SLOVENSKI STANDARD
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Energetska učinkovitost stavb - 3. del: Prezračevanje nestanovanjskih stavb - Zahtevane lastnosti za sisteme za prezračevanje in klimatizacijo

Energy performance of buildings - Part 3: Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems

Lüftung von Nichtwohngebäuden - Teil 3: Allgemeine Grundlagen und Anforderungen für Lüftungs- und Klimaanlagen und Raumkühlsysteme

Performance énergétique des bâtiments - Ventilation dans les bâtiments non résidentiels - Partie 3: Exigences de performances pour les systèmes de ventilation et de conditionnement d'air

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91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

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Energy performance of buildings - Part 3: Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

If this draft becomes a European Standard, 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.

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

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Contents

Page

Foreword

This document (prEN 16798-3:2014) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document will supersede EN 13779:2007.

This standard forms part of a series of standards aimed at European harmonisation of the methodology for the calculation of the energy performance of buildings. An overview of the whole set of standards is given in CEN/TR 15615, Explanation of the general relationship between various CEN standards and the Energy Performance of Buildings Directive (EPBD) ("Umbrella document").

Attention is drawn to the need for observance of all relevant EU Directives transposed into national legal requirements. Existing national regulations with or without reference to national standards, may restrict for the time being the implementation of the European Standards mentioned in this report.

Introduction

This standard is part of a set of standards developed to support EPBD directive implementation, hereafter called "EPB standards".

EPB standards deal with energy performance calculation and other related aspects (like system sizing) to provide the building services considered in the EPBD directive.

This standard provides requirements especially for designers, installers, manufacturers, building owners and users, on ventilation, air-conditioning and room-conditioning systems in order to achieve a comfortable and healthy indoor environment in all seasons with acceptable installation and running costs. The standard focuses on the system-aspects for typical applications and covers the following:

— Aspects important to achieve and maintain a good energy performance in the systems without any negative impact on the quality of the indoor environment.

— Definitions of design and performances data.

This standard was developed during the first EPBD mandate and the first version was published in 2008.

The revision for inclusion in the second mandate package was performed…

The revision concerned mainly the following aspects:

— Update of filtration aspects

— Update of heat recovery aspects

— clear split to EN 15251, outdoor air volume flows have be shifted to EN 15251

— aspects of energy performance have been updated

— The document was split in a normative part, containing all the normative aspects and a supplementary technical report containing additional information and informative annexes.

— The standard allows a normative national annex

The standard was updated to cover hourly/monthly/seasonal time-step.

1 Scope

This European Standard applies to the design and implementation of ventilation, air conditioning and room conditioning systems for non-residential buildings subject to human occupancy, excluding applications like industrial processes. It focuses on the definitions of the various parameters that are relevant for such systems.

The guidance for design given in this standard and accompanying TR 13779 are mainly applicable to mechanical supply and exhaust ventilation systems. Natural ventilation systems or natural parts of hybrid ventilation systems are not covered by this standard. Reference is made to the Technical Report for informative guidance on the design of such systems.

Applications for residential ventilation are not dealt with in this standard. Performance of ventilation systems in residential buildings are dealt with in EN 15665 and CEN/TR 14788.

The classification uses different categories. For some values, examples are given and, for requirements, typical ranges with default values are presented. The default values given in this standard are not normative as such, and should be used where no other values are specified. Classification should always be appropriate to the type of building and its intended use, and the basis of the classification should be explained if the examples given in the standard are not to be used.

NOTE Different standards may express the categories for the same parameters in a different way, and also the category symbols may be different.

