SLOVENSKI STANDARD
SIST EN 15665:2009

01-julij-2009

Prezraļevanje stavb - Ugotavljanje karakteristiļnih izhodiļ za zasnovo prezraļevalnih sistemov za stanovanja

Ventilation in buildings - Determining performance criteria for design of residential ventilation systems

Lüftung von Gebäuden - Bestimmung von Leistungskriterien für die Auslegung von Lüftungssystemen in Wohngebäuden

Ventilation des bâtiments - Détermination des criteres de performance pour la conception des systemes de ventilation résidentielle

Ta slovenski standard je istoveten z: **EN 15665:2009**

ICS:

91.140.30	Prezraļevalni in klimatski sistemi	Ventilation and air-conditioning

SIST EN 15665:2009 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15665

March 2009

ICS 91.140.30

English Version

Ventilation for buildings - Determining performance criteria for residential ventilation systems

Ventilation des bâtiments - Détermination des critères de performance pour les systèmes de ventilation résidentielle

Lüftung von Gebäuden - Bestimmung von Leistungskriterien für Lüftungssysteme in Wohngebäuden

This European Standard was approved by CEN on 7 February 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 15665:2009: E

Contents

Page

Foreword

This document (EN 15665:2009) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Nowadays most ventilation requirements either in regulations or in standards are based on required airflow rates. Also, there is relatively limited knowledge about the basis for ventilation flow rates. Airflow rates are however probably the easiest way to express ventilation requirements.

Nevertheless it is worthwhile to consider in a more detailed way the influence of the dilution due to air change on human exposure, in order to understand the ventilation requirements expressed in terms of flow rates.

Figure 1 explains the process from pollutant to health risk.

This European Standard does not deal with health effects, health risks (linked to noise, tobacco), dose and energy impact.

This European Standard is not intended to design and/or dimension a ventilation system.

This European Standard is intended to support any regulation or standard.

This European Standard is intended to give guidance to those with responsibility for producing requirements and standards for residential ventilation systems.

It is recommended that future revisions of relevant regulations and standards should consider the content of this European Standard.

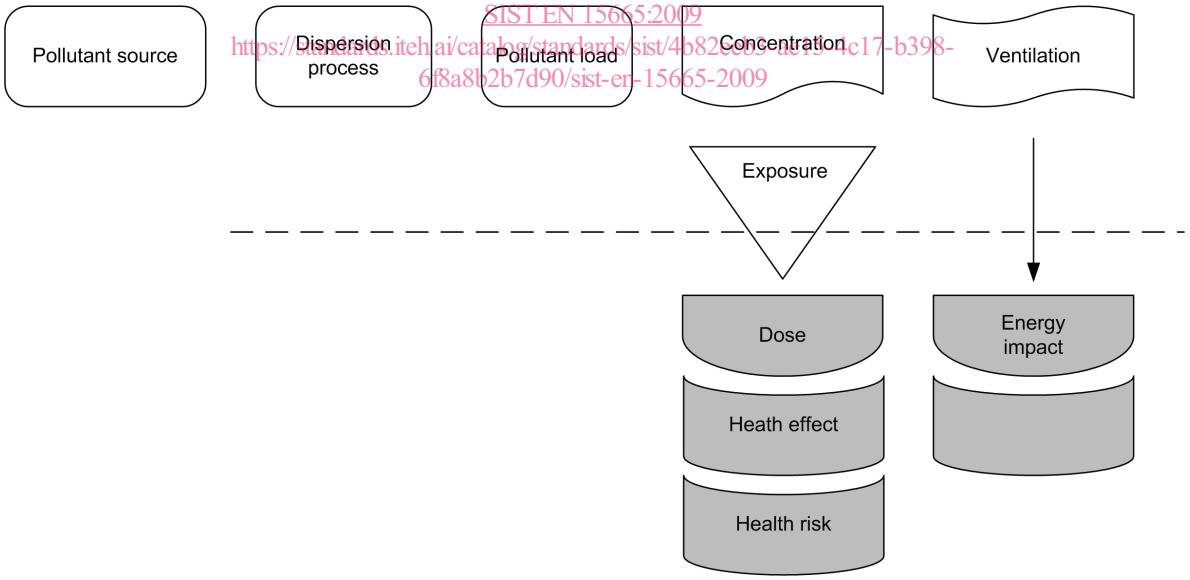

Figure 1 — Pollutant process

1 Scope

This European Standard sets out criteria to assess the performance of residential ventilation systems (for new, existing and refurbished buildings) which serve single family, multi family and apartment type dwellings throughout the year.

