International Standard

ISO 16813

Building environment design — Indoor environment — General principles

Conception de l'environnement des bâtiments — Environnement intérieur — Principes généraux

Second edition
2024-11

Reference number
ISO 16813:2024(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

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

This second edition cancels and replaces the first edition (ISO 16813:2006), which has been technically revised.

The main changes are as follows:

— updated Clauses 2 and 3;

— revision of the flow diagram of the design process (Annex A);

— addition of the nine general principles of sustainability (NGPS) provided by ISO 15392;

— addition of subclauses on building environment parameters and variables, project team, commissioning, post-occupancy evaluation, and commissioning issues and lesson learned;

— deletion of Annex B on flow diagram of design process;

— addition of Annex B on building environment parameters and variables.

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.

Introduction

This document provides general principles of building environment design and is intended for design team members, (e.g. architects, environmental designers and building system designers), as well as building clients, contractors, government officials and academic experts.

The aim is to assist these groups in applying an effective design process in order to achieve a balance between comfort and environmental considerations. This document specifies the design drawings and specifications to be evaluated at every design stage. This document also provides the framework for sustainability issues to be considered in the design requirements and the constraints to take into consideration from very early stages of the building design process.

Building environment design — Indoor environment — General principles

1 Scope

This document establishes the general principles of building environment design to achieve a quality building environment for the occupants and sustainability. This document promotes an approach in which the various parties involved in building environment design collaborate with one another to provide a high-quality building environment.

The design process aims to achieve the following:

— to address issues concerning sustainability over the building life cycle, including owning and operating costs at all stages of the design process;

— to assess the proposed design with rational criteria for the thermal, acoustic and visual environment, the indoor air quality, energy efficiency and performance of technical building systems at each design stage;

— to use an iterative design process in which each design stage is subject to design review and decisions before proceeding with the next design phase.

The building environment design involves not only the architectural design associated with the environmental quality, but also building system design including effective control methods.

This document is applicable to building environment design for new construction and retrofitting existing buildings.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
commissioning
sequence of events that ensures the building and the *technical building systems* (3.7) are functioning in accordance with the building environment parameters in the design specifications for the building lifetime

3.2
commissioning process
systematic application of processes and procedures designed to ensure that the project objectives are achieved and maintained throughout the building lifetime

Note 1 to entry: The commissioning process begins at project conception and continues through to the pre-design, design, construction, start-up, turnover and occupancy to the operation phase.

[SOURCE: ISO 16484-1:2024, 3.4, modified — Note 2 to entry has been deleted.]

3.3
design document
written description that formalizes and rationalizes the design at every design stage

3.4
energy efficiency
measures that ensure the building and system function in accordance with the design parameters by the efficient use of energy

3.5
life cycle
consecutive period of a building from planning to final disposal

3.6
life cycle cost
total costs of a building or its parts throughout its lifetime, including costs of planning, design, acquisition, operation, maintenance and disposal

3.7
technical building system
building component for heating, cooling, mechanical ventilation (filtration and exhaust), humidification, dehumidification, domestic hot water, water supply, drainage and sanitary equipment, lighting, building automation and control, and electricity production

Note 1 to entry: A technical building system can refer to one or to several building services (e.g. heating, cooling, lighting and domestic hot water).

Note 2 to entry: Lifts and fire extinguishing systems can be included in technical building systems.

Note 3 to entry: A technical building system is composed of different sub-systems.

Note 4 to entry: Electricity production can include cogeneration, wind power and photovoltaic systems.

[SOURCE: ISO 19454:2019, 3.16, modified — Specified building component uses]

4 Fundamentals

4.1 General

General principles of building environment design allow design teams to provide the desired quality of building environment in a sustainable way according to fundamentals of the design process. Annex A shows a flow diagram of the entire design process. The design team shall keep in mind energy balance over the life cycle of a building and life cycle costs.

The design process aims to ensure efficient building environment design providing the specified quality and performance level, i.e. safety, health, comfort and energy use as well as sustainability.

The nine general principles of sustainability (NGPS) are defined in ISO 15392. The NGPS encompasses the following subjects:

— continual improvement;

— equity;

— global thinking;

— holistic approach;

— involvement of interested parties;

— long term vision;

— precautions and risk;

— responsibility;

— transparency.