Overarching		Building (as such)		Technical Building Systems										
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & control	PV, wind, ..
sub1	M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General	1	General	1	General									
2	Common terms and definitions; symbols, units and subscripts	2	Building Energy Needs	2	Needs									
3	Applications	3	(Free) Indoor Conditions without Systems	3	Maximum Load and Power									
4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	4	Ways to Express Energy Performance									
5	Building Functions and Building Boundaries	5	Heat Transfer by Transmission	5	Emission & control									
6	Building Occupancy and Operating Conditions	6	Heat Transfer by Infiltration and Ventilation	6	Distribution & control									
7	Aggregation of Energy Services and Energy Carriers	7	Internal Heat Gains	7	Storage & control									
8	Building Partitioning	8	Solar Heat Gains	8	Generation & control									
9	Calculated Energy Performance	9	Building Dynamics (thermal mass)	9	Load dispatching and operating conditions									
10	Measured Energy Performance	10	Measured Energy Performance	10	Measured Energy Performance									
11	Inspection	11	Inspection	11	Inspection									
12	Ways to Express Indoor Comfort			12	BMS									
13	External Environment Conditions													
14	Economic Calculation													

Figure 1 — Position of this standard within the EN EPB set of standards 2

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.

EN 308, *Heat exchangers — Test procedures for establishing performance of air to air and flue gases heat recovery devices*

EN 779:2012, *Particulate air filters for general ventilation - Determination of the filtration performance*

EN 1507, *Ventilation for buildings — Sheet metal air ducts with rectangular section — Requirements for strength and leakage*

EN 1751, *Ventilation for buildings — Air terminal devices — Aerodynamic testing of damper and valves*

EN 12097, *Ventilation for buildings — Ductwork — Requirements for ductwork components to facilitate maintenance of ductwork systems*

EN 12237, *Ventilation for buildings — Ductwork — Strength and leakage of circular sheet metal ducts*

EN 12599:2000, *Ventilation for buildings — Test procedures and measuring methods for handing over installed ventilation and air conditioning systems*

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

EN 13053:2012, *Ventilation for buildings — Air handling units — Rating and performance for units, components and sections*

EN 13180, *Ventilation for buildings — Ductwork — Dimensions and mechanical requirements for flexible ducts*

EN 15232:2012, *Energy performance of buildings — Impact of Building Automation, Controls and Building Management*

EN 15239, *Ventilation for buildings — Energy performance of buildings — Guidelines for inspection of ventilation systems*

EN 15240, *Ventilation for buildings — Energy performance of buildings — Guidelines for inspection of air-conditioning systems*

EN 15241, *Ventilation for buildings — Calculation methods for energy losses due to ventilation and infiltration in commercial buildings*

EN 15251:2007, *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*

EN 15727, *Ventilation for buildings — Ducts and ductwork components leakage classification and testing*

EN 15780, *Ventilation for buildings — Ductwork — Cleanliness of ventilation systems*

ISO 12759, *Fans — Efficiency classification for fans*

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
room conditioning system
system able to keep comfort conditions in a room within a defined range

Note 1 to entry: Air conditioning systems as well as surface based systems are included.

3.2
occupied zone
volume of air that is confined by specified horizontal and vertical planes

Note 1 to entry: Usually the term “occupied zone” is used only for areas designed for human occupancy.

Note 2 to entry: The vertical planes are usually parallel with the walls of the room. Usually there is also a limit placed on the height of the occupied zone. Thus, the occupied zone in a room is that space in which the occupants are normally located and where the requirements for the indoor environment shall be satisfied. Definitions are given in 7.2.

Note 3 to entry: The definition of the occupied zone is dependent on the geometry and the use of the room and should be specified case by case.

3.3
ventilation effectiveness
relation between the pollution concentrations in the supply air, the extract air and the indoor air in the breathing zone (within the occupied zone)

3.4
specific fan power
combined amount of electric power need by all the fans in the air distribution system divided by the total airflow rate through the building under design load conditions, in W.m-3.s

3.5
demand controlled ventilation
ventilation system where the ventilation rate is controlled by air quality, moisture, occupancy or some other indicator for the need of ventilation

3.6
ventilation system
combination of appliances designed to supply interior spaces with outdoor air and to extract polluted indoor air

Note 1 to entry: The system can consist of mechanical components (e.g. combination of air handling unit, ducts and terminal units). Ventilation system can also refer to natural ventilation systems making use of temperature differences and wind with facade grills in combination with mechanical exhaust (e.g. in corridors, toilets etc.). Both mechanical and natural ventilation can be combined with operable windows. A combination of mechanical and non-mechanical components is possible (hybrid systems).