This European Standard specifies ways to determine performance criteria to be used for design levels in regulations and/or standards.

These criteria are meant to be applied to, in particular:

— mechanically ventilated building (mechanical exhaust, mechanical supply or balanced system);

— natural ventilation with stack effect for passive ducts;

— hybrid system switching between mechanical and natural modes;

— windows opening by manual operation for airing or summer comfort issues.

This European Standard considers aspects of hygiene and indoor air quality.

Health risk from exposure to tobacco smoke is excluded from this European Standard.

2 Normative references

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

EN 12792:2003, *Ventilation for buildings – Symbols, terminology and graphical symbols*

EN 15242:2007, *Ventilation for buildings – Calculation methods for the determination of air flow rates in buildings including infiltration*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12792:2003 and the following apply.

3.1
background pollutants
group of indoor pollutants which are continuous and diffuse

NOTE 1 These pollutants are represented by materials, furnishings and products used in the dwelling.

NOTE 2 These pollutants also include those resulting from human occupation such as water vapour and carbon dioxide from respiration.

3.2
specific pollutants
group of indoor pollutants which are of short duration, and in specific locations in the dwelling

NOTE These pollutants are mainly represented by water vapour, carbon dioxide and odours, whose production is related to specific human activities in the dwelling (such as cooking, washing, bathing).

3.3
parameter
pollutant or marker that is used in the expression of a requirement

NOTE 1 More than one parameter may be used at the same time and combined.

NOTE 2 Relative humidity, odours, CO_2 are examples of parameters.

3.4
criteria
way (method) to express the required performance

NOTE Criteria can be, for example, numbers of hours above 70 % RH in living room calculated on a standard week basis, number of minutes to reach 25 % of the initial pollution concentration based on a standard pollutant emission in a toilet, average level of CO_2 above outside in bedroom on a 10 hours night with two standard persons.

3.5
requirement
level of required performance

NOTE Requirements can be, for example, "maximum of 100 hours above 70 % in living room", "less than 10 minutes to reach 25 % of initial ", "less than 800 10^{-6} CO_2 (generally named ppm) as an average", "minimum of 8 l/s in toilet", "35 l/s for global ventilation in standard inside/outside conditions".

4 Symbols and units

For the purposes of this document, the symbols and units given in EN 12792:2003 apply.

5 Needs for residential ventilation: main issues

5.1 General

There shall be adequate means of ventilation provided for the building and its occupants.

5.2 General sources of pollutants

The following sources of pollutants influencing the ventilation in dwelling shall be considered:

— Outside environment, such as climate, earth (which can provide radon);

— Human respiration, odours;

— Human behaviour, such as cooking, bathing, drying machine, cleaning;

— Emissions of building materials and furniture;

— Emissions of cleaning material;

— Combustion appliance.

Each of these sources can produce pollutants.

5.3 Consequences of this pollution inside a dwelling

Depending on the pollutant sources given in 5.2, the following consequences can be observed:

a) For the building: risk of condensation, risk of dryness, mould growth, fungi's, dust mites, interstitial condensation;

b) For human health and comfort: carbon monoxide, CO_2 level and water vapour, temperature, air velocity, germs, microorganisms, formaldehydes, VOC (volatile organic compounds), "volatile organic compound, odours, noise from outside.

