

Australian/New Zealand Standard™

**Thermal performance of buildings—
Determination of air permeability of
buildings—Fan pressurization method**



AS/NZS ISO 9972:2015

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Australasian Fire and Emergency Service Authorities Council
Australian Building Codes Board
Australian Cellulose Insulation Manufacturers Association
Australian Professional Thermography Association
Building Research Association of New Zealand
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD-058, Thermal Insulation.

The objective of this Standard is to provide measurement of the air permeability of buildings or parts of buildings in the field to validate the designed thermal performance. It specifies the use of mechanical pressurization or depressurization of a building or part of a building. It describes the measurement of the resulting air flow rates over a range of indoor-outdoor static pressure differences. This Standard also provides measurement of the air leakage of building envelopes of single-zone buildings.

This Standard is identical with, and has been reproduced from ISO 9972:2015, *Thermal performance of buildings—Determination of air permeability of buildings—Fan pressurization method*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this International Standard’ should read ‘this Australian/New Zealand Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

None of the normative references in the source document have been adopted as Australian or Australian/New Zealand Standards.

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The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

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INTRODUCTION

The fan-pressurization method is intended to characterize the air permeability of the building envelope or parts thereof. It can be used, for example,

- a) to measure the air permeability of a building or part thereof for compliance with a design air-tightness specification,
- b) to compare the relative air permeability of several similar buildings or parts of buildings, and
- c) to determine the air-leakage reduction resulting from individual retrofit measures applied incrementally to an existing building or part of building.

The fan pressurization method does not measure the air infiltration rate of a building. The results of this method can be used to estimate the air infiltration rate and resulted heat load by means of calculation.

Other methods, like tracer gas, are applicable when it is desired to obtain a direct measurement of the air infiltration rate. A single tracer gas measurement, however, gives limited information on the performance of ventilation and infiltration of buildings.

The fan-pressurization method applies to measurements of air flow through the construction from outside to inside or vice versa. It does not apply to air flow measurements from outside through the construction and back to outside.

The proper use of this International Standard requires knowledge of the principles of air flow and pressure measurements. Ideal conditions for the test described in this International Standard are small temperature differences and low wind speeds. For tests conducted in the field, it needs to be recognized that field conditions can be less than ideal. Nevertheless, strong winds and large indoor-outdoor temperature differences are to be avoided.

NOTES

AUSTRALIAN/NEW ZEALAND STANDARD

Thermal performance of buildings—Determination of air permeability of buildings—Fan pressurization method**1 Scope**

This International Standard is intended for the measurement of the air permeability of buildings or parts of buildings in the field. It specifies the use of mechanical pressurization or depressurization of a building or part of a building. It describes the measurement of the resulting air flow rates over a range of indoor-outdoor static pressure differences.

This International Standard is intended for the measurement of the air leakage of building envelopes of single-zone buildings. For the purpose of this International Standard, many multi-zone buildings can be treated as single-zone buildings by opening interior doors or by inducing equal pressures in adjacent zones.

International Standard does not address evaluation of air permeability of individual components.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7345, *Thermal insulation — Physical quantities and definitions*

3 Terms, definitions, and symbols**3.1 Terms and definitions**

For the purposes of this document, the terms and definitions given in ISO 7345 and the following apply.

3.1.1**air leakage rate**

air flow rate across the building envelope

Note 1 to entry: This movement includes flow through joints, cracks, and porous surfaces, or a combination thereof, induced by the air-moving equipment used in this International Standard (see [Clause 4](#)).

3.1.2**building envelope**

boundary or barrier separating the inside of the building or part of the building subject to the test from the outside environment or another building or another part of the building

3.1.3**air change rate**

air leakage rate per internal volume across the building envelope

3.1.4**air permeability**

air leakage rate per the envelope area across the building envelope

3.1.5
specific leakage rate
<envelope> air leakage rate per the envelope area across the building envelope at the reference pressure difference

3.1.6
specific leakage rate
<floor> air leakage rate per net floor area across the building envelope at the reference pressure difference

3.1.7
effective leakage area
leakage area calculated at the test reference pressure differences across the building envelope

3.1.8
specific effective leakage area
<envelope> leakage area per the envelope area across the building envelope at the reference pressure difference

3.1.9
specific effective leakage area
<floor> leakage area per net floor area across the building envelope at the reference pressure difference

3.1.10
to close an opening
to set an opening in close position using the closing device present on the opening without additionally increasing the airtightness of the opening

Note 1 to entry: If there is no way to close the opening (i.e. without closing device), it remains open.

