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Building environment design — Indoor environment — General principles

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

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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.

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ISO 16813 was prepared by Technical Committee ISO/TC 205, Building environment design.

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Introduction

This international standard gives the general principles of building environment design and has been prepared for building designers, i.e. architects, environmental designers and building system designers, as well as building clients, contractors, government officials, and academic staff.

The aim is to assist these groups in applying an effective design process in the pursuit of high quality indoor environment for the occupants, while also seeking to protect the environment for the future generations. The standard provides the framework for sustainability issues to be taken into account in the design constraints from the very early stages of building design and requires the design drawings and specifications to be evaluated at every design stage according to the criteria provided by other relevant standards.

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Building environment design — Indoor environment — General principles

1 Scope

This International Standard establishes the general principles of building environment design taking into account aspects of sustainability related to indoor environmental quality and healthy indoor environment for the occupants. The standard promotes an approach in which the various parties involved in building environmental design collaborate with one another to provide a sustainable building environment. The unique features of the design process are articulated by the following aims:

- to provide the indoor building environment the aims concerning sustainability from the initial stage of the design process, including building plant life cycle, together with owning and operating costs considered at all stages of the design process,
- to assess the proposed design with rational criteria for indoor air quality, thermal, acoustic, and visual comfort, energy efficiency and HVAC system controls at each design stage
- to make iterations between decisions and evaluations of the design throughout the design process.

The building environment design involves not only architectural design associated with environmental quality but also environmental system design associated with effective controls measures. This International Standard is applicable to building environment design for new construction and retrofitting.

2 Normative references

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The following referenced documents are indispensable for the application 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 15686-1, Buildings and constructed assets-service life planning – Part 1: General Principles

ISO 6242-1, *Building construction -- Expression of users' requirements -- Part 1: Thermal requirements*

ISO 6242-2, *Building construction -- Expression of users' requirements -- Part 2: Air purity requirements*

ISO 11855-1, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 1: Definition, symbols, and comfort criteria*

ISO 11855-2, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 2: Determination of the design heating and cooling capacity*

ISO 11855-3, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 3: Design and dimensioning*

ISO 11855-4, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 4: Dimensioning and calculation of the dynamic heating and cooling capacity of Thermo Active Building Systems (TABS)*

ISO 11855-5, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 5: Installation*

ISO 11855-6, *Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems -- Part 6: Control*

ISO 13153, *Framework of the design process for energy-saving single-family residential and small commercial buildings*

ISO 13612-1, *Heating and cooling systems in buildings -- Method for calculation of the system performance and system design for heat pump systems -- Part 1: Design and dimensioning*

ISO 13612-2, *Heating and cooling systems in buildings -- Method for calculation of the system performance and system design for heat pump systems -- Part 2: Energy calculation*

ISO 13675, *Heating systems in buildings -- Method and design for calculation of the system energy performance -- Combustion systems (boilers)*

ISO 16484-1, *Building automation and control systems (BACS) -- Part 1: Project specification and implementation*

ISO 16484-2, *Building automation and control systems (BACS) -- Part 2: Hardware*

ISO 16484-3, *Building automation and control systems (BACS) -- Part 3: Functions*

ISO 16484-5, *Building automation and control systems (BACS) -- Part 5: Data communication protocol*

ISO 16484-6, *Building automation and control systems (BACS) -- Part 6: Data communication conformance testing*

ISO 16813, *Building environment design -- Indoor environment -- General principles*

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ISO 16814:2008	Building environment design -- Indoor air quality -- Methods of expressing the quality of indoor air for human occupancy
ISO 16817:2012	Building environment design -- Indoor environment -- Design process for visual environment
ISO 16818:2008	Building environment design -- Energy efficiency -- Terminology
ISO 23045:2008	Building environment design -- Guidelines to assess energy efficiency of new buildings

3 Terms and definitions

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

3.1

acoustic comfort

reaction of occupants to the indoor acoustic environment, described in terms of sound pressure level and audibility

3.2

competent person

person who is capable of relating and understanding all the design parameters involved in the design of the building and its associated services

3.3**computer analysis**

detailed examination to quantify the effects of the proposed building design in terms of energy requirements and the indoor environment

NOTE Ideally by hourly computer simulation on annual basis during the lifetime of the building

3.4**assumptions**

set of descriptions that must be considered by the designer if the actual requirements are difficult to identify at the design decision-making stage

3.5**building environment design**

course of action to be taken in building design, involving architectural and environmental system design of the building, its parts or its building service components

NOTE Sustainability issues are considered as being significant in building environment design

3.6**building control system**

measures taken to ensure the system operates in accordance with the specified conditions

3.7**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 The commissioning process begins at project conception and continues through pre-design phase, design, construction, start-up, turnover, occupancy and operation.