3.7
Exhaust Air Tansfer Ratio (EATR)
level of carry over of supply air by the exhaust air

3.8
Outdoor Air Correction Factor (OACF)
ratio of entering supply mass flow (ODA) and the leaving supply mass flow (SUP)

3.9
Design Condition
declared nominal air volume flow at a density of 1,2 kg m^{-3}

3.10
Design load condition
filter pressure drop of clean filters, dry heat exchangers and humidifiers at design condition

4 Symbols and units

For the purposes of this document, the symbols and units given in Table 1 apply. The units in brackets are also in use.

Table 1 — Symbols and units

Quantity	Symbol	Unit
Pressure difference	Δp	Pa
Temperature difference	$\Delta\theta$ *)	K
Ventilation effectiveness	ε_v	-
Coefficient of Performance	ε	-
Temperature	θ (theta)	K (°C)
Air temperature in the room	θ_a (theta)	K (°C)
Mean radiant temperature	θ_r (theta)	K (°C)
Operative temperature	θ_o (theta)	K (°C)
Temperture	ϑ	K (°C)
Density	ρ (rho)	$kg.m^{-3}$
Heat or cooling load	Φ (phi)	W (kW)
Temperature ratio	Φ_t	-
Ventilation effectiveness	ε	-
Area	A	m^2
Costs	C	€ [a]
Concentration	c	$mg.m^{-3}$
Concentration	a	-
Specific heat capacity at constant pressure	c_p	$J.kg^{-1}.K^{-1}$
Diameter	d	m
Energy consumption (measured)	E	J (MJ, GJ)
Energy demand (calculated)	E	J (MJ, GJ)
Filter Efficiency	E	-
Efficiency	η	-
Exhaust Air Transfer Ratio	$EATR$	-
Specific leakage	f	$l.s^{-1}.m^{-2}$
Promary Energy Factor	f	-
Present value factor	f_{pv}	-
Height	h	m
Initial Investment	I	€ [b]
Thermal insulation of clothing	I_{cl}	clo
Length	L	m
Metabolic rate (activity)	M	met
Life span	n	years

Table 1 — Symbols and units *(continued)*

Quantity	Symbol	Unit
n_{50}-value	n_{50}	h^{-1}
Fan power	P	W
Specific fan power	P_{SFP}	$W.m^{-3}.s$
Outdoor Air Correction Factor	$OACF$	-
Present value	PV	€ [a]
Pressure	p	Pa
Thermal Energy	Q	kWh
Mass flow rate	q_m	$kg.s^{-1}$
Volume flow rate	q_v	$m^3.s^{-1}$ ($l.s^{-1}$, $m^3.h^{-1}$)
Interest rate	r	-
Time	t	s (h)
Volume	V	m^3
Air velocity	v	$m.s^{-1}$
Auxiliary Energy	W	kWh, Wh

[a] Or National currency

[b] EN 12792 prefers Θ but t and T may be used as well.

5 Links to EPB calculation methods

5.1 General

This standard contains designing and calculation aspects. Designing aspects in Clause 6 and calculation aspects in Clause 7.

5.2 Input data for energy calculation

5.2.1 General

Table 2 — Input data for energy calcualtion

Description	Symbol	Unit	Intended[1)]
Ventilation rate per person	$q_{V,P}$	l/s m^3/h l/($sm^{2)}$ m^3/($hm^{2)}$	M5-6 M5-12
Ventilation rate for building emission	$q_{V,B}$	l/s m^3/h l/($sm^{2)}$ m^3/($hm^{2)}$	M5-6 M5-12
breathing zone ventilation	$q_{V,bz}$	l/s m^3/h l/($sm^{2)}$ m^3/($hm^{2)}$	M5-6 M5-12
specific heating energy required for outdoor air treatment	q_H	Wh/(m^3/h·a)	M5-2
Delivered energy factor heat	f_H	-	M3-9
specific cooling energy required for outdoor air treatment	q_C	Wh/(m^3/h·a)	M4-2
Delivered energy factor cold	f_C		M4-9
specific humidification generation input	e_{HU}	Wh/(m^3/h·a)	M6-9

