SLOVENSKI STANDARD
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Prezračevanje stavb - Naravni in hibridni prezračevalni sistemi v nestanovanjskih stavbah - Projektiranje

Ventilation for buildings - Natural ventilation and hybrid ventilation systems in non-residential buildings - Design

Lüftung von Gebäuden - Natürliche und hybride Lüftungssysteme in Nicht-Wohngebäuden - Planung

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Ventilation des bâtiment - Systèmes de ventilation naturelle et hybride dans les bâtiments non-résidentiels - Conception

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ICS:

91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems

SIST-TS CEN/TS 18351:2027 **en,fr,de**

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SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

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October 2026

ICS 91.140.30

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Ventilation for buildings - Natural ventilation and hybrid ventilation systems in non-residential buildings - Design

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European foreword

This document (CEN/TS 18351:2026) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

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Introduction

This is the first edition of the document, making a significant step forward in addressing a topic that, until now, has not been properly standardized in any CEN publications. Natural ventilation and hybrid ventilation have been discussed in various research and design contexts, but there has been a lack of unified guidance specific to their practical application in building design. This document fills that gap by providing a dedicated and structured framework for the design of natural ventilation systems and hybrid ventilation systems. It reflects the growing recognition of the need for clear, actionable guidance in this emerging area of ventilation design.

This document provides an introduction and a comprehensive guidance on the ventilation principles and the design aspects that may be considered in the design of natural ventilation systems and hybrid ventilation systems in non-residential buildings to achieve acceptable indoor air quality (IAQ).

Natural ventilation systems can either be designed as a stand-alone system or integrated with a mechanical ventilation system (or vice versa) offering the strengths of the two systems resulting in a hybrid ventilation system.

Traditionally, ventilation needs have been met by natural ventilation in which the flow process is driven by wind and differences in temperature. Making natural ventilation the oldest form of ventilation. Natural ventilation has developed from being largely uncontrolled systems to a demand-controlled ventilation system with cooling and ventilation capabilities. Hybrid ventilation was introduced much later at the end of the 20th century and was described as systems using both natural ventilation and mechanical ventilation. This shift also calls for a corresponding transition for those involved in the ventilation system design. Hence, this document is to support the design of these ventilation systems.

Sample Document

The primary role of ventilation is to achieve acceptable IAQ for the occupants by replacing the indoor air, but can also be applied to achieve acceptable thermal comfort. This document focusing on IAQ, only. Besides ventilation, the IAQ can be controlled by source control, filtration and air cleaning. All important aspects and considerations when designing a ventilation system. The design of ventilation systems commonly considers other aspects like energy, acoustics, maintenance, and durability. These aspects are only partly covered in this document. The requirements to fulfil the acceptable IAQ can either be set formulated as performance-based or in a prescriptive manner, both methods are covered in this document.

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IAQ is a fundamental component and plays an important role achieving overall indoor environmental quality (IEQ), which encompasses all aspects of the indoor environment that affect occupant health, comfort and well-being. IEQ includes not only air quality, but also thermal comfort, lighting, acoustics, and other environmental conditions.

Resilient ventilation system design is also an important part to ensure future robustness of the ventilation solution and how this can cope with various external impacts like future weather conditions.

This document has a link to the following CEN publications:

— EN 16798-1 which includes possible levels of indoor air quality requirements.

— EN 16798-3 applies to the design, energy performance of buildings and implementation of mechanical ventilation, air conditioning and room conditioning systems for non-residential buildings and can be seen as complementary to this document.

— EN 16798-7 which gives information on calculation of air flow rates in buildings.

— CEN/TS 18335 applies to the design of ventilative cooling systems to achieve acceptable thermal comfort.

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— FprEN 15665 “Ventilation for buildings - Ventilation systems in residential buildings - Design” applies to the design of ventilation systems for residential buildings to achieve acceptable indoor air quality.