5.4 Expectations about ventilation

Considering the pollutant sources and their consequences, the adequate means of ventilation should be provided for one or more of the following purposes:

a) Dilution and/or removal of background pollutants such as substances emitted by furnishings and building materials and cleaning materials used in the building, odours, metabolic CO_2 and water vapour;

b) Dilution and/or removal of specific pollutants from identifiable local sources such as toilet odours, cooking odours, water vapour from cooking or bathing, combustion products;

c) Provision of outdoor air for occupants;

d) Provision of control of temperature effects (over heating and draught);

e) Provision of air for combustion appliances.

All these purposes shall be considered with regard to the health and comfort of the occupants and integrity of the building.

NOTE 1 Ventilation is primarily concerned with the first three purposes (a) to c)) but it is linked to the last two (d and e)).

NOTE 2 When providing ventilation, other aspects of performance including thermal comfort, durability, fire safety, noise and energy use should be considered.

6 General approach

6.1 Questions, assumptions and way of proceeding

Before designing a ventilation system, the people involved in regulations and/or standards shall answer lots of questions and assumptions that have to be taken into account for calculation. The result of this calculation can be expressed by a continuous explicit airflow rate (e.g. mechanical ventilation with constant airflow rate) or an equivalent airflow in terms of air quality according to conventional assumptions applicable in each country (e.g. Technical Approvals).

The following way of proceeding shall be used in order to determine airflow rates (see Figure 2):

a) Step 1: verify if there is any applicable regulation (health, fire protection, noise, gas, etc.) in the country that leads to certain limit in airflows;

b) Step 2: identify the parameters which are taken into account or which are considered as relevant;

c) Step 3: at this step of the procedure, take into account the 3 following points:

1) for each parameter, a detailed description shall be made of the nature, sources, distribution and time dependence;

2) for each parameter, the appropriate criteria shall be chosen as described in Clause 7;

3) assumptions for buildings, ventilation systems, outdoor conditions and occupancy patterns shall be described corresponding to the table at the chosen level described in 6.2;

d) Step 4: use the appropriate calculation method able to handle the chosen criteria and assumptions;

e) Step 5: make requirements on the chosen criteria and verify the performance of the calculation results with other applicable requirements (health, fire protection, noise, gas, etc.);

f) Step 6: give results which can be expressed as an equivalent airflow.

