
**Energy performance of buildings —
Presentation of measured energy use
of buildings**

*Performance énergétique des bâtiments — Présentation de
l'utilisation énergétique réelle des bâtiments*

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Building energy use defined by usage	2
4.1 Classification of building energy use by usage.....	2
4.2 Energy for space heating.....	2
4.3 Energy for space cooling.....	2
4.4 Energy for air movement.....	2
4.5 Energy for domestic hot water.....	3
4.6 Energy for lighting.....	3
4.7 Energy for household/office appliances.....	3
4.8 Energy for indoor transportation.....	3
4.9 Energy for building auxiliary devices.....	3
4.10 Energy for cooking.....	3
4.11 Energy for cooling storage.....	3
4.12 Energy for devices in data center.....	3
4.13 Energy for other specific functional devices.....	3
5 Building energy use defined by boundary	4
5.1 Identification of building energy use by boundary.....	4
5.2 Heat/cold reaching the building space (E_B).....	4
5.3 Energy delivered to the building's technical system (E_T).....	4
5.4 Energy input to the district heating/cooling system (E_D).....	5
5.5 Renewable energy produced on the building site (E_R).....	5
5.6 Terms and symbols of the categories of building energy use determined by boundary.....	5
6 Expression of energy carriers	7
6.1 Expression methods of energy carriers.....	7
6.2 Presenting building energy use data with original energy carriers.....	7
6.3 Presenting building energy use data with equivalent energy.....	7
7 Presentation of building energy use	7
Annex A (normative) Symbols and abbreviations	8
Annex B (informative) Presentations of building energy use: examples	10
Bibliography	14

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12655 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*.

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Introduction

This International Standard is prepared by ISO/TC 163,/WG 4, a joint group between ISO/TC 163, *Thermal performance and energy use in the built environment* and ISO/TC 205, *Building environment design*.

It provides a set of clear definitions, terms and procedures for presenting the energy use in buildings in a consistent and uniform way, including:

- Classifications of building energy use by purpose (e.g. energy for space heating, energy for cooking, energy for lighting);
- Categories of energy use by boundaries inside or outside of buildings (e.g. actual heat/cold reaching the building space (E_B), energy delivered to the building's technical system (E_T), energy used by the district heating/cooling system (E_D);
- Building energy data shall be presented with original energy carriers or with equivalent energy, and the indication (subscript) is required to make the data understandable.

Such a comprehensive expression of building energy use is of great importance for an in-depth understanding of building energy performances and trends. And it is conducive to:

- a) Regulating the presentation of the energy use of buildings with respect to data collection, metering and analysis;
- b) Providing a uniform platform for the assessment and comparison of building energy;
- c) Laying the foundation of energy data collection, metering, statistics, audit and analysis for both regional and national buildings.

The measuring methods are out of scope of this International Standard.

Relationship with ISO/TR 16344, ISO 16343 and ISO 16346

Three relevant International Standards, ISO/TR 16344, ISO 16343 and ISO 16346, were developed to form a uniform platform for calculation and evaluation of building energy performance. However, some ambiguities still exist, due to lack of uniform specifications, such as the classification of energy usage, the boundaries related to the energy data, and the basis of the aggregation methods. Hence, the present International Standard is complementary to these International Standards on energy rating and energy performance. It provides common rules for how to present the energy uses, as a uniform platform for exchanging information, without prescribing what has to be measured or assessed as it is the case for procedures aiming at energy performance assessment and certification.

At the same time, the relevant terms, definitions and symbols in ISO/TR 16344, such as space heating, space cooling and domestic hot water heating, are incorporated by reference in the present International Standard, so as to be consistent with the existing International Standards.

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Energy performance of buildings — Presentation of measured energy use of buildings

1 Scope

This International Standard sets out a consistent methodology to present energy use in buildings, which is specified clearly with the energy usage, corresponding boundary and the energy data (presented with original energy carriers or equivalent energy).

