178)

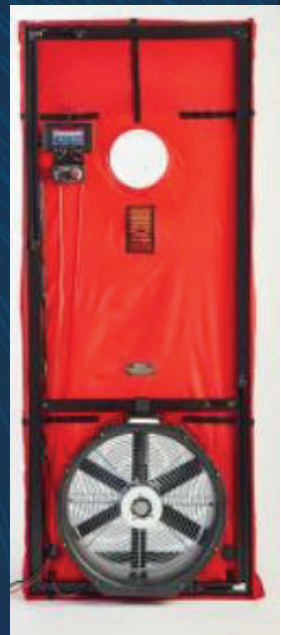
Air Barrier Component – windows, doors, skylights, etc. $0.20 \text{ L}/(\text{s}\cdot\text{m}^2)$ @ 75 Pa pressure difference (ASTM E283)

Air Barrier Assembly - wall assembly, roof assembly, foundation assembly $0.20 \text{ L}/(\text{s}\cdot\text{m}^2)$ @ 75 Pa pressure difference (ASTM E2357)

Air Barrier System - Whole Building $2.0 \text{ L}/(\text{s}\cdot\text{m}^2)$ @ 75 Pa pressure difference (ISO 9972, ASTM E3158)

Test Methods

- Air barrier systems –



Air Barrier Materials

- Testing the air leakage rate separates materials based on the value BUT MORE IS NEEDED!!

Peanut butter

Kraft smooth peanut butter

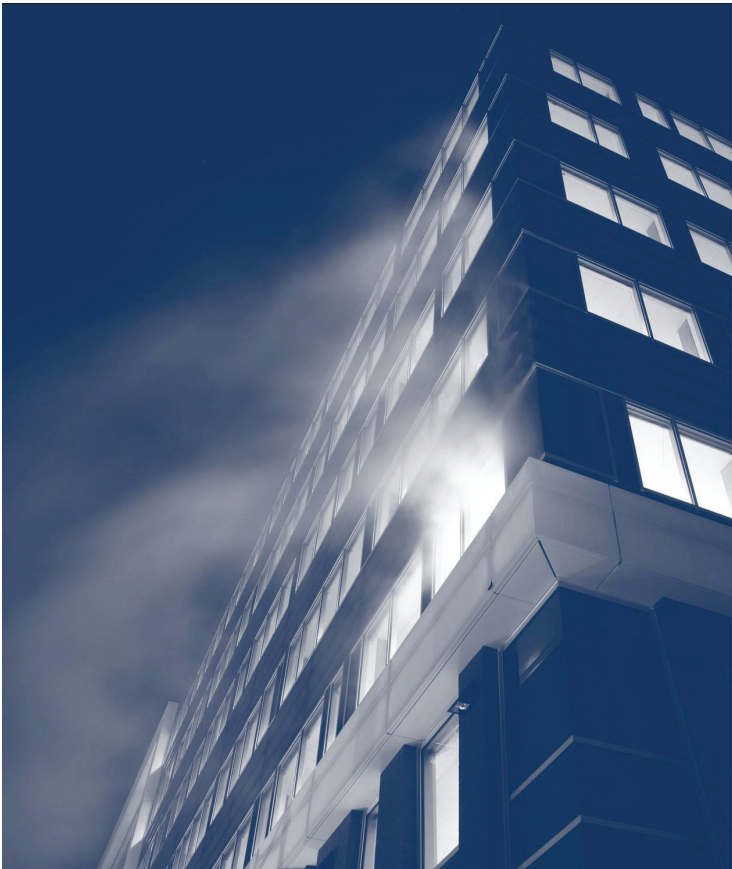
Applied at 20 mils wet

Tested to ASTM E2178

Air leakage result -

0.0021 L/s·m² - it meets the requirement

However, would you use this material in your project?