1) To be updated within M/480 mandate

Table 2 — Input data for energy calculation *(continued)*

Description	Symbol	Unit	Intended
Primary energy factor humidifier	$F_{P,cr}$		M6-9
primary energy factors electricity	$f_{p,S}$		
primary energy factors heating	$f_{p,H}$		

5.2.2 Source of date for energy calculation

Input data about products that are required for the calculation described in this standard shall be the data supplied by the manufacturer if they are declared according to relevant EN product standards.

If no such data from the manufacturer is available or if the required data are not product data, default values are given in Annex B.

Default data given in Annex B may be replaced by other data, for example nationally determined data. To ensure consistency with this calculation method, input data shall be presented according to the template given in Annex A.

NOTE Compliance with the template given in Annex A does not guarantee that the new data set is consistent.

5.3 Output data for energy calculation

Table 3 — Output data for energy calculation

Description	Symbol	Unit	Intended
average demand controlled air volume flow	$q_{V,dc}$	l/s m^3/h $l/(sm^{2)}$ $m^3/(hm^{2)}$	M5-2
ventilation outdoor air volume flow	$q_{V;ODA}$	l/s m^3/h $l/(sm^{2)}$ $m^3/(hm^{2)}$	M5-2
Specific fan power	P_{SFP}	$W.m^{-3}.s$	M5-2 M5-6 M5-10
internal specific fan power	$P_{SFP,INT}$	$W.m^{-3}.s$	M5-6 M5-10
overall fan motor efficiency	η_e	-	M5-6 M5-10
HR coefficient of performance	ε	-	M5-6
HR energy efficiency	η_e	-	M5-6
HR temperature ration	$\square_t$	-	M5-2
HR humidity ratio	$\square_h$	-	M5-2
primary energy performance HVAC unit	E_{RLT}	$Wh/(m^3/h{\cdot}a)$	M5-9 M5-10

6 Agreement of design criteria

6.1 General

The design criteria specify the information needed to design the system. These criteria also constitute the basis for the measurements that will be carried out during the hand-over process. They provide the common language between all the parties including the client, designer, contractor and the operation and maintenance personnel.

Information necessary to design the system is organised on the basis of various documents outlined in 6.2 to 6.13. If the method used for dimensioning the system requires more details, they shall be provided.

Calculation procedure for the energy requirements of the ventilation system is presented in EN 15241 and EN 15243[2)]

6.2 Principles

Although in this standard the terms “client”, “designer” or “contractor” are used to describe the function, the responsibilities are dependent on the contract. Their use does not presuppose any definition of responsibility for the information. Nevertheless, if one party does not provide the information, the other shall ask for it or make and record the necessary assumptions. All key design decisions shall be agreed and documented.

The description of the characteristics of the environment and the structure of the building shall be obtained for design. The desired results required at the time of hand-over and during normal operation shall be specified and documented.

The description of the building with construction data, use and requirements is an evolving process with an increasing degree of detail and accuracy with the evolution of the project. Therefore the use of all specifications shall always be stated clearly. The details about the information needed are also dependent on the calculation method that is employed. The introduction of a system of abbreviations for constructions, room use and requirements to be used throughout the design phase is recommended.

6.3 General building characteristics

6.3.1 Location, outdoor conditions, neighbourhood

Information about the location of the relevant building, the significant neighbourhood characteristics such as adjacent buildings, shading, reflections, emissions, roads, airfields, sea coast, special requirements and all other information that will influence the building design shall be specified in design. The reference for noise and wind exposure of facades should be given, if available. The category of outdoor air shall be defined in accordance with Table 6.

6.3.2 Design weather data

Information shall be given on climate data; as a minimum, design conditions for winter and summer are required, as well as annual data for energy calculation. The most important climate parameters for the design are:

— Winter: outdoor temperature and wind velocity;

2) Shall be udated according final Mandate 480