This International Standard is applicable to the presentation of energy use of civil buildings for data collection, metering, statistics, audit and analysis.

2 Normative references

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/TR 16344, *Energy performance of buildings — Common terms, definitions and symbols for the overall energy performance rating and certification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 16344 and the following apply.

3.1

building energy

energy used during the operation of buildings, including the energy used for building basic functions and the energy provided for occupant's activities

EXAMPLE Examples of occupant's activities include working, cooking, leisure, sanitation, etc.

Note 1 to entry: The energy used during the manufacture of building materials, the energy for material transportation and the energy during building construction are not included.

3.2

energy usage

specific usage of building energy

EXAMPLE Space heating, space cooling, domestic hot water, lighting, etc.

3.3

boundary

position in relation to the energy usage chain of buildings

3.4

equivalent energy

equivalent value of the energy carrier used in buildings to combine or share different energy carriers with the same platform according to the standardized conversion approach

4 Building energy use defined by usage

4.1 Classification of building energy use by usage

According to the energy usage in buildings, as shown in [Figure 1](#), the total building energy use shall be classified as the following:

- Energy for HVAC and domestic hot water, including energy for space heating, energy for space cooling, energy for air movement and energy for domestic hot water.
- Energy for lighting and plug-in, including energy for lighting and energy for household/office appliances.
- Energy for other ultimate usage, including energy for indoor transportation and energy for building auxiliary devices.
- Energy for other special usage, including energy for cooking, energy for cooling storage, energy for devices in data center and energy for other specific functional devices.

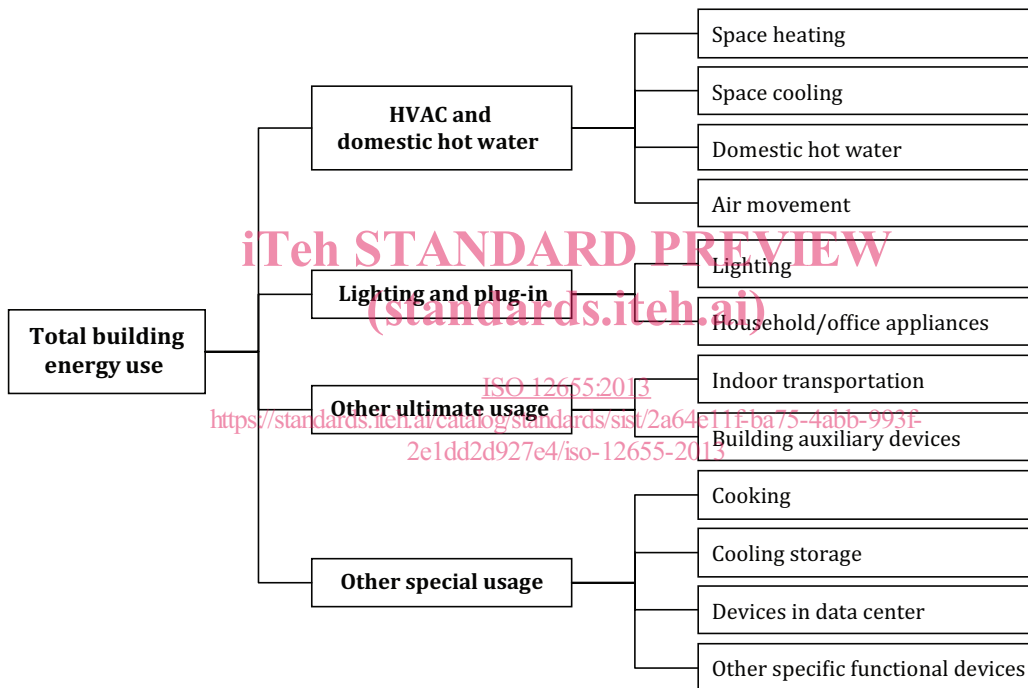


Figure 1 — The usage of energy in buildings

4.2 Energy for space heating

The energy used to provide heat (including humidification) for space heating of the building shall be *energy for space heating*.

