



Building and ductwork airtightness in Czech Republic: national trends and requirements

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Building airtightness - Requirements

From 2002 up to now

- indicator: n_{50} [h^{-1}]
- limit values set in a technical standard (ČSN 730540-2)
- applicable for all of buildings, new construction, refurbishment
- proof of compliance not mandatory

Type of ventilation	$n_{50,N}$ [h^{-1}]	
	level 1	level 2
Natural	4,5	3,0
Mechanical	1,5	1,2
Mechanical with heat recovery	1,0	0,8
Mechanical with heat recovery, buildings with very low heat demand	0,6	0,4

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Buildings tested

Reasons for testing

- avoiding structural damage (timber structure buildings)
- avoiding excessive heat loss (energy efficient buildings – PH)
- complying with a certification scheme (e.g. BREEAM, ADMD)
- **obtaining financial support – NZÚ (since 2009)**

Number of buildings tested

- exact number unknown
- 21 members of A.BD_CZ → approx. 1 800 tests/year
- no more than 15 % of new residential buildings are tested

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Test protocol and guidelines

Test protocol

- fan pressurization method - ČSN EN ISO 9972
- no alternative methods used...

Guidelines

Guideline for NZÚ

- requirements on equipment
- time of measurement
- **building preparation (method 3)**
- position of measuring device
- Δp sequence
- control of regression line
- **calculation of reference values**
- test report (**filled in special form**)

TNI 73 0330

- sampling method for residential buildings
- sampling rules
- assessment of tests results
- guard zone technique allowed

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Incentives

EP programme New Green Savings (NZÚ)

nová → zelená → úsporám

- launched in 2009
- administered by the State Environmental Fund
- funded by revenues from EUA and EUAA units
- goal – reducing greenhouse gases emissions by means of energy savings in family houses and residential buildings
- financial support for:
 - construction of new energy-efficient houses (PH standard)
 - renovation with substantial energy savings
 - installation of ventilation system with heat recovery
 - installation of renewable energy heat sources
 - other measures contributing to sustainable goals..

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Incentives

New Green Savings - Airtightness requirements

- proof of compliance is mandatory
- testing acc. to ČSN EN ISO 9972 + special guidelines
- special form for the test report

nová → zelená → úsporám	Required value of n_{50} [h^{-1}]	
	Single-family house	Residential building
new building with low energy demand (low-energy house)	1.0	---
new passive house	0.6	0.6
installation of ventilation system with heat recovery	2.5	---

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Incentives

New Green Savings - lessons learnt

- mandatory testing has stimulated progress in knowledge and skills
- implementing mandatory testing is a feasible approach
- it requires a regulative framework:
 - requirements
 - test protocol (incl. guidelines)
 - procedures for the compliance check
 - qualified testers
 - supervision of the testers activity



- efforts to prepare the framework for general purpose

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Requirements

2020 revision of ČSN 73 0540-2 (not voted yet)

- indicator: n_{50} [h^{-1}]
- limit value depends on the building size (ratio A_E/V)
- calculated individually for each building

$$n_{50} \leq n_{50,RQ} \quad n_{50,RQ} = \frac{A_E}{V} \cdot q_{E50,RQ}$$

Type of ventilation	q_{E50} [$\text{m}^3/(\text{h} \cdot \text{m}^2)$]	
	required	recommended
Natural	3,0	3,0
Mechanical	1,5	1,2
Mechanical with heat recovery	1,0	0,8
Mechanical with heat recovery, buildings with very low heat demand	0,6	0,4

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Test protocol and guidelines

2022 Proposal of a new standard ČSN 73 0515

- supplementary guideline to ČSN EN ISO 9972
- goal: detailed testing protocol for check of compliance
- combines NZÚ Guidelines and TNI 73 0330
- updates the information
- sets requirement on equipment and technicians
- gives more detailed instructions (+ illustrations)
- gives guidelines for testing in special situations
- makes use of :
 - recent research results
 - international knowledge exchange (TAAC, Buildair)

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Qualification of testers

Options

- member of accredited laboratory (ČSN EN ISO/IEC 17025)
(3 laboratories hold the accreditation)
- member of Association Blower Door CZ
- combination of both...



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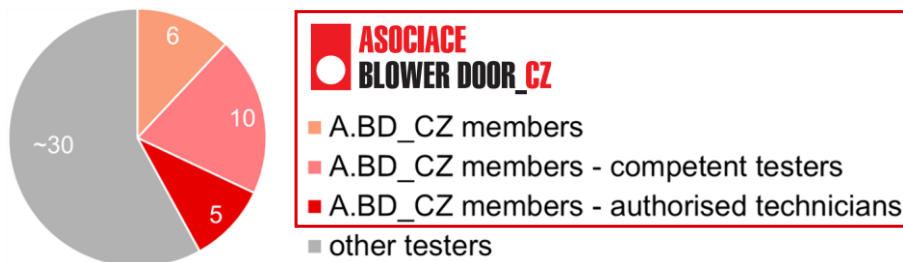
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Qualification of testers

Association Blower Door CZ

- supervises competence of the members
- supervises good function of equipment
- organises the reproducibility experiments (round-robin tests) (needed for accreditation acc. to ČSN EN ISO/IEC 17025)
- since 2021 - provides a complex competent testers scheme „Authorised technician for airtightness testing of buildings“



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Building airtightness - conclusions

Conclusions

- testing is still not mandatory (except for the EP programme)
- mandatory testing:
 - a strong driver (EP programme..)
 - feasible approach
 - contributes to the energy efficiency goals
- necessary framework for mandatory testing – almost ready...



- effort needed to convince the state authorities

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Ductwork airtightness

Regulations

Vent. system components

- airtightness testing required
- part of product certification before its release to market
- products tested in laboratory

Ductwork installation

- no regulation
- testing only recommended
- if required, limit values and penalties are set in the contract

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Ductwork airtightness - installations

Incentives

- no special programmes promoting the testing
- poor motivation – ductwork airtightness not taken into account in the EP calculations

Testing practice

- number of tests performed - no data available
- only a low portion of the installations is tested
- reasons for testing:
 - certification schemes (e.g. BREEAM, LEED)
 - special installations (laboratories, clean rooms, industry...)

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Ductwork airtightness - installations

Airtightness indicator, classification

- air leakage factor:

$$f = \frac{q_v}{A} \left[\frac{\text{m}^3}{\text{s} \cdot \text{m}^2} \right]$$

- classification of ductwork airtightness:
 - ČSN EN 12237
 - ČSN EN 1507

Test protocol

- ČSN EN 12599
- no national guidelines

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Ductwork airtightness - conclusions

Future trends

- no requirements neither mandatory testing of ductwork installations
- no regulation is foreseen in the next future
- in general:
 - check of compliance perceived as a matter of contract
 - mandatory testing perceived as an administrative obstacle

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Thank you for your attention

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