SLOVENSKI STANDARD
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Energijske lastnosti stavb - Prezračevanje stavb - 18. del: Razlaga in utemeljitev EN 16798-17 - Smernice za pregled sistemov prezračevanja in klimatizacije - Moduli M4-11, M5-11, M6-11, M7-11

Energy performance of buildings - Ventilation for buildings - Part 18: Interpretation of the requirements in EN 16798-17 - Guidelines for inspection of ventilation and air-conditioning systems (Modules M4-11, M5-11, M6-11, M7-11)

Energetische Bewertung von Gebäuden - Lüftung von Gebäuden - Lüftung von Gebäuden - Teil 18: Interpretation der Anforderungen der EN 16798-17 - Leitlinien für die Inspektion von Lüftungs- und Klimaanlagen (Module M4 11, M5 11, M6 11, M7 11)

Performance énergétique des bâtiments - Ventilation des bâtiments - Partie 18 : Interprétation des exigences de l'EN 16798-17 - Lignes directrices pour l'inspection des systèmes de ventilation et de conditionnement d'air (Module M4-11, M5-11, M6-11, M7-11)

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European foreword

This document (CEN/TR 16798-18:2017) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

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.

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

The necessary editorial revisions were made to comply with the requirements for each EPB technical report.

This document has been produced to meet the requirements of Directive 2010/31/EU 19 May 2010 on the energy performance of buildings (recast), referred to as “recast EPDB”.

For the convenience of Standards users CEN/TC 156, together with responsible Working Group Conveners, have prepared a simple table below relating, where appropriate, the relationship between the ‘EPBD’ and ‘recast EPBD’ standard numbers prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”.

EPBD EN Number	Recast EPBD EN Number	Title
EN 15251	EN 16798-1	Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)
N/A	CEN/TR 16798-2	Energy performance of buildings – Ventilation for buildings – Part 2: Interpretation of the requirements in EN 16798-1 – Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)
EN 13779	EN 16798-3	Energy performance of buildings – Ventilation for buildings – Part 3: For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)
N/A	CEN/TR 16798-4	Energy performance of buildings – Ventilation for buildings – Part 4: Interpretation of the requirements in EN 16798- 3 – For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)

EN 15241	EN 16798-5-1	Energy performance of buildings – Ventilation for buildings – Part 5-1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8) – Method 1: Distribution and generation
EN 15241	EN 16798-5-2	Energy performance of buildings – Ventilation for buildings – Part 5-2: Calculation methods for energy requirements of ventilation systems (Modules M5-6.2, M5-8.2) – Method 2: Distribution and generation
N/A	CEN/TR 16798-6	Energy performance of buildings – Ventilation for buildings – Part 6: Interpretation of the requirements in EN 16798-5–1 and EN 16798-5-2 – Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M 6-5, M6-8 , M7-5, M7-8)
EN 15242	EN 16798-7	Energy performance of buildings – Ventilation for buildings – Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5-5)
N/A	CEN/TR 16798-8	Energy performance of buildings – Ventilation for buildings – Part 8: Interpretation of the requirements in EN 16798-7 – Calculation methods for the determination of air flow rates in buildings including infiltration – (Module M5-5)
EN 15243	EN 16798-9	Energy performance of buildings – Ventilation for buildings – Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) – General
N/A	CEN/TR 16798-10	Energy performance of buildings – Ventilation for buildings – Part 10: Interpretation of the requirements in EN 16798-9 – Calculation methods for energy requirements of cooling systems (Module M4-1,M4-4, M4-9) – General
EN 15243	EN 16798-13	Energy performance of buildings – Ventilation for buildings – Part 13: Calculation of cooling systems (Module M4-8) – Generation
EN 15243	CEN/TR 16798-14	Energy performance of buildings – Ventilation for buildings – Part 14: Interpretation of the requirements in EN 16798-13 – Calculation of cooling systems (Module M4-8) – Generation
N/A	EN 16798-15	Energy performance of buildings – Ventilation for buildings – Part 15: Calculation of cooling systems (Module M4-7) – Storage

N/A	CEN/TR 16798-16	Energy performance of buildings – Ventilation for buildings – Part 16: Interpretation of the requirements in EN 16798-15 – Calculation of cooling systems (Module M4-7) – Storage
EN 15239 and EN 15240	EN 16798-17	Energy performance of buildings – Ventilation for buildings – Part 17: Guidelines for inspection of ventilation and air-conditioning systems (Module M4-11, M5-11, M6-11, M7-11)
N/A	CEN/TR 16798-18	Energy performance of buildings – Ventilation for buildings – Part 18: Interpretation of the requirements in EN 16798-17 – Guidelines for inspection of ventilation and air-conditioning systems (Module M4-11, M5-11, M6-11, M7-11)

Introduction

The set of EPB standards, Technical Reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards [1];

b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards [2]; and

c) the detailed technical rules are the basis for the following tools:

   1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses,

   2) a common template for each technical report that accompanies an EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses, and

   3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, EN ISO 52000-1:2017 [3].