4.3 Energy for space cooling

The energy used to provide cold (including dehumidification) for space cooling of the building shall be *energy for space cooling*.

4.4 Energy for air movement

The energy used by the mechanical ventilation fans for building ventilation and air circulation shall be *energy for air movement*. It includes electricity consumed by fans inside air handling devices (air

handling unit, outdoor air processor, fan coil unit, etc.), exhaust fans in toilet, ventilation fans in the garage and other ventilated spaces.

4.5 Energy for domestic hot water

The energy used to produce and transport hot water for building domestic water service shall be *energy for domestic hot water*.

4.6 Energy for lighting

The energy used by the lamp(s), control gear and control circuit in or associated with the luminaries shall be *energy for lighting*. It includes the indoor lighting and exterior lighting. The indoor lighting is usually composed of lighting for public space and private space.

4.7 Energy for household/office appliances

The energy used by the household and office appliances, such as personal computers, printers, drinking fountains and TVs, shall be *energy for household/office appliances*.

4.8 Energy for indoor transportation

The energy used by the indoor transportation devices in buildings, such as lifts, escalators and passenger conveyors, shall be *energy for indoor transportation*.

4.9 Energy for building auxiliary devices

The energy used by all kinds of the building auxiliary devices that serve the building, such as pumps for water supply and drainage, automatic door, shall be *energy for building auxiliary devices*.

4.10 Energy for cooking

The energy used for cooking inside a building shall be *energy for cooking*. It includes the fuel and electricity consumed by cooking utensils and exhaust fans in the kitchen.

NOTE The energy used by the exhaust fans in the kitchen doesn't belong to the item of *energy for air movement* anymore.

4.11 Energy for cooling storage

The energy used by the refrigeration devices for storage shall be *energy for cooling storage*.

4.12 Energy for devices in data center

The energy used by the devices in data centers inside the building, including servers and ancillary air-conditioning, shall be *energy for devices in data center*.

4.13 Energy for other specific functional devices

The energy used by other specific functional devices, such as medical equipment, laundry equipment and auxiliary devices of swimming pool, shall be *energy for other specific functional devices*.

5 Building energy use defined by boundary

5.1 Identification of building energy use by boundary

Considering energy flow through the buildings, the building energy use shall be defined according to boundary, and the categories are as follows:

- Heat/cold reaching the building space (E_B);
- Energy delivered to the building's technical system (E_T);
- Energy input to the district heating/cooling system (E_D);
- Renewable energy produced on the building site (E_R).

Schematic of the categories of building energy use determined by the boundaries mentioned above are shown in [Figure 2](#).

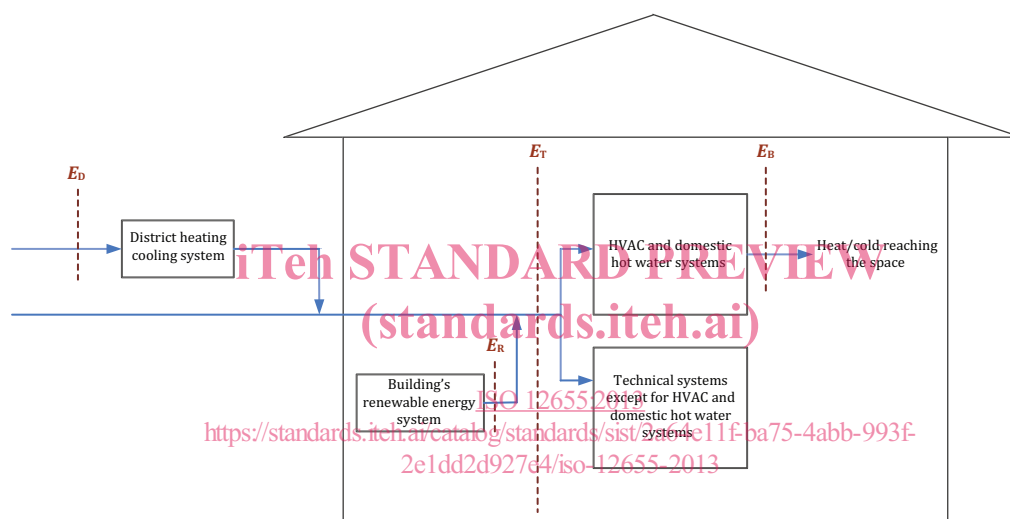


Figure 2 — Identification of building energy use by boundary (shown as dotted line)