The design team shall define goals based on the requirements, constraints and actual conditions to be achieved, integrating the ownership and operating costs during the design stage.

The design team shall take a holistic approach to their design taking into consideration relationships, synergies or trade-offs, or a combination, of physical environmental factors. Building environment design requires long-term consideration of environmental and energy performance. Since combating climate change, as well as promoting sustainable development, is the present critical issue, the design shall prepare for uncertainties of design conditions caused by climate change, for example, selecting a sustainable solution that is expected to minimize the impact of building energy consumption on climate change. However, excessive provisions can waste resources and go against sustainability.

Successful building environment design results from identifying and involving interested parties. Key interested parties are neighbours, local authorities, local association professionals (service providers and operators) as well as end users. The project leader should monitor whether the interested parties are properly involved in the building environmental design process. The commissioning team should monitor for a balanced inclusion of participants. The design team shall execute the project locally, but with a global vision.

Responsibility and transparency shall be guaranteed by documenting and retaining all information of the design process. The design documents are utilized for continual improvement of the building.

4.2 Building environment parameters and variables

The design team shall determine the scope to be explicitly addressed in the building environment design. The scope shall be articulated in terms of the constituent elements to describe the environmental quality and the performance that are expected to be achieved in the project. Each of the constituent elements is expressed as a pair of a parameter and its value(s). The notion of building environmental parameters refers to such parameters. The values of building environmental parameters shall be determined as target values for each condition of thermal environment, acoustic environment, visual environment, and indoor air quality. The values of building environmental parameters shall be achieved regardless of the changing outdoor environmental conditions or predicted user behaviours, or both, during the occupancy and operation phase. Building environment parameters represent the following environmental and energy performances of the project:

— indoor air quality;

— indoor thermal environment;

— indoor acoustic environment;

— indoor visual environment;

— controls;

— energy use.

Building environmental parameters of the project are determined as objective variables of the building environment design. The objective variables are dependent variables whose values depend on changes in the corresponding design variables and accompanying control variables under certain conditions described by context variables. Variables related to building environmental design can be classified as follows (See also Annex B):

— Objective variables that are controlled by building environmental design and describing targeted environmental and energy conditions, such as temperature, humidity, sound level, illuminance, luminance and energy consumption.

— Design variables that are to be determined by the design team, such as a type of insulating material and the thickness, and window dimensions.

— Control variables that are controlled by design variables and bridge between objective and design variables, such as thermal resistance, transmittance, reflectance, sound absorption coefficient and sound transmission loss.

— Context variables that are external conditions, such as meteorological properties and disturbance conditions.

4.3 Project team

4.3.1 Design team

The design team is an organization of people who are responsible for the building design. The design team can consist of an architect, an interior designer, a lighting designer, a landscape designer, engineers in electrical engineering, illuminating engineering, heating, ventilation and air conditioning (HVAC) systems, structural engineering and construction management, and other specialists.

The design team is responsible for addressing human and technical issues on the project. An integrated multidisciplinary approach shall be adopted throughout the design process by:

— identifying the necessary professional skills;

— facilitating collaborative work.

The design process of some projects involves building users as well as the clients.

4.3.2 Construction team

The construction team includes those project members who are tasked with physically constructing the project. The construction team can consist of the project manager, main contractor, site manager, site engineer and sub-contractors.

4.3.3 Commissioning team

The commissioning team can consist of representatives from the owner, project manager, commissioning provider, design professionals (e.g. architects and engineers), operating and maintenance staff, general contractor, major subcontractors, vendors and suppliers. The commissioning provider leads, plans, schedules and coordinates the commissioning team to implement the commissioning process.

The commissioning team can be included in the design team but does not manage the design and construction of the project. The commissioning team is responsible for implementing the entire commissioning process.

4.4 Project information

Available project information that influences development of design concepts together with constraints and all requirements shall be documented. When assumptions are made in place of necessary information related to the codes, standards or regulations for building environment design, with respect to the building environment, those assumptions shall be documented. The project information that influences programming, development or design, or a combination, of building component and technical building systems shall also be documented.

4.5 Framework of generation and verification

Architectural design and building system design are goal-driven activities. The routes necessary to achieve the result are not straightforward and can be flexible. In some instances, the assumptions are made under uncertain conditions. Hence, the design process involves the use of generation and verification. The