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

Rationale behind the EPB technical reports

There is a risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally or regionally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore, each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [2]):

— to avoid flooding and confusing the actual normative part with informative content,

— to reduce the page count of the actual standard, and

— to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [4] that laid the foundation for the preparation of the set of EPB standards.

This Technical Report

This Technical Report accompanies and complements EN 16798-17:2017 by providing informative explanations and guidance to support the application of the normative content of the standard, taking into account the requirements and options of the Recast Energy Performance of Buildings Directive [11] (abbreviated as EPBD).

Air conditioning inspection may be carried out at any time and for a variety of purposes. It may, for example, be part of a routine maintenance programme, though this may not include every part of the guidance in the standard or technical report. Experience shows that inspections typically identify measures that can result in tangible energy and running cost savings that require little or no capital expenditure. However, these measures represent only a small proportion of the savings that are technically possible. Inspections can also confirm that some potential sources of energy wastage are not actually present.

The focus of the EPBD inspection requirements is to prevent energy wastage. However, measures to reduce energy consumption should not be at the expense of the indoor environment, in particular indoor air quality.

The specific requirements of the EPBD given in the corresponding article are the following:

— Article 15 requires the introduction of "measures to establish a regular inspection of the accessible parts of air-conditioning systems of an effective rated output of more than 12 kW. The inspection shall include an assessment of the air-conditioning efficiency and the sizing compared to the cooling requirements of the building."

— Article 16 requires that "an inspection report should be issued and handed to the owner or tenant of the building after each inspection of a heating or air-conditioning system". The inspection report should contain the result of the inspection performed in accordance with Article 14 or Article 15 and include recommendations for the cost-effective improvement of the energy performance of the inspected system. These measures should take into account climatic and local conditions as well as indoor climate environment and should not affect other requirements concerning buildings such as accessibility, safety and the intended use of the building.

— The recommendations may be based on a comparison of the energy performance of the system inspected with that of the best available feasible system and a system of similar type for which all relevant components achieve the level of energy performance required by the applicable legislation.

— Alternatively, Member States "may opt to take measures to ensure the provision of advice to users on the replacement of air-conditioning systems or on other modifications to the air-conditioning system which may include inspections to assess the efficiency and appropriate size of the air-conditioning system."

1 Scope

This Technical Report refers to standard EN 16798-17:2017, module M4-11, M5-11, M6-11 and M7-11.

It contains information to support the correct understanding and use of this standard.

This Technical Report does not contain any normative provision.

Information regarding features affecting the frequency and duration of inspection is included in 5.2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this technical report 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.

prEN 16798-1:2015, *Energy performance of buildings — Ventilation for buildings — Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics — Module M1-6*

EN 16798-3:2017, *Energy performance of buildings — Ventilation for buildings — Part 3: For non-residential buildings — Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)*

EN 16798-9:2017, *Energy performance of buildings — Ventilation for buildings — Part 9: Calculation methods for energy requirements of cooling systems (Module M4-1, M4-4, M4-9) — General*

prEN 16798-11:2015, *Energy performance of buildings — Part 11: Module M4-3 — Calculation of the design cooling load*

EN 16798-13:2017, *Energy performance of buildings — Ventilation for buildings — Part 13: Calculation of cooling systems (Module M4-8) — Generation*

EN 16798-17:2017, *Energy performance of buildings — Ventilation for buildings — Part 17: Guidelines for inspection of ventilation and air conditioning systems (Module M4-11, M5-11, M6-11, M7-11)*

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

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

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

EN 14511-1, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 1: Terms, definitions and classification*

EN ISO 7345:1995, *Thermal insulation — Physical quantities and definitions (ISO 7345:1987)*

EN ISO 52000-1:2017, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1:2017)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, EN ISO 52000-1:2017, EN 16798-17:2017, EN 12792 and EN 14511-1 apply.

NOTE More information on some key EPB terms and definitions is given in CEN ISO/TR 52000-2:2017 [3].

4 Symbols, subscripts and abbreviations

For the purposes of this document, the symbols, subscripts and abbreviations given in EN ISO 52000-1:2017 and in EN 16798-17:2017 apply.

5 Description of the inspection procedures

5.1 Purpose of the inspection

EN 16798-17:2017 requires that the recommendations include an indication of their probable cost-effectiveness.

These recommendations are meant to encourage the system owner to undertake actions but they do not require action from the owner.

To increase the likelihood that the proposed improvements are implemented, the inspection report should stress improvements that are obviously needed to allow the system to function well and that are cost-effective over a relatively short time period.

Detailed cost-effectiveness studies are outside the scope of EN 16798-17:2017. However, the advice can include recommendations for detailed costs analyses, in particular, when an opportunity for improvement is not obvious as a result of the inspection.