**ABAA'S WHOLE
BUILDING AIR LEAKAGE
RATE TESTING TRAINING
COURSE AND
PERSONNEL
CERTIFICATION
PROGRAM**

WHOLE BUILDING AIRTIGHTNESS JURISDICTIONAL

	Building Types Included	Intended Use	Airtightness Requirement		Recommended Standard		Consequence of a Failed Test		Location Specific?
			Institutional, Commercial & Multifamily	Residential	Institutional, Commercial & Multifamily	Residential	Commercial & Multifamily	Residential	
WA State Code (2018)	All	Energy Code Requirement	0.25 cfm/eq ft @ 75 Pa	5 ACH @ 50 Pa	ASTM E779 or equivalent	None	If leakage exceeds 0.4 cfm/eq ft, repair and retest. If between 0.25 and 0.4 cfm/eq ft, repair items practical and no need to retest.	Repair and retest.	WA state
Seattle City Code (2015)	All	Energy Code Requirement	0.3 cfm/eq ft @ 75 Pa	5 ACH @ 50 Pa	ASTM E779 or equivalent	None	Report repairs completed; no need to retest.		City of Seattle
California State Code (2019)	All buildings in climate zones 10 to 16	Energy Code Compliance Option	0.4 cfm/eq ft @ 75 Pa	0.4 cfm/eq ft @ 75 Pa	ASTM E779 or equivalent	ASTM E779 or equivalent			State of CA
IECC (2018)	Except buildings in climate zone 2B	Energy Code Compliance Option	0.4 cfm/eq ft @ 75 Pa	5 ACH @ 50 Pa	ASTM E779 or equivalent	None			No
ASHRAE 90.1 (2018)	All except low-rise residential	Energy Standard Compliance Option	0.4 cfm/eq ft @ 75 Pa		ASTM E779 or ASTM E1827		If between 0.4 and 0.6 cfm/eq ft, report repairs; no need to retest. If over 0.6 cfm/eq ft, retest required.		No
PHIUS (2018)	All	Green Standard	= 5 stories: 0.1 cfm/eq ft @ 75 Pa OR 0.08 cfm/eq ft @ 50 Pa All other: 0.08 cfm/eq ft @ 75 Pa OR 0.06 cfm/eq ft @ 50 Pa		None		Repair and retest or not certified.		No, but generally limited to US
LEED v4.1	All	Green Standard	4.25 to 1.5 ACH @ 50 Pa 0.195 to 0.0675 cfm/eq ft @ 50 Pa				No points awarded if outside of range for climate zone.		No

	Building Types Included	Intended Use	Airtightness Requirement		Recommended Standard		Consequence of a Failed Test		Location Specific?
			Institutional, Commercial & Multifamily	Residential	Institutional, Commercial & Multifamily	Residential	Commercial & Multifamily	Residential	
USACE (2012)	All military buildings	Army Corps Requirement	0.25 cfm/eq ft @ 75 Pa		USACE (2012)		Repair and retest.		Army Corps buildings
Fort Collins (2018)	All	Energy Code Requirement	0.25 cfm/eq ft @ 75 Pa	5 ACH @ 50 Pa in CZ 1 to 2 3 ACH @ 50 Pa in CZ 3 to 6	ASTM E779 or Fort Collins Protocol		Repair and retest.		City of Fort Collins
Utah State Energy Conservation Code (2018)	All residential buildings Commercial buildings	Energy Code Requirement Energy Code Compliance Option	0.4 cfm/eq ft @ 75 Pa	3.5 ACH @ 50 Pa	ASTM E779 or equivalent	ASTM E779 or equivalent	Repair and retest.		State of Utah
New York City Energy Code (2020)	Between 10,000 and 50,000 sq ft and a 75ft tall Greater than 50,000 sq ft or 75 ft tall	Energy Code Requirement Energy Code Compliance Option	0.4 cfm/eq ft @ 75 Pa	3 ACH @ 50 Pa	ASTM E779	RESNET/ICC 380, ASTM E779, ASTM E1827	Repair and retest.		New York City
IgCC (2018)	All except low-rise residential	Green Building Code	0.25 cfm/eq ft @ 75 Pa	Building type not included	ASTM E779, ASTM E1827, CAN/CGSB-149.10, CAN/CGSB-149.15, ISO 9972	Building type not included	If leakage exceeds 0.4 cfm/eq ft, repair and retest. If between 0.25 and 0.4 cfm/eq ft, repair items practical and no need to retest.	Building type not included	No


WHOLE BUILDING AIRTIGHTNESS TEST METHODS

Test Type	Category	ASTM E3158 - 18	CGSB 149.10 - 2019
Guidance Location in Standard		Section 9.3; Table 1	Sections 6.1.4 & 6.1.5; Table 3
Building "In Use"/ Operational Envelope	Natural ventilation openings	Closed and latched	Closed
	Active or passive smoke control systems	As found	Not specified
	Waste or linen handling systems and equipment	+ Rooftop vent - open + Chute intake doors - closed + Chute intake room and discharge room doors - closed and latched + Fire dampers - left as found	Not specified
	Interior doors, hatches, and operable windows inside the test envelope which are closed during normal building operation	Closed and latched	Open
	Other interior doors	Open	Open
	Mechanical ventilation or air-conditioning openings	Dampers closed; if no damper or gravity damper, no preparation unless fan(s) serving this opening are operated greater than 8000hrs per year, then sealed	Close damper; see Table 3 in standard for further guidance
	Intermittently used mechanical ventilation or air-conditioning openings	Dampers closed; if no damper or gravity damper, no preparation unless fan(s) serving this opening are operated greater than 8000hrs per year, then sealed	Close damper; if no damper, no preparation
	Clothes dryer/vent	As found; seal vent if a dryer is not installed	Switch off and close door; seal vent if a dryer is not installed
	Windows, doors, and roof hatches	Closed and latched	Latched
	Solid fuel appliance (i.e., fireplace)	Dampers closed	Dampers closed; if no damper, clear ashes
	Openings not intended for ventilation	Floor drains and plumbing; traps filled	Floor drains and plumbing; traps filled
	Closed-Up/ Building Envelope	Natural ventilation openings	Sealed
Active or passive smoke control systems		Sealed	Sealed; not specified in Table 3
Waste or linen handling systems and equipment		Sealed at rooftop chute vent opening	Sealed; not specified in Table 3
Interior doors, hatches, and operable windows inside the test envelope that are closed during normal building operation		Open	Open
Other interior doors		Open	Open
Mechanical ventilation or air-conditioning openings		Sealed; equipment with dampers are to have dampers closed and the opening sealed	Sealed
Intermittently used mechanical ventilation or air-conditioning openings		Sealed	Sealed
Clothes dryer/vent		Sealed	Switch off and close door; seal vent if a dryer is not installed
Windows, doors, and roof hatches		Closed and latched	Latched
Solid fuel appliance (i.e., fireplace)		Dampers closed; chimney sealed	Dampers closed or flue sealed
Openings not intended for ventilation		Sealed; floor drains and plumbing; traps filled	Sealed; floor drains and plumbing; traps filled
Additional Notes			