3.1.11
to seal an opening
to make an opening hermetic by any appropriate means (adhesive, inflatable balloon, stopper, etc.)

3.2 Symbols

Symbol	Quantity	Unit
A_E	envelope area	m^2
A_F	floor area	m^2
ELA_{pr}	effective leakage area at the reference pressure difference	m^2
ELA_{Epr}	specific effective leakage area per the building envelope area at the reference pressure difference	m^2/m^2
ELA_{Fpr}	specific effective leakage area per the floor area at the reference pressure difference	m^2/m^2
C_{env}	air flow coefficient	$m^3/(h \cdot Pa^n)$
C_L	air leakage coefficient	$m^3/(h \cdot Pa^n)$
n_{pr}	air change rate at the reference pressure difference	h^{-1}
p	pressure	Pa
p_{bar}	uncorrected barometric pressure	Pa
p_v	partial water vapour pressure of water	Pa
p_{vs}	saturation vapour pressure of water	Pa
q_{50}	air leakage rate at 50 Pa	m^3/h
q_{Epr}	specific leakage rate per the building envelope area at the reference pressure difference across the envelope	$m^3/(h \cdot m^2)$
q_{Fpr}	specific leakage rate per the floor area at the reference pressure difference across the envelope	$m^3/(h \cdot m^2)$
q_m	measured air flow rate	m^3/h
q_{pr}	air leakage rate at the reference pressure difference	m^3/h
q_r	readings of air flow rate	m^3/h
V	internal volume	m^3
Δp	induced pressure difference	Pa
Δp_0	zero-flow pressure difference (average)	Pa
$\Delta p_{0,1}; \Delta p_{0,2}$	zero-flow pressure difference before and after the test (air moving equipment closed)	Pa
$\Delta p_{0+}; \Delta p_{0-}$	average of the positive and negative values of zero-flow pressure difference (+ and – mean positive pressure and negative pressure across the envelope respectively)	Pa
Δp_m	measured pressure difference	Pa
Δp_r	reference pressure difference	Pa
φ	relative humidity	—
T_0	absolute temperature at standard conditions	K
T_e	external air absolute temperature	K
T_{int}	internal air absolute temperature	K
θ	Celsius temperature	$^{\circ}C$
ρ	air density	kg/m^3
ρ_0	air density at standard conditions	kg/m^3
ρ_e	external air density	kg/m^3
ρ_{int}	internal air density	kg/m^3

4 Apparatus

4.1 General

The following description of apparatus is general in nature. Any arrangement of equipment using the same principles and capable of performing the test procedure within the allowable tolerances is permitted. Examples of equipment configurations commonly used are indicated in [Annex A](#).

Periodic calibration of the measurement system, used in this test method, according to manufacturer specifications or to standardized quality insurance systems is required.

4.2 Equipment

4.2.1 Air-moving equipment

Device that is capable of inducing a specific range of positive and negative pressure differences across the building envelope or part thereof. The system shall provide a constant air flow at each pressure difference for the period required to obtain readings of air flow rate.

4.2.2 Pressure-measuring device

Instrument capable of measuring pressure differences with an accuracy of ± 1 Pa in the range of 0 Pa to 100 Pa.

4.2.3 Air flow rate measuring system

Device capable of measuring air flow rate within ± 7 % of the reading.

Care shall be taken if the principle underlying the measurement of volumetric flow rate is an orifice. The reading of the air flow rate shall be corrected according to air density [see Formula (2)].

4.2.4 Temperature-measuring device

Instrument capable of measuring temperature to an accuracy of $\pm 0,5$ K.

5 Measurement procedure

5.1 Measurement conditions

5.1.1 General

There are two modes for this measurement procedure: depressurization or pressurization of a building or part of a building. Regardless of which mode is used, the air leakage of building envelope can be measured. The accuracy of this measurement procedure is largely dependent on the instrumentation and apparatus used and on the ambient conditions under which the data are taken.

NOTE 1 Pressurization means that the pressure inside the building is higher than outside. Depressurization means that the pressure inside the building is lower than outside.

NOTE 2 If the product of the indoor/outdoor air temperature difference, expressed in Kelvin, multiplied by the height, expressed in metres, of the building or measured part of the building gives a result greater than 250 mK, it is unlikely that a satisfactory zero-flow pressure difference can be obtained (see [5.3.3](#)).

NOTE 3 If the wind speed near the ground exceeds 3 m/s or the meteorological wind speed exceeds 6 m/s or reaches 3 on the Beaufort scale, it is unlikely that a satisfactory zero-flow pressure difference can be obtained (see [5.3.3](#)).