5.2 Heat/cold reaching the building space (E_B)

The heat/cold gained by the building space through HVAC system or domestic hot water system shall be *heat/cold reaching the building space*, denoted as E_B . It is irrelevant to the process of energy conversion in the technical systems of the building.

5.3 Energy delivered to the building's technical system (E_T)

The energy delivered to and used by the technical systems of the building (including energy conversion devices and transportation devices of the HVAC system and domestic hot water system, lighting, household/office appliances and other devices in the building) shall be *energy delivered to the building's technical systems*, denoted as E_T .

NOTE 1 Sources of E_T include the directly input fuel (such as coal, oil and gas), electricity and the energy provided by the district heating/cooling system (such as electricity, heat and cold energy), and the renewable energy produced on the building site.

NOTE 2 For space cooling, $E_{T,c}$ includes the energy used by energy conversion devices (such as chillers and heat pumps) and auxiliary devices (such as chilled water pumps, cooling water pumps and fans in cooling towers) when the cold energy is acquired from the building's own technical system. If the cold energy is provided by the district cooling system, $E_{T,c}$ refers to the input cold energy and the energy used by auxiliary devices within the building (such as chilled water pumps).

NOTE 3 For space heating or domestic hot water, $E_{T,h}$ or $E_{T,hw}$ includes the energy used by energy conversion devices (such as boilers and heat pumps) and auxiliary devices (such as hot water pumps, the water pumps and fans related to the heat pumps) when the heat is acquired from the building's own technical system. If the heat is provided by the district heating system, $E_{T,h}$ or $E_{T,hw}$ refers to the input heat and the energy used by auxiliary devices within the building (such as hot water pumps).

If the energy produced by the energy conversion devices (such as co-generation units (CHPs), chillers, heat pumps and boilers) serve more than one technical system or building, E_T of a certain technical system shall be shared according to its actual acquisition.

5.4 Energy input to the district heating/cooling system (E_D)

The energy delivered to and consumed by the district heating/cooling system outside of the building shall be *energy input to the district heating system*, denoted as E_D .

5.5 Renewable energy produced on the building site (E_R)

The energy generated by the active renewable energy system integrated with the building (such as photovoltaic panels, solar heat collectors and wind power generators) with renewable energy sources, shall be *renewable energy produced on the building site*, denoted as E_R . Passive application of renewable energy is not included.

5.6 Terms and symbols of the categories of building energy use determined by boundary

The terms and corresponding subscripts to distinguish among different energy usage, different boundaries of the building energy use are shown in Table 1 (E_R is not listed).

NOTE More details, such as the consistency in the order of the subscripts and the examples of the application of the symbols and subscripts are given in Annex A (normative).

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Table 1 — Terms and symbols of the categories of building energy use determined by boundary

Energy usage	Heat/cold reaching the building space (E_B)	Energy delivered to the building's technical system (E_T)	Energy input to the district heating /cooling system (E_D)
Space heating	$E_{B,h}$ Heat reaching the building space for space heating	$E_{T,h}$ For district heating system, $E_{T,h}$ is the input heat from district heating system and the electricity used for the hot water pumps within the building for space heating. Otherwise, $E_{T,h}$ is the energy input for space heating inside the building, including energy input to energy conversion devices and auxiliary devices, excluding indoor fans.	$E_{D,h}$ Energy input to the conversion devices and transportation system in district heating system for space heating