NOTE 2: Details of how to conduct the commissioning process are outside the scope of this standard.

3.10**constraints**

fixed items including the mandates of local building regulations, health and occupational legislation, and design fundamentals that have to be met during the design process considering the restraints of the global environment.

3.11**design aids**

set of guidelines used for conceptual details and final designs for the indoor environment, based on the requirements expressed and/or not expressed by the client and stakeholders

3.12**design concept**

set of fundamental thoughts for the project starting at the design work stage taking into account the constraints

3.13**design criteria**

set of descriptions based on a particular environmental element and the associated system controls used for assessing the presented design

EXAMPLE Examples of environmental elements are indoor air quality, thermal, acoustical and visual comfort, energy efficiency and electromagnetic fields

3.14

design parameters

set values of the internal environmental conditions to be achieved regardless of the changing external environmental conditions

3.15

design process

course of actions performed to produce a set of design drawings and specifications describing the functions for which a building has the potential to provide

NOTE Any changes in the building environment design after iterations of decisions and evaluations of the design have been made must be analysed until the final design stage is achieved.

3.16

detail design

design developed during the third stage of the design process based on the approved evaluation of the schematic design.

3.17

document

written description of the essential factors of every design stage to be retained for future information

3.18

energy conservation

measures applied to reduce building energy use without seriously influencing the global environment and to provide the environment that achieves the design criteria

3.19

energy efficiency

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

3.20

evaluation

a sub-process to assess the proposed design with regard to the design criteria at each of the design stages

3.21

final design

the design of the final stage of the design process based on the approved evaluation of the design detail

3.22

global cost

life cycle cost plus social cost for sustainability, all costs related to the measures deemed necessary to ensure the efficient running of the building, including the energy and other conservation issues that may apply [cf. ISO 15686 - 1]

3.23

indoor air quality

quality of air inside non-industrial buildings, described in terms of odour, chemical and biological pollutants, is related to the ventilation rate, air distribution patterns and pollution sources to ensure human health, olfactory comfort and perceived comfort

3.24

life cycle cost

total building costs of or its parts throughout its life, including the costs of planning, design, acquisition, operations, maintenance and disposal, less any residual value [cf. ISO 15686 -1]

3.25**Performance criteria**

descriptions based on particular environmental elements and associated control systems for assessing the buildings performance

3.26**project**

course of action necessary to ensure that a new or existing building meets the requirements of its clients and the constraints applied

NOTE A project starts when the client requests formally or informally, the architect or building engineer to perform actions to create a building. The project ends when the requirements and constraints set by the client or the project regulations are achieved, or when it is found it is impossible to fulfil the client's requirements and constraints.

3.27**requirements**

important but revisable items required by the client as well as the circumstances of a project that the designer should take into account throughout the design process

EXAMPLES budget, physical dimensions, performance and general sustainability issues

3.28**schematic design**

initial design presented early in the design process based on the design concept

3.29**structure**

physical shape, dimensions, and configuration of a building, its parts, or its building service components

3.30**sustainability**

maintenance of ecosystem components and functions for future generations, to address economic efficiency, social issues and environmental preservation

3.31**thermal comfort**

condition of mind, which expresses satisfaction with the thermal environment

NOTE Thermal comfort is the combined thermal effect of environmental parameters including air temperature, vapour pressure, air velocity, mean radiant temperature (fixed factors) and clothing and activity level of occupants (variable factors).

3.32**visual comfort**

occupant satisfaction with the indoor visual environment, described in terms of illumination level, glare, visibility, reflection and psychological and physiological content with natural and artificial illumination

4 Fundamentals**4.1 General**

General principles of indoor environment design allow the clients and designers to provide the desired quality of indoor environment in a sustainable building according to the fundamentals of the design process with energy conservation and whole life cycle in mind.

The design process aims to ensure efficient environmental building design providing the specified quality and performance level involving safety, health, comfort, and energy use as well as, sustainability the philosophy, ethics, and assumptions taken by the people concerned.

The Nine General Principles of Sustainability (NGPS) are defined in ISO 15392:2008. The NGPS consists of:

- continual improvement,