International Standard

ISO 21075

Design and assessment process of whole-building mechanical ventilation systems in residential buildings

Processus de conception et d'évaluation des systèmes de ventilation mécanique de l'ensemble du bâtiment dans les bâtiments résidentiels

Sample Document
get full document from standards.iteh.ai

First edition
2026-11

Reference number
ISO 21075:2026(en)

© ISO 2026

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Sample Document

get full document from standards.iteh.ai



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

All rights reserved.

This ISO publication is protected by copyright and is owned by ISO and/or its licensors.

The content of this ISO publication is provided under licence, not sold. Use is subject to the applicable licence terms issued by ISO, an ISO member body, or an authorized third-party distributor.

Except as required for implementation or expressly permitted by a separate licence, no part of this ISO publication may be reproduced, distributed, modified, used, or made available in any form or by any means – electronic or mechanical, including photocopying, scanning, recording, or posting on internal or external digital platforms.

Any use beyond the scope of the granted rights is prohibited and may result in legal action.

ISO copyright office
CP 401 • CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Design flow for a mechanical ventilation system in a residential building **3**
4.1 Stage I — Formulation of project definition 3
4.1.1 General 3
4.1.2 Project requirements and constraints 3
4.1.3 Assumptions 4
4.1.4 Output — Document I 4
4.1.5 Evaluation I 4
4.1.6 Iteration 4
4.2 Stage II — Conceptual and schematic design 4
4.2.1 General 4
4.2.2 Choose target values or levels 4
4.2.3 Output — Document II 5
4.2.4 Evaluation II 5
4.2.5 Iteration from conceptual design and schematic design 5
4.2.6 Iteration from project definition 5
4.3 Stage III — Detailed design 5
4.3.1 General 5
4.3.2 Analysis 5
4.3.3 Output — Document III 6
4.3.4 Evaluation III 6
4.3.5 Iteration into detail design 6
4.4 Stage IV — Final design 6
4.4.1 General 6
4.4.2 Output — Final design document 6
4.5 End of design 6
5 Air quality **7**
5.1 General 7
5.2 Air quality standard values 8
5.2.1 General 8
5.2.2 Main pollutants targeted for air quality 8
5.2.3 Water vapor in terms of air quality 8
5.3 Design for the required ventilation airflow rate 8
5.3.1 Identifying the space and the number of occupants to be ventilated and checking indoor and outdoor environment conditions 8
5.3.2 Approaches to design for the required ventilation airflow rate 9
5.4 Air quality assessment method 9
5.5 Ventilation airflow rate assessment method 10
5.6 Maintaining good indoor air quality 10
5.6.1 Effects of type 1, type 2 and type 3 mechanical ventilation systems on air quality 10
5.6.2 Ventilation paths when multiple rooms are to be ventilated 10
5.6.3 Purifying outdoor air when air is polluted 10
5.6.4 Purifying return air in central air conditioning systems 10
5.6.5 Ventilation path filters 11
5.6.6 Effects of localized ventilation 11
5.6.7 Ventilation system components 11
5.6.8 Dealing with pollution, etc. in a ventilation system (maintenance) 11
5.6.9 Incorporating a mechanism for indoor air quality 11
6 Thermal comfort **11**

Sample Document
Sample document from standards.iteh.ai

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

6.1 General 11
6.2 Factors affecting overall thermal comfort 12
6.3 Factors affecting local thermal discomfort 13
6.4 Setting of the target range of thermal comfort 13
6.5 Assessment of thermal comfort level 13
6.6 Other points to be considered 13

7 Energy Usage 14
7.1 General 14
7.2 Planning for energy usage 14
7.3 Target values 14
7.4 Assessing specific fan power 14
7.4.1 General 14
7.4.2 Specific fan power (SFP) 14
7.4.3 Correcting specific fan power for leakage 15
7.5 Assessing heat/energy exchange ratio 15
7.5.1 General 15
7.5.2 Heat and energy exchange efficiency 15
7.5.3 Correcting heat and energy exchange efficiency for performance tolerance 16
7.5.4 Correcting for net supply airflow ratio 16
7.5.5 Correcting heat and energy exchange efficiency for air infiltration and exfiltration caused by unbalanced airflow rate between supply and exhaust airflow 16