ASTM E 779 - 19	ASTM E 1827 - 11 (2017)	ISO 9972:2015	USACE (2012)
Sections 8.1 & 8.2	Sections 8.1.1 & 8.3; Table 1	Section 5.2; Table 1	Section 4.8.2
Not specified	Closed	Closed	
Not specified	Not specified	As found	
Not specified	Not specified	Not specified	
Not specified	Open	Open	
Open	Open	Open	
Close damper; if no damper, no preparation	Sealed	Sealed	Option not provided
Not specified	Close damper; if no damper, no preparation	Closed	
Not specified	Switch off and close door	Not specified; standard notes other intentional openings shall be closed	
Closed and Latched	Latched	Closed	
Close damper	Dampers closed; if no damper, clear ashes	Cleared of ashes and closed	
Not specified	Floor drains and plumbing; traps filled	Closed	
Option not provided	Sealed	Sealed	Sealed
	Sealed; not specified in Table 1	Sealed; not specified in Table 1	Sealed
	Sealed; not specified in Table 1	Sealed; not specified in Table 1	Sealed
	Open	Open	Open
	Open	Open	Open
	Sealed	Sealed	Close dampers; optional to seal
	Sealed	Sealed	Close dampers; optional to seal
	Switch off and close door	Sealed	Sealed
	Latched	Closed	Closed and latched
	Close damper; if no damper, clear ashes	Cleared of ashes and sealed	Sealed
	Sealed; floor drains and plumbing; traps filled	Sealed; floor drains and plumbing; traps filled	Sealed; floor drains and plumbing; traps filled
	Table 1 in standard is backwards		Buildings with dropped ceiling plenums must have openings in the plenum totaling 4 ft ² for every 500 ft ² of ceiling area

AIR BARRIERS

WHOLE BUILDING TEST METHODS HISTORY



US Army Corps of Engineers
Engineer Research and Development Center




air barrier abaa association of america

U.S. Army Corps of Engineers
Air Leakage Test Protocol for
Building Envelopes

Version 3 - May 11, 2012

Approved for public release; distribution is unlimited.




air barrier abaa association of america

Standard Method for Building Enclosure Airtightness
Compliance Testing

Issue Date: August 25, 2016

Designation: E3158 - 18



Designation: E3158 - 18

Standard Test Method for
Measuring the Air Leakage Rate of a Large or Multizone
Building¹

This standard is issued under the fixed designation E3158; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript letter (s) indicates an editorial change since the last revision or approval.

1. Scope

1.1 This standard test method provides a quantitative field-test procedure and calculation method for assessing an air leakage rate using a fan-induced pressure differential(s) across the building envelope, generated by blower doors or equivalent equipment.

1.2 Building setup conditions in accordance with defining the test boundaries appropriate for testing the envelope's air leakage are defined in this test method.

1.3 Procedure to determine the air pressure boundaries of the test envelope to be tested are provided in this test method.

1.4 This test method applies to all multizone and large building types and portions or subsections thereof.

1.5 This test method defines three test procedures: multi-point regression, repeated single point, and repeated two-point air leakage rate testing.

1.6 This test method allows for testing the test envelope in a pressurized condition, a depressurized condition, or in both conditions and averaging the results.

1.7 This test method applies to an air leakage rate specification with a reference pressure greater than 10 Pa (0.04 in. WC) and not greater than 100 Pa (4.01 in. WC).

1.8 This test method describes two methods of preparation for the building, in order to conduct the test: the building envelope which HVAC-related openings are excluded, and in the operational envelope where the HVAC-related openings are included.

1.9 Units—The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.10 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.11 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²
E456 Terminology Relating to Quality and Statistics
E631 Terminology of Building Constructions
E779 Test Method for Determining Air Leakage Rate by Fan Pressurization
E1198 Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
E1258 Test Method for Airflow by Fan Pressurization
E1827 Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
E2378 Test Method for Air Permeance of Building Materials
E2357 Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

2.2 International Organization of Standards:
ISO 15926 Terminology Relating to Quality and Statistics
ISO 15927 Terminology of Building Constructions
ISO 15928 Test Method for Determining Air Leakage Rate by Fan Pressurization
ISO 15929 Test Method for Determining Airtightness of Buildings Using an Orifice Blower Door
ISO 15930 Test Method for Air Permeance of Building Materials
ISO 15931 Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

3. Terminology

3.1 Definitions:

3.1.1 For definitions of general terms related to building construction used in this test method, refer to Terminology E631 and for general terms related to accuracy, bias, precision, and uncertainty, refer to Terminology E456.