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1 Scope

This document gives guidance on the design of natural ventilation systems and hybrid ventilation systems in non-residential buildings to achieve acceptable indoor air quality. It is applicable to spaces intended for human occupancy in non-residential buildings.

The guidance for design in this document is applicable to natural ventilation systems and hybrid ventilation systems, encompassing the natural ventilation part of the hybrid ventilation systems, only. The type of control and the design process of hybrid ventilation systems is covered by this document.

This document does not set the requirements for the indoor air quality, but utilizes these as input parameters when designing natural ventilation systems and hybrid ventilation systems.

This document does not apply to:

— thermal comfort and overheating;

— health risk from exposure to tobacco smoke;

— air cleaning;

— design of mechanical ventilation systems.

2 Normative references

There are no normative references in this document.

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
ventilation
air replacement by purpose-provided means

Note 1 to entry: Prescriptive requirements or performance-based requirements on ventilation are not a matter for this definition.

Note 2 to entry: Ventilation can be combined with air treatment.

3.2
purpose-provided
provided for the purpose based on characteristics that fit the requirements

3.3
air replacement
mean of dealing with IAQ which replaces the air within an enclosure with air coming directly from outdoors or passing through a transfer zone or both

Note 1 to entry: Air replacement can be done through ventilation, air leakage and airing.

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3.4
natural ventilation
ventilation whose operating principle is based solely on the effect of wind and the stack effect

Note 1 to entry: Open windows can be used for natural ventilation if they are purposed-provided.

3.5
hybrid ventilation
mixed mode ventilation
ventilation whose operating principle is based on the combination of natural ventilation and mechanical ventilation

Note 1 to entry: Natural ventilation and mechanical ventilation can either work simultaneously or alternating.

3.6
mechanical ventilation
ventilation whose operating principle is based solely on the operation of fans

3.7
airing
air replacement by means that are not purpose-provided

Note 1 to entry: Usually done through manual opening of doors or windows or both.

3.8
stack effect
thermal buoyancy
pressure difference caused by the difference in density between indoor air and outdoor air due to their temperature difference

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3.9
stack ventilation
natural ventilation which relies on vents located at different heights in the sides of a building or room

Note 1 to entry: The concept of side includes facade and roof.

Note 2 to entry: Stack ventilation relies mainly on the stack effect.

3.10
cross ventilation
natural ventilation which relies on vents located on different sides of a building or room

Note 1 to entry: The concept of side includes façades and roofs.

Note 2 to entry: Cross ventilation mainly relies on the effect of the wind.

3.11
single sided ventilation
natural ventilation which relies on one or several vents located on the same side of a room

Note 1 to entry: The concept of side includes façades and roofs.

Note 2 to entry: Single sided ventilation relies on the fluctuation of the wind and on the stack effect at room level.

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3.12
vent
opening in the building envelope that is intended for the passage of air

3.13
standard ventilation
ventilation to achieve acceptable air quality under normal occupancy

Note 1 to entry: Acceptable indoor air quality can be linked with occupants or building needs.

3.14
intensive ventilation
boost ventilation
ventilation at increased air replacement rate for a specific purpose limited in time

3.15
non-residential
relating to a building, etc. that is not used for people to live in

Note 1 to entry: One can make the distinction between 6 different groups:

1) educational – e.g. building for education and research;

2) office – e.g. office, trade, inventory, incl. public administration;

3) industry – e.g. warehouses, factories;

4) retail – e.g. retail stores, shopping centres, shops;

5) leisure – e.g. pubs, restaurants, cafes, sport facilities;

6) healthcare – e.g. medical centres, hospitals, clinics.

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3.16
intake vent
vent through which air is taken from outside the building

3.17
exhaust vent
vent through which air is discharged to outside the building

3.18
supply air
air that is provided inside the building by a ventilation system or by airing

3.19
extract air
air that is removed from inside the building by a ventilation system or by airing

3.20
occupied zone
part of a room that people occupy under normal conditions of occupation

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3.21
discharge coefficient
square of the quotient of the dynamic pressure of a moving fluid upstream of a local device by the pressure loss generated by this device on the fluid

Note 1 to entry: For an air terminal device, it is equivalent to the quotient of the actual air flow rate flowing through the air terminal device by the flow rate that would flow through the opening of a free straight duct of constant cross section (loss coefficient = 1) without that device.