8 Acoustics 17
8.1 General 17
8.2 Target noise levels 17
8.3 Assessment process 17
8.3.1 Choose ventilator specifications 17
8.3.2 Choose ventilator location 17
8.3.3 Calculate noise level in each room 18
8.3.4 Assessing room noise level 18
8.4 Vibration noise 18

9 Building-related influencing factors 18
9.1 General 18
9.2 Building envelope insulation performance 18
9.2.1 Recommended range of insulation performance 18
9.2.2 Expressing insulation performance 18
9.2.3 Disadvantages due to poor insulation performance 18
9.3 Airtightness 18
9.3.1 Recommended range of airtightness 18
9.3.2 Expressing airtightness 19
9.3.3 Measuring airtightness 19
9.3.4 Disadvantages due to poor airtightness 19
9.3.5 Disadvantages due to overly tight airtightness 19
9.4 Effects of localized ventilation 19
9.5 Doors, partitions, etc. 19

10 Comprehensive assessment of the residential building with a mechanical ventilation system 19
10.1 General 19
10.2 Trade-offs 20
10.3 Items affecting multiple elements 20
10.4 Other 20

Annex A (informative) **Examples of evaluation process of thermal comfort 21**

Annex B (informative) **Work flow for assessing noise 23**

Annex C (informative) **Item checklist when planning a ventilation system 36**

Bibliography 38

Sample Document
Get full document from standards.iteh.ai

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

Sample Document

This document was prepared by Technical Committee ISO/TC 205, *Building environment design*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

get full document from standards.iteh.ai

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Introduction

Energy conservation in buildings is a pressing issue, while occupants increasingly demand comfortable indoor environments. Though ventilation can maintain good indoor air quality and prevent infections, it also brings cold/hot outdoor air indoors in the winter/summer season, which increases the heating/cooling demand. Therefore, reconciling a good indoor environment and energy conservation in the process of designing the whole-building ventilation system of a residential building is an important consideration.

Other national and international standards, and technical reports, exist that specify criteria for indoor air quality, thermal comfort and the auditory environment. Other standards also specify methods for evaluating the energy performance of ventilators, heat and energy recover components, heating and cooling equipment, and buildings.

Designers can assess these factors using relevant standards when designing a ventilation system, however, one or more factors risk being omitted because the designers consider and organize freely the factors relevant to thermal comfort, indoor air quality, auditory environment and energy performance. Furthermore, the ventilation system's performance can vary according to the design, even if the designer chooses the same components.

This document specifies the steps for designing the whole-building ventilation system of a residential building, and the points to be considered regarding indoor environment and energy consumption. This document can help designers consider and organize factors in designing the whole-building ventilation system, which can attain both a good indoor environment and energy conservation.

Sample Document

get full document from standards.iteh.ai

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Design and assessment process of whole-building mechanical ventilation systems in residential buildings

1 Scope

This document describes steps for designing and assessing the whole-building mechanical ventilation system for residential buildings, and the points to be taken into account regarding indoor environment and energy consumption. This document allows the designer to plan a whole-building mechanical ventilation system that improves indoor air quality, the auditory environment and thermal comfort, while also using energy in a practical way. It describes the performance of the building in order to effectively operate a whole-building mechanical ventilation system.

This document does not cover:

— criteria for indoor air quality;

— criteria for indoor thermal comfort (covered by ISO/TC 159);

— criteria for auditory environment (covered by ISO/TC 43);

— evaluation methods of energy performance of heating and cooling equipment;

— evaluation methods of energy performance of ventilators (covered by ISO/TC 86);

— evaluation methods of energy performance of heat recovery components (covered by ISO/TC 86);

— evaluation methods of building performance (covered by ISO/TC 163);

— design steps and evaluation method of localized ventilation equipment;

— ventilation systems using natural driving force in all ventilation airflow paths.