3.1.2 Definitions of Terms Specific to This Standard:
3.1.2.1 *baseline pressure*, *n*—internal test envelope pressure with the air movement equipment off and sealed, recorded while the building is configured for the test.
3.1.2.2 *building envelope*, *n*—defined boundary of the test sample to determine its air leakage rate excluding the HVAC-related devices (HVAC devices sealed).


¹This test method is under the jurisdiction of ASTM Committee E06 on Performance of Building and is the direct responsibility of Subcommittee E06.03 on Air Leakage and Ventilation Performance.
Current edition approved Dec. 1, 2018. Published January 2019. DOI: 10.1520/E3158-18.

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WHOLE BUILDING AIRTIGHTNESS TEST METHODS

ASTM E3158 – 18

- Building codes have been updated to include this test method



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PREQUALIFICATIONS FOR INDIVIDUALS PERFORMING TESTING

EXISTING PREQUALIFICATIONS AND QUALIFICATIONS

- Current qualifications were based on experience and/or blower door manufacturer training
- Large building airtightness is still something new compared to single family homes.



PREQUALIFICATIONS AND QUALIFICATIONS

QUALIFICATIONS OF TESTERS

- Credentialing Program (ISO 17024) that will certify individuals in Large Building Airtightness Testing



ABAA PERSONNEL CERTIFICATION PROGRAM FOR TESTING WHOLE BUILDINGS

1. Recognize experienced and qualified testers
22. Allow new entrants into the process to grow the talent pool

TRAINING PROGRAM

- FIVE-DAY PROGRAM
- Day 1 and 2 – classroom – building science, blower doors, overview of testing
- Day 3 and 4 – Hands on testing using mock-ups
- Day 5 – Conduct a whole building test

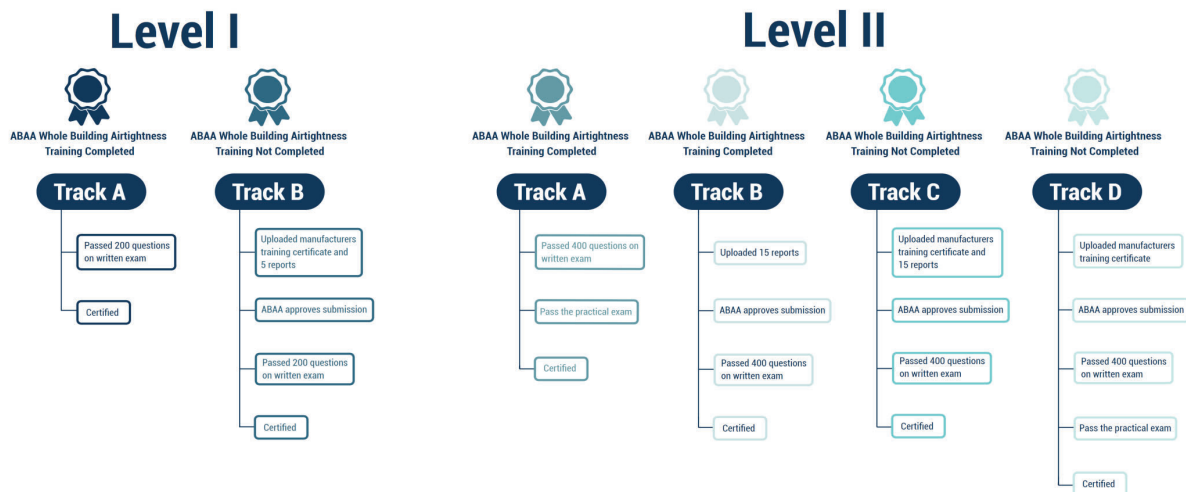


TRAINING PROGRAM



QUALIFICATIONS OF TESTERS

follows the Certification Scheme Handbook
in accordance with ISO 17024



ANZ Scheme Manager
Air Tightness Testing and Measurement Association
Suite 101, 18-20 Victoria Street, Erskineville, Sydney, NSW 2043
+61(0)403957480

Questions?

Laverne Dalglish
Executive Director
Air Barrier Association of America
1600 Boston-Providence Hwy
Walpole, MA 02081 USA
+1 204 771 7351
ldalglish@airbarrier.org

Qualification of Airtightness Testers in France

Feedback after 15 years



V. Leprince, June 16th 2026

1

HISTORY OF THE FRENCH REGULATION REGARDING AIRTIGHTNESS

Year	Milestone Description
2006	Creation of the first national qualification scheme.
2007–11	Database development & voluntary labeling labels (Effinergie).
2012	RT2012 introduces mandatory envelope airtightness check for new residential building
2022	RE2020 introduces mandatory ventilation checks + airtightness requirements on some non-residential (<3000m ²)
2026	663 qualified testers in 381 companies

From Voluntary to Mandatory

- Over 15 years, France has introduced **more and more mandatory measurement** at commissioning.
- Measurement have to be performed by **qualified testers** approved by the Ministry.

