Building Airtightness in EP Calculation – Situation in Czech Republic

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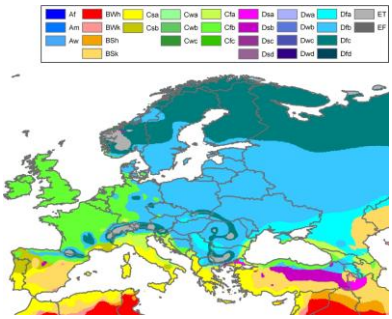
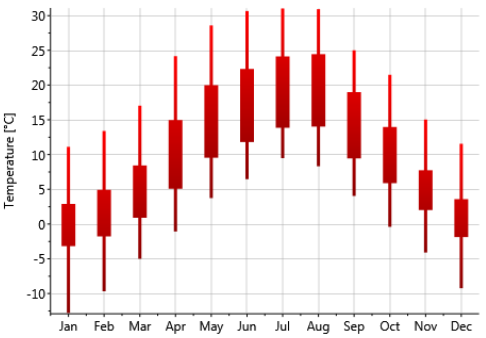
Importance of building airtightness

Climatic conditions





Impact of air leakage

- cold / mild climate
- convective air transfer

→

- excessive heat loss
- risk of interstitial condensation

Building airtightness

Requirements

- 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

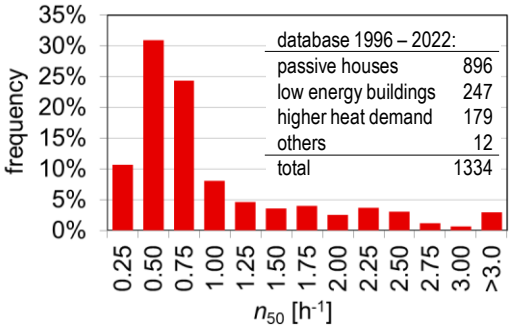
Building airtightness

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 – EP programme NZÚ

Buildings tested

- exact number unknown
- no more than 15 % of new residential buildings are tested



EP – national calculation method

Legal framework

EPBD		• imposes obligation to reduce the energy consumption of buildings
	Law No. 406/2000 Coll.	• implementation of EPBD in CZ • imposes obligation to fulfil EP requirements • imposes obligation to issue EPC
	Ordinances no. 264/2020 Coll. 222/2024 Coll	• specify the EP requirements • specify the methodology for assessing the EPB • specify the content of an EPC
ČSN EN ISO 52016-1		• specifies the EP calculation method (energy needs for heating and cooling)

EP – national calculation method

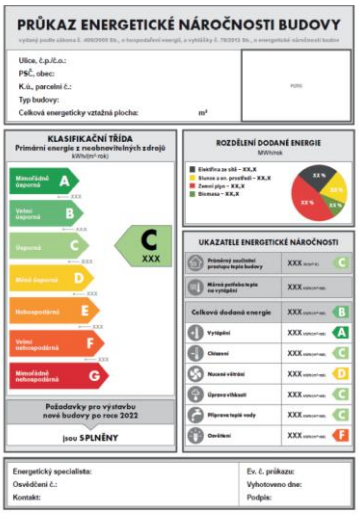
Legal framework

EPBD

Law No. 406/2000 Coll.

Ordinances no. 264/2020 Coll. 222/2024 Coll

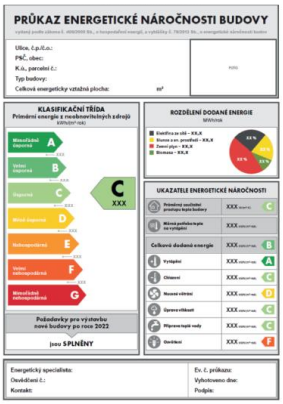
ČSN EN ISO 52016-1



EP – national calculation method

EP certificate

- until 2024:
  - issued as a part of application for building permit
  - airtightness can be only estimated
- since 2024:
  - issued at commissioning
  - measured airtightness can be set into the EP calculation



EP – national calculation method

Calculation method (energy needs)

- ČSN EN ISO 52016-1 + related EPB standards
- hourly method (monthly method still allowed)
- input values:
  - default values from Annexes of EN ISO standards
  - Ordinances no. 264/2020 Coll., 222/2024 Coll

Ventilation heat loss

- ČSN EN ISO 52016-1:

$$H_V = \rho_a \cdot c_a \cdot q_V \text{ [W/K]}$$

ventilation → Ord. no. 264/2020 Coll
infiltration → ČSN EN ISO 16798-7

Implementation of ČSN EN ISO 16798-7

General settings

- estimation of infiltration flow rates only
- method 1
  - determination of air flow rates based on the detailed building characteristics
  - equilibrium pressure method – mass balance
- calculation time step – 1 hour
- input values:
  - no further guidance in legal documents
  - no National Annex

  - default values according to Annex B

Implementation of ČSN EN ISO 16798-7

Calculation procedure and input values

calculation step	input values	source	software
on-site wind velocity	meteo. wind velocity u_{10}	climatic data	variable
	shielding coeffs. C_{rgh}, C_{top}	Annex B	fixed
leakage paths characteristics	building airtightness n_{50}, $q_{E,50}$	estimated	variable
	leak. coeff. and exp. C_{lea}, n_{lea}	Annex B	fixed
leakage paths distribution	distribution scheme (calculation procedure)	Annex B	fixed
wind pressure coefficients	values of C_p	Annex B	fixed

Implementation of ČSN EN ISO 16798-7

Estimation of building airtightness

- rules are not defined in the national EP calculation method (Ordinances no. 264/2020 Coll., 222/2024 Coll)
- no default values in legal or technical documents
- guidelines in technical standards:
  - limit values acc. to ČSN 73 0540-2 can be used as an assumption for EP calculation
  - guidelines for estimation of pre- and post-renovation n_{50} (TNI 73 0329)

- real airtightness – no reliable statistical data available...

Conclusion

Positive

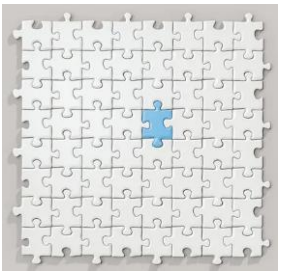
- building airtightness
- air infiltration

taken into account in EP calculation

- an advanced calculation method used (equilibrium pressure method, ČSN EN 16798-7)
- software tools include the determination of air infiltration – it cannot be avoided...

Limits and challenges

- reliable input data – still unavailable
- limited competence of EP experts
  - correct use of the calculation method...
  - reliability of results...



Thank you

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