Sample Document
get full document from standards.iteh.ai

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 17772-1, *Energy performance of buildings — Indoor environmental quality — Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17772-1, ISO 52000-1 and the following apply.

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/

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

3.1
whole-building mechanical ventilation system
system for providing integrated or simultaneous ventilation for two or more spaces in a building including one or more habitable rooms

3.2
airtightness
quantitative index showing amount of gap in the building envelope

3.3
air change rate
value obtained by dividing air supply by room air volume, expressed as the number of air changes per hour

Note 1 to entry: Air change rate is expressed as the number of air changes per hour (1/h).

3.4
supply airflow
SA
air going from ventilator to rooms

3.5
supply airflow rate
amount of supply airflow

3.6
power consumption
total power consumed by a component

Note 1 to entry: Power consumption is expressed as watt (W).

Sample Document

3.7
designed airflow
flow rate for ventilation equipment estimated based on the characteristics of the blower static pressure flow rate and the characteristics of the static pressure flow rate of the air conveyance path composed of ducts, etc.

Note 1 to entry: Designed airflow is expressed as cube meter per hour (m^3/h).

3.8
designed airflow rate
amount of designed airflow

3.9
whole-building ventilator power consumption
total power consumption for auxiliary equipment included in electric motors and ventilation equipment during continuous operation of whole-building ventilator under normal usage conditions

3.10
type 1 mechanical ventilation system
ventilation system using mechanical fans for both supply air and exhaust air

3.11
type 2 mechanical ventilation system
ventilation system using one or more mechanical fans only for supply air

3.12
type 3 mechanical ventilation system
ventilation system using one or more mechanical fans only for exhaust air

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

3.13
exhaust airflow
EA
air going from ventilator to outdoor

3.14
exhaust airflow rate
amount of exhaust airflow

3.15
specific fan power
value obtained by dividing mechanical ventilating system power consumption by designed airflow

Note 1 to entry: Specific fan power is expressed as watt per airflow rate W/(m^3/h).

3.16
net supply airflow rate
outdoor airflow rate effectively supplied indoors without affecting environmental hygiene

3.17
net supply airflow ratio
NSAR
ratio of net supply airflow rate to supply airflow rate

3.18
space to be ventilated
space consisting of one or several rooms connected by openings, viewed as a single unit for the purpose of ventilation system design

Sample Document

Note 1 to entry: For example, if several rooms are connected by hallways or stairs and ventilation paths are provided by means of air vents or undercuts in doors, furniture or partitions, hallways and stairs are included in the space to be ventilated.

Note 2 to entry: Depending on the style, specifications or countries' laws, regulations or guidelines related to the building for which a ventilation system is designed.

Get full document from standards.iteh.ai

4 Design flow for a mechanical ventilation system in a residential building

4.1 Stage I — Formulation of project definition

4.1.1 General

The design and assessment process of whole-building mechanical ventilation systems in residential buildings allows design teams to plan a whole-building ventilator that improves indoor air quality, auditory environment and thermal comfort, and that also uses energy in a practical way.

Figure 1 shows a design flow for a whole-building mechanical ventilation system for residential buildings. It should be considered to reconcile a good indoor environment and energy conservation in the process of designing the system.

4.1.2 Project requirements and constraints

The project requirements and constraints are clarified in this subclause. The requirements for the building or space are defined based on the use of the building. The constraints that would prevent the project from being completed should be checked. The characteristics of the building site, such as the following, should also be reviewed:

— climate;

— geometry;

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

— geography;

— culture.

4.1.3 Assumptions

The following items are also to be confirmed:

— building scale;

— building use;

— the performance required for the building.

4.1.4 Output — Document I

Document I shall be issued as an output of the project definition process. It contains the building characteristics, the project definition, the requirements, the constraints and the assumptions.

4.1.5 Evaluation I

Evaluation I is the process of approving Document I. The following items are verified in the document:

— the consistency of the requirements;

— the constraints;

— the assumptions.