2

RE2020 REQUIREMENTS FOR AIRTIGHTNESS

Requirements in Q_{4Pa_surf}

- 0,6 m³/(h.m²) For single houses
- 1 m³/(h.m²) for multi-family buildings
- 1,70 m³/(h.m²) for offices and schools <3000 m².

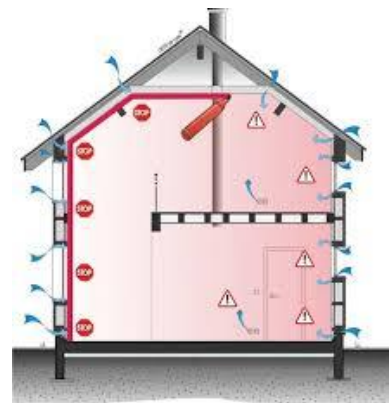
Measured value

- *1.2 if test is done by sampling
- +0,3 m³/(h.m²) if the test is done before completion

$$Q_{4Pa-surf} = \frac{q_4}{A_{Tbat}}$$

WHY AIRTIGHTNESS REQUIREMENTS?

- **Energy use** of course... but not only
- Airtightness is a key parameter for high-performance buildings
 - **Durability:** Minimizes moisture condensation risks within wall structures.
 - **Thermal Comfort:** Eliminates unwanted drafts
 - **IAQ:** Ensures proper air flow pathways and mechanical ventilation efficiency.



2 OPTIONS TO JUSTIFY AIRTIGHTNESS LEVEL

- To demonstrate compliance, builders can choose between two complementary methods:

Option 1: Systematic Measurement

Every single completed building is tested by a **qualified tester** using standard blower-door equipment.

Best for verifying custom structures.

Option 2: Quality Management (QMA)

Process-oriented approach focusing on construction details, worker training, planning and checking.

The QM needs to be **approved by the ministry**
Mostly for single-houses builders pre-designed homes

5

WHY A QUALIFICATION SCHEMES FOR TESTERS?

- Requirements needs a reliable measurement



Limit Variability

Limit variations in measurement results due to different measuring devices, user errors, and standard misinterpretations.



Standardize Results

Guarantees uniform practices so that decisions on building compliance remain reliable



Enrich Research

Create a network and a dataset assisting research and state policymaking.

