TECHNICAL REPORT

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

Performance énergétique des bâtiments — Termes, définitions et symboles communes pour l'évaluation de la performance et la certification énergétique

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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.

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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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/TR 16344 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, in conjunction with TC 205, *Building environment design*.

Introduction

This Technical Report is one of three closely linked documents dealing with definitions and general procedures for overall building energy performance rating and certification (see also Figure 1):

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

— ISO 16343, *Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings*;

— ISO 16346, *Energy performance of buildings — Assessment of overall energy performance*.

Their development greatly benefited from similar CEN documents (viz. CEN/TR 15615, EN 15217 and EN 15603, respectively) developed to support the European Energy Performance of Buildings Directive (EPBD).

The main differences between this Technical Report (i.e. ISO/TR 16344) and CEN/TR 15615 are:

— this Technical Report covers only the subjects covered in CEN/TR 15615:2008, Annex C (Definitions) and Annex D (Common symbols and subscripts);

— this Technical Report includes specific definitions added from other sources without jeopardizing the consistency and integrity of the document;

— some editorial changes have been made.

Note that a revision of the set of CEN documents to support the EPBD is anticipated in the near future. Issuing the corresponding ISO documents aims to bring the key subject of building energy performance assessment to the fore at the global level.

Given the strong demand for these documents at ISO level, it was decided not to delay the advancement of the ISO documents by waiting for these CEN developments. However, it is expected that a future revision of the ISO documents will be carried out in collaboration with CEN under the Vienna Agreement.