Sample Document

4.1.6 Iteration

If Document I is not approved, the document shall be revised by iterating the steps from the project definition.

get full document from standards.iteh.ai

4.2 Stage II — Conceptual and schematic design

4.2.1 General

The conceptual design provides a rough consideration to realise the requirements confirmed in 4.1. For example, the following items should be taken into account:

— number and approximate distribution of the occupants;

— general equipment used in the room or the area;

— ventilation flow rate, air change rate;

— ventilation airflow path;

— usage of the energy recovery device.

4.2.2 Choose target values or levels

The target value or level for each item is set:

— indoor air quality;

— indoor thermal comfort;

— energy use;

— acoustic environment.

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

Clause 5 helps to set the target of indoor air quality, Clause 6 helps to set the target of indoor thermal comfort, Clause 7 helps to set the target of energy use, and Clause 8 helps to set the target of acoustic environment. The performance of the building is checked as well, since the indoor environments are also affected by its performance. Clause 9 helps to confirm the building performance. In addition, some environmental factors have a mutual effect on each other. In some cases, this may be a multiplier effect, but in others, trade-offs are involved. Clause 10 helps to understand the interactions of the factors.

4.2.3 Output — Document II

Document II shall be issued as an output of the schematic design process. It contains the outline of the whole-building mechanical ventilation system and target values or levels of indoor air quality, thermal comfort, energy use and acoustic environment.

4.2.4 Evaluation II

Evaluation II is the process of approving Document II. The following items are verified:

— the consistency of the requirements;

— the target value or level of each environmental factor;

— the rough design of the ventilation system.

4.2.5 Iteration from conceptual design and schematic design

If Document II is not approved and there is room to meet the requirements by reconsidering the conceptual or schematic design, the document shall be revised by iterating the steps from conceptual design and schematic design.

Sample Document

4.2.6 Iteration from project definition

If Document II is not approved, and it is not easy to meet the requirements by reconsidering the conceptual or schematic design, the project definition shall be revised.

iTeh Standards (https://standards.iteh.ai)

4.3 Stage III — Detailed design

4.3.1 General

In detailed design, the concrete plan is put into practice. The following items are considered at this stage:

— the type of ventilation system;

— the kind of energy recovery device or system;

— ducting and separation layout;

— layout of air supply and return air terminal devices;

— the kind of mechanical fans;

— location of mechanical fans.

4.3.2 Analysis

The analysis should be carried out on at least indoor air quality and energy use of the ventilation system. A mass system simulation should be carried out at least to verify the indoor thermal comfort, and the mean sound pressure level of the room should be calculated to verify the acoustic environment.

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026

4.3.3 Output — Document III

Document III shall be issued as an output of the detailed design process. Document IIIa contains the specifications of the ventilation system and the physical properties of the building where the ventilation system is installed. Document IIIb contains the analysis results, i.e. the predicted performance of the ventilation system.

4.3.4 Evaluation III

Evaluation III is the process of approving Document III. The following items are verified:

— the consistency of the requirements in Document I;

— the target values or levels in Document II;

— the description and analysis result in Document III.

Stage IV cannot be started without the approval of Document III.

4.3.5 Iteration into detail design

If the current design does not meet the target described in Document II, an alternative design shall be provided. If it is necessary to change the concept or scheme to meet the target, the design shall be revised by iterating the steps from conceptual and schematic designs. If it is not easy to meet the requirements by reconsidering the conceptual or schematic design, the project definition shall be revised.

4.4 Stage IV — Final design

Sample Document

4.4.1 General

Stage IV is the final stage of the design process, where the actual information of the ventilation system is handed over to the constructors. At this stage, a detailed assessment plan shall be developed.

get full document from standards.iteh.ai

4.4.2 Output — Final design document

The final design document shall consist of the specifications of the ventilation system and building characteristics, as well as the assessment plan for the performance of the ventilation system.

4.5 End of design

If no problems are found with the final design, the design work ends.

© ISO 2026 – All rights reserved

ISO 21075:2026 • https://standards.iteh.ai/catalog/standards/iso/2e744515-c239-4269-a1b3-013753ceff2e/iso-21075-2026