6

3 STEPS TO GUARANTY THE RELIABILITY OF AIRTIGHTNESS TESTS



French customized rules

FD P 50- 784 describes rules adapted to the French national EP-regulation



Training

By authorized training centers, following a pre-defined program

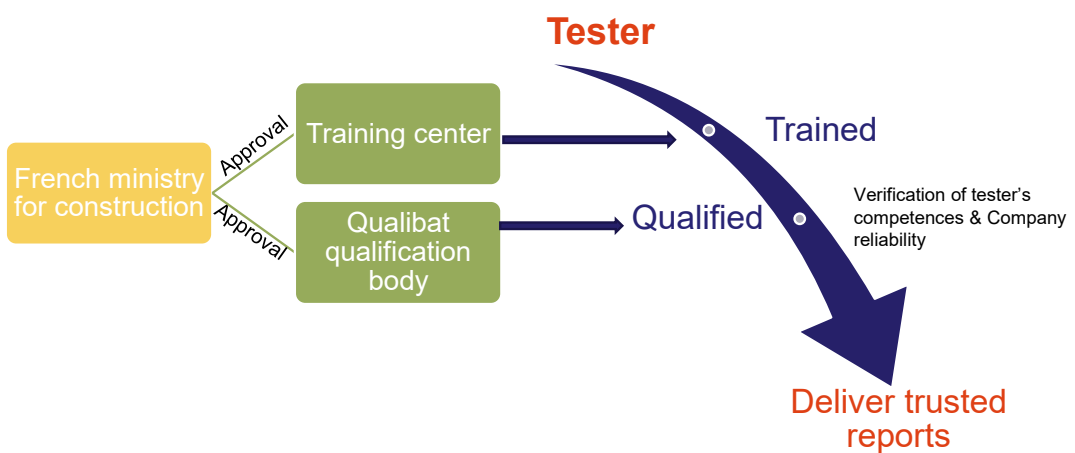


Qualification

By Qualification body under contract with the ministry

7

QUALIFICATION PROCESS



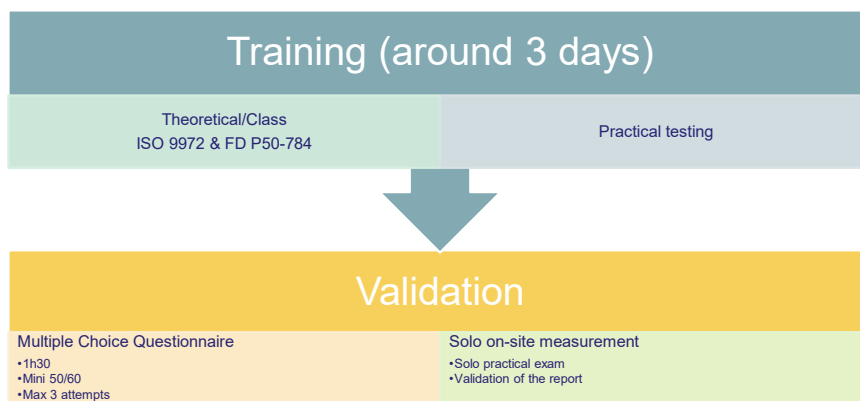
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CONTENT OF FRENCH CUSTOMIZED RULES FD P 50-784

- Terms, Definitions, and Symbols
- Measurement device
- Procedure
 - Calculation of Q_{4PA_surf}
 - Sampling rules
 - Time of measurement
 - Building preparation
- Reporting of Results
 - Calculation of A_{tbat} (as in EP-regulation)
- Test Report
 - Must include leakage detection
- Uncertainties
 - Inc. Atbat uncertainty
- Appendices : Building preparation
 - Detailed table for the report
- Appendices: Devices calibration
 - Every year for manometer
 - Every 2 years for the fan
 - Calibration points and methodology are provided
- Appendices: Leakage classification

9

TRAINING COURSE



10

QUALIBAT QUALIFICATION 8711 CRITERIA

-  **Legal & Admin:** Proof of legal registration and adequate professional liability insurance.
-  **Personnel:** Each operator must hold individual state-approved certificates.
-  **Calibration:** Devices must have traceable, up-to-date periodic calibrations.
-  **Traceability:** Records of every measurement and raw data export.

Validated training

Expert review of 5 reports by Qualibat

- Pre-defined grill



11

MAINTAINING QUALIFICATION QUALITY

- **Strict Continuous Surveillance**
 - Qualification is never permanent.
 - Annual verification of equipment state.
 - Annual check on active insurance policies
 - Periodic sample report auditing
 - Send data for the database

Probationary Period

Initially, new companies receive a **1-year probationary qualification**. Full renewals must be processed every **4 years**.

12

A UNIQUE NATIONAL DATABASE

570k+

RECORDS GATHERED

- From Control to Knowledge
 - Established in 2006, the database requires every certified tester to upload measurement records.
 - Includes building location, geometry, installed system, raw measurements and leakage location
 - (In recent year new database on ductwork airtightness)

13

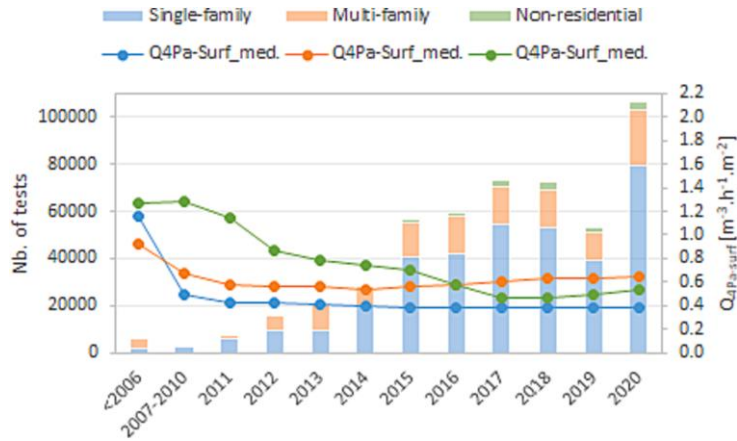
SCIENTIFIC PUBLICATIONS FROM THIS DATABASE

1. Quantitative correlation between buildings air permeability indicators: Statistical analyses of over 400,000 measurements (2023) Energy and Buildings
 - 1. Bassam Moujalled, Benedikt Kölsch, Adeline Mélois, Valérie Leprince
2. French building airtightness database after 10 years of operation: statistical analyses of about 500,000 measurements (2022) AIVC conference
 - 1. Bassam Moujalled, Adeline Mélois, Valérie Leprince, Gaëlle Guyot
3. Statistical analyses of about 420,000 measurements of the French database of building airtightness (2021) Buildair Symposium
 - 1. Bassam Moujalled, Adeline Mélois, Valérie Leprince, Gaëlle Guyot
4. Improving building envelope knowledge from analysis of 219,000 certified on-site air leakage measurements in France (2019) Building and Environment
 - 1. Adeline Mélois, B. Moujalled, G. Guyot, V. Leprince
5. French database of building airtightness, statistical analyses of about 215,000 measurements: impacts of buildings characteristics and seasonal variations (2018) AIVC conference
 - 1. Bassam Moujalled, Valerie Leprince, Adeline Bailly Mélois
6. 6 years of envelope airtightness measurements performed by French certified operators: analyses of about 65,000 tests (2015) AIVC conference
 - 1. Adeline Bailly*1, Gaëlle Guyot1, and Valérie Leprince2

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WHAT DO WE KNOW WITH THOSE DATA...