3.22
ventilation effectiveness
degree to which ventilation is effective in replacing the air

Note 1 to entry: It is usually expressed by the contaminant removal effectiveness.

3.23
contaminant removal effectiveness
ventilation effectiveness in terms of removing air contaminants from a breathing zone

Note 1 to entry: It is expressed as the ratio of the air contaminant concentration in the extract air to the average air contaminant concentration in the breathing zone.

3.24
fan assisted hybrid ventilation
hybrid ventilation based on natural ventilation that can be supported by fans

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3.25
stack and wind assisted hybrid ventilation
hybrid ventilation based on mechanical ventilation that can be supported by the effect of wind and the stack effect

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3.26
zone
one or more rooms

3.27
primary ventilation requirements
requirement aiming to quantify a level of indoor air quality to be achieved or an amount of air replacement to be achieved

3.28
descriptive requirement
requirement in the form of a specified technical solution

EXAMPLE Minimum opening area.

3.29
ventilation system
combination of a ventilation installation and the enclosure it serves

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4 Abbreviated terms

For the purposes of this document, the abbreviations given in Table 1 apply.

Table 1 — Abbreviated terms

Abbreviated terms	Designation
BMS	Building Management System
CO_2	Carbon dioxide
IAQ	Indoor Air Quality
IEQ	Indoor Environmental Quality
RH	Relative Humidity
VOC	Volatile Organic Compounds

5 Design process and principles of natural ventilation systems and hybrid ventilation systems

5.1 General

Figure 1 shows the overall structure of this document and the design route. Design requirements and criteria are dealt with in Clause 6. The design of the natural ventilation system and hybrid ventilation system can be evaluated following the pathway in Clause 7 and Clause 8, respectively.

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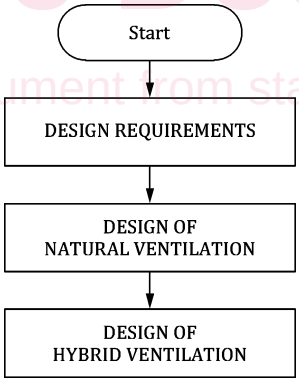


Figure 1 — Overall structure of the document

5.2 Primary purpose of ventilation

The primary purpose of ventilation is to provide acceptable IAQ by diluting or removing air contaminants within a space. This can be done by natural ventilation, mechanical ventilation, or a combination of the two called hybrid ventilation.

Natural ventilation and hybrid ventilation shall be designed to meet the requirement, e.g. achieving the ventilation requirements. Ventilation rate may occasionally be increased or decreased for a specific purpose during a designated timeframe. The increased part is referred to as intensive ventilation which can be handled by the ventilation system or airing. The latter can supplement the ventilation system to increase the air replacement rate.

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5.3 Natural ventilation principles

Natural ventilation is replacing the indoor air in the building relying on the natural driving forces, without the use of fans.

A natural ventilation system is a ventilation system designed to achieve the selected IAQ target values using vents which relies on pressure differences created by thermal forces or wind forces to ventilate the space inside a building.

The design of a natural ventilation system requires the establishment of the location and size of purpose provided vents which are intentional designed vents in the building envelope.

It is important to distinguish between different types of natural ventilation, as the term covers systems ranging from simple vents kept constantly open to fully automated natural ventilation systems capable of automatically regulating system components to achieve acceptable IAQ.

Natural ventilation can be divided into three main principles:

— single-sided ventilation;

— cross ventilation;

— stack ventilation (or stack effect).

Figure 2 illustrates a cross section of a building utilizing the three types of natural ventilation principles in the different rooms.

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