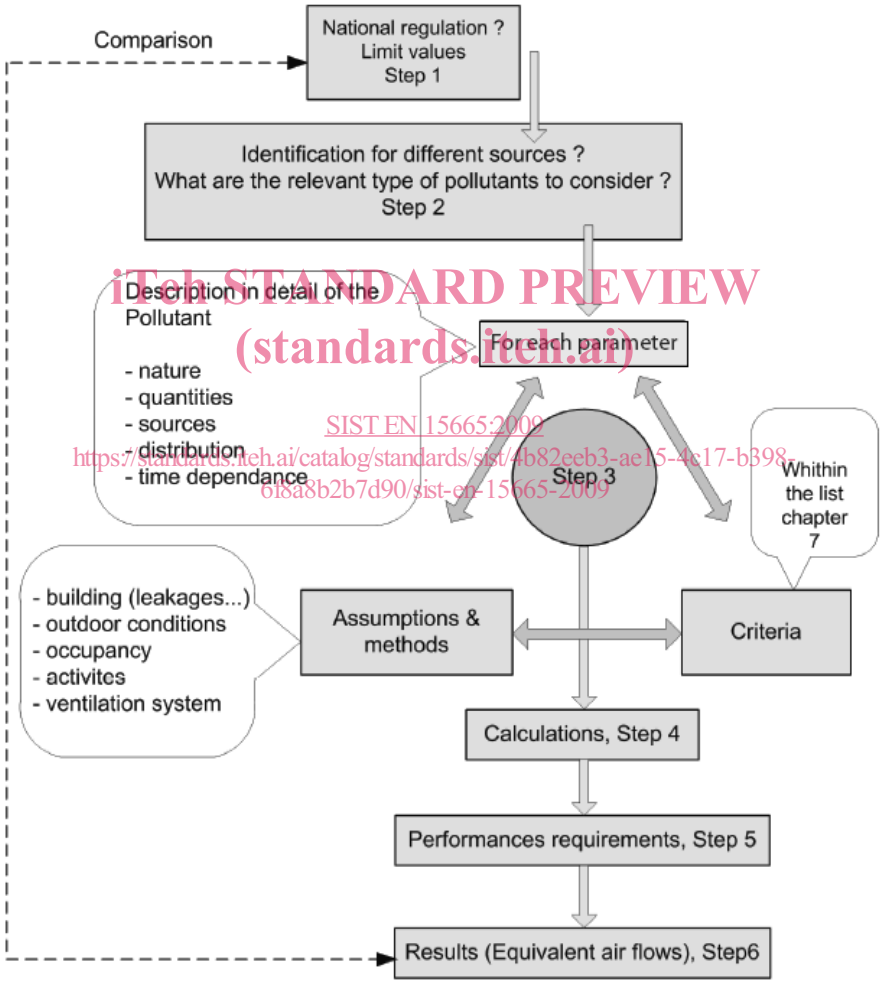

Figure 2 — Way of proceeding for the determination of airflow rates

NOTE The process remains the same but the level of the assumption can be fitted to level 1 to 3; see 6.2.

6.2 Requirements for designing a ventilation system

6.2.1 General

Depending on the parameter taken into account together with the criteria and the building, the appropriate level of calculation method shall be used:

— ventilation airflow rates values (level 1);

— calculation done for one point (level 2);

— yearly calculation done for design days (daily pattern) (level 3).

At each level, different tables shall be completed.

At each corresponding level, criteria shall be chosen between the different ways developed in Clause 7 to explain how parameters are taken into account.

For each level, the number of cases could vary from one case to many (statistical approach), depending on the size of the building, the number of habitants, etc.

NOTE The local ventilation effectiveness may affect the calculation of exposure level.

6.2.2 Assumptions and criteria chosen for ventilation airflow rates values (level 1)

The design regulation or standard shall describe the following relevant items:

a) Type of room:

1) Type of process for extract and supply air (natural or mechanical);

2) Floor level.

b) Regime:

1) Continuous (min, max);

2) Intermittent (min, max, time schedule);

3) Closable or not (air inlets).

c) Airflow rate expressed in one of the following expression in Table 1:

1) l/s per m^2

2) l/s per person

3) l/s per room

d) Global airflow rates (including infiltrations).

e) Global air infiltration.

At the level of component (externally and internally mounted air transfer devices, exhaust and supply air terminal devices, etc.) requirements can be expressed in equivalent area mm^2, in airflow at a certain pressure difference ΔP, etc.

Pressure loss due to doors between air inlets and air exhaust shall be taken into account.

Table 1 – Design airflow rates for level 1

Airflow rate in l/s

Room or space	Airflow rate (Normal value)	Airflow rate (Increased value)
Kitchen		
Bathroom		
WC		
Living room		
Bedroom 1		
Bedroom n		
All dwelling		

An example is given in Annex A.

6.2.3 Assumptions and criteria chosen for a single calculation representing point (level 2)

The requirements considered at level 2 are for a single calculation representing point, for example, for an average point in winter to roughly design a shaft natural ventilation airflow.

NOTE A shaft natural ventilation system relies on pressure differences without the aid of powered air movement components.

Assumptions for the case under consideration are given in Table 2. The size of the dwelling under consideration shall be defined as assumptions for the case under consideration.

In case of no specific assumptions, default value shall be used for the calculation, as specified in Table 2.

Table 2 — Assumptions for level 2

Assumptions	Case under consideration	Default value	Unit
Indoor temperature		19	°C
Outdoor temperature		8	°C
Wind speed		1	m/s
Wind direction[a]		60° windward	-
Shielding[a]		shielded	-
Air leakage classes		n_{50} = 1	1/h
Air leakage splitting		See Table 4.	-
Outdoor humidity (optional)			% RH

[a] According to EN 15242.