Airtightness evolution (1)



15

WHAT DO WE KNOW WITH THOSE DATA...

Building properties and impact on airtightness(4)

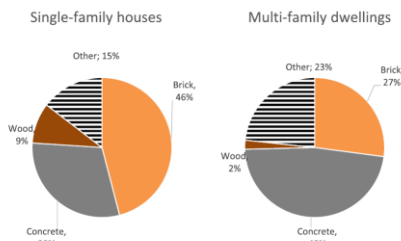


Fig. 2. Main materials for residential buildings.

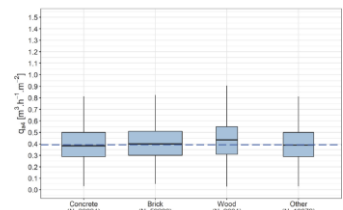


Fig. 4. Impact of the main material on envelope airtightness for 175,828 single-family houses ($Q_{4Pa-surf,average} = 0.39 m^3 \cdot h^{-1} \cdot m^{-2}$).

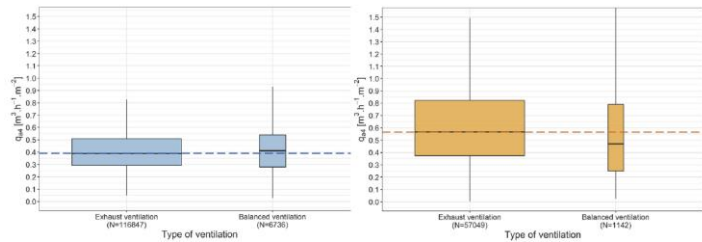
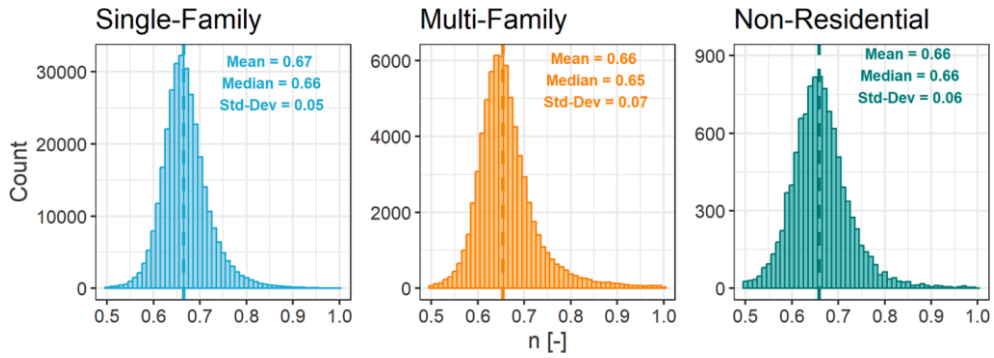


Fig. 7. Impact of type of ventilation system on envelope airtightness for single-family houses (left) and multi-family dwellings (right).

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WHAT DO WE KNOW WITH THOSE DATA...

- n-values (1)



17

WHAT DO WE KNOW WITH THOSE DATA...

- Seasonal variations.. Or not (4)

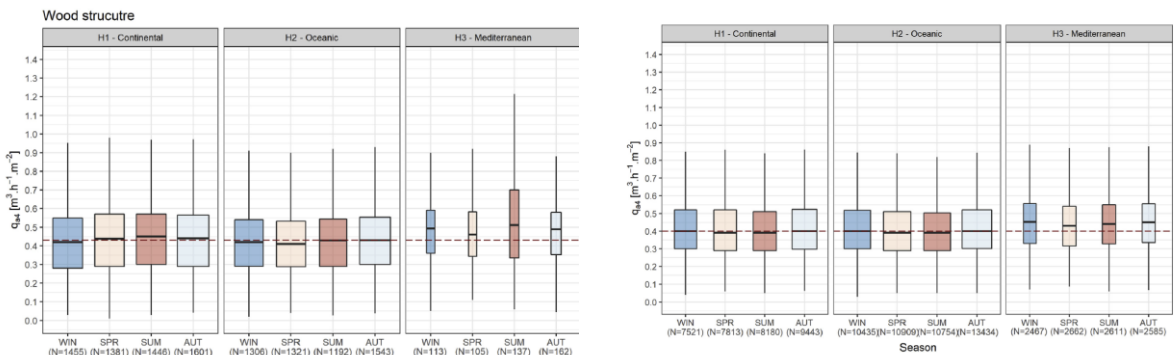


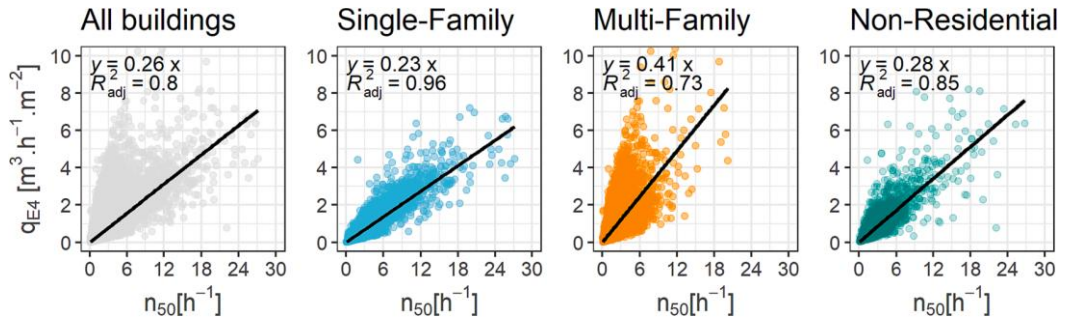
Fig. 9. Variation of air leakage for heavy structure houses (with interior insulation) according to climate and season ($q_{a,i,comp} = 0.40 m^3 \cdot h^{-1} \cdot m^{-2}$)

WIN=Winter; SPR=Spring; SUM=Summer; AUT=Autumn

18

WHAT DO WE KNOW WITH THOSE DATA...

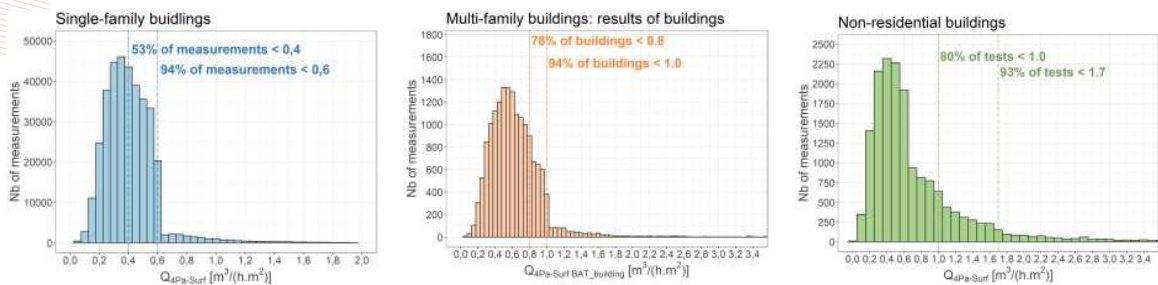
- Correlations between q_{E4} and n_{50} depending on the building type (1)



19

WHAT DO WE KNOW WITH THOSE DATA...

- Last minutes corrections in single houses (2)



20

WHAT DO WE KNOW WITH THOSE DATA...

- Main leakage location and correlation with building airtightness(2)

Table 1: The top five leakages with the greatest impact on air permeability

Type of building	Leakages with highest values of mean n50 (Occurrence)
Single-family	B4-Junction between wall and ceiling or pitched roof (3%) D6-Beam connection with floor or ceiling (3%) D5-Beam or joist connection with walls (3%) B2-Junction between two vertical walls (3%) F5-Lighting components (13%)
Multi-family	F5-Lighting components (5%) B3-Junction between wall and floor (13%) E2-Attic trap door (absent or ineffective seal) (5%) B4-Junction between wall and ceiling or pitched roof (3%) F4-Wiring inside internal walls (19%)
Non-residential	A5-False ceiling panels (8%) B4-Junction between wall and ceiling or pitched roof (6%) A3-mortar/glue junction between masonry blocks, wall panels (3%) D5-Beam or joist connection with walls (4%) D2-Vapour barrier membrane through which duct, pipe, beams, hatches (4%)

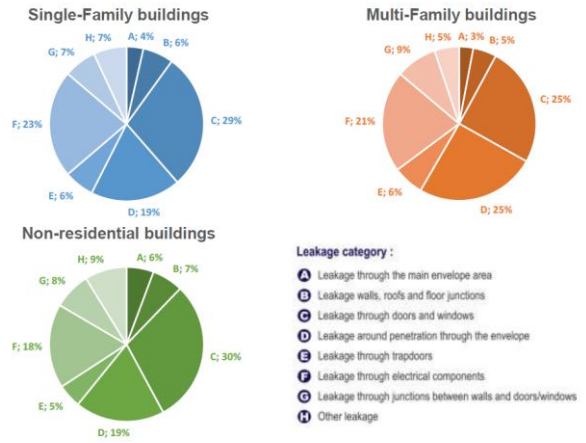


Figure 8: Frequency of detected leakages in single-family, multi-family and non-residential buildings

15-YEAR FEEDBACK & CHALLENGES

🏆 Key Achievements

- Established a unified national testing standard.
- Improved building quality and workmanship.
- Formed one of the largest databases in the world.

⚠️ Remaining Challenges

- Managing and sorting huge data sets.
- Maintaining the test quality over the years.
- Test every new and refurbished buildings
- Reach the same result for RE2020 ventilation audits.

Thank you for your attention

Valerie.leprince@cerema.fr