5.2 Methods

5.2.1 Features affecting the frequency and duration of inspection

5.2.1.1 General

The minimum contents and frequency of mandatory inspection is defined on national level, with a recommended default value of five years for ventilation and air-conditioning systems. Inspection including the buildings is recommended every ten years. On voluntary basis, more extensive and more frequent inspections are possible.

The inspection may be more or less frequent, depending on the following:

— type of building;

— energy impact of the system;

— type of equipment;

— quality of system documentation;

— availability of records of measurements and/or energy check consumption metering; and

— quality of maintenance.

For centralized systems for cooling and ventilation, different parts and system components may require more frequent checks, and in this case the corresponding records should be available for inspection.

After the initial inspection, the time for the next inspection may be longer or shorter depending on the results from the initial inspection and on the level of maintenance.

The outcome of the inspection is to generate advice for the owner or manager to improve the system, or improve system maintenance. A part of that advice is to recommend more frequent routine inspection and maintenance, for a good practice maintenance programme. The advice should be integrated and balanced with other energy conservation recommendations.

The time taken for the inspection obviously depends on the following parameters:

— size and age of the system;

— type of building;

— time since latest inspection;

— quality of documentation; and

— maintenance of the systems installed.

5.2.1.2 Ventilation-only systems

The health aspects might influence the energy performance of mechanically ventilated supply; therefore inspection should focus on maintenance periods for:

— air filters;

— heat exchangers;

— sensors/controls where they are used.

For filters, heat exchangers and sensors/controls, a certification or a technical agreement should give an advice on the maintenance period.

The frequency of the ventilation inspection depends on the system and its susceptibility to drift, fouling and ageing. It might also depend on quality of maintenance.

A simple natural ventilation system is normally very robust in terms of ageing and fouling (large apertures, simple grilles, no moving part) nevertheless; it is very sensitive to any change in the design (some grilles may be tapped for instance, or the window changed) or to improved air tightness.

Conversely, an exhaust and supply with heat recovery system is susceptible to fouling and ageing but less to any change of the building (provided the changes improve the air tightness which is the general case). The system components are not as critical when changed due to the improved thermal comfort they provide.

Some systems may provide self-detection of faults or issue a diagnostic warning, in which case a monthly or annual report should be taken into account in determining the actual inspection frequency. The influence of parameters on system components hence on inspection frequency is given in Table 1.

Table 1 — Parameters influencing inspection frequency

Parameters	System				
	Natural	Mechanical exhaust	Mechanical supply	Heat recovery	Controls
Building	XX	—	—	X	—
Ageing (moving parts)	—	X	X	—	—
Fouling (grilles)	X	X	X	X	—
Fouling (other)	—	—	X	XX	X
Drift	—	—	—	—	X (XX)
Modification / change	XX	X	—	—	—

5.2.1.3 Air-conditioning systems

This technical report gives recommendation for:

— defining system categories, see 5.2.2;

— the extent of the inspection for ventilation-only systems, see 5.2.3.1; and

— the extent of the inspection for air conditioning systems, see 5.2.3.2.

The checklist given in 7.4 is suitable for a relatively "simple" inspection for a combined system. However, this inspection does not provide a complete picture of the system energy performance including the performance of controls.

5.2.2 Examples of elements to define system categories

5.2.2.1 Ventilation-only systems

The criteria that can be used to define the categories include the following:

— type of ventilation system: mechanical exhaust/supply, mechanical exhaust and supply, natural, hybrid;

— nominal air flow rate;

— date of installation; and

— age of the building.

5.2.2.2 Air-conditioning systems

The criteria that can be used to define the categories include but are not limited the following:

— type of the air conditioning system (generation and emission);

— cooling capacity;

— annual running time;

— age of the installation;

— use of the building (e.g. residential, office, etc.); and

— location of the system (e.g. outdoor/indoor) and the building.

Table 2 gives an example on how to classify the system category.

Table 2 — Example of a classification system with three system categories

System category	Specification	Details	Unit	Remarks
1	Nominal cooling capacity Annual running time Date of installation	12,0 – 49,9 under 2 000 [a] less than 10	kW h/a years	
2	Nominal cooling capacity Annual running time Date of installation	50,0 – 399,9 up to 5 000 less than 15	kW h/a years	
3	Nominal cooling capacity Annual running time Date of installation	Above 400,0 up to 5 000 [b] less than 20	kW h/a years	

a Summer cooling only.

b All year cooling.

5.2.3 Recommendations for the extent of the inspection

5.2.3.1 Ventilation-only systems

The following lists describe examples of the minimum recommended extent for inspection. The extent may be different for different inspection levels. In the examples, the recommended extent for three different levels is given for a few sub-systems. Additional features for the inspection are possible.

The list of items for ventilation-only system inspection in each level (1, 2, 3) is given in Table 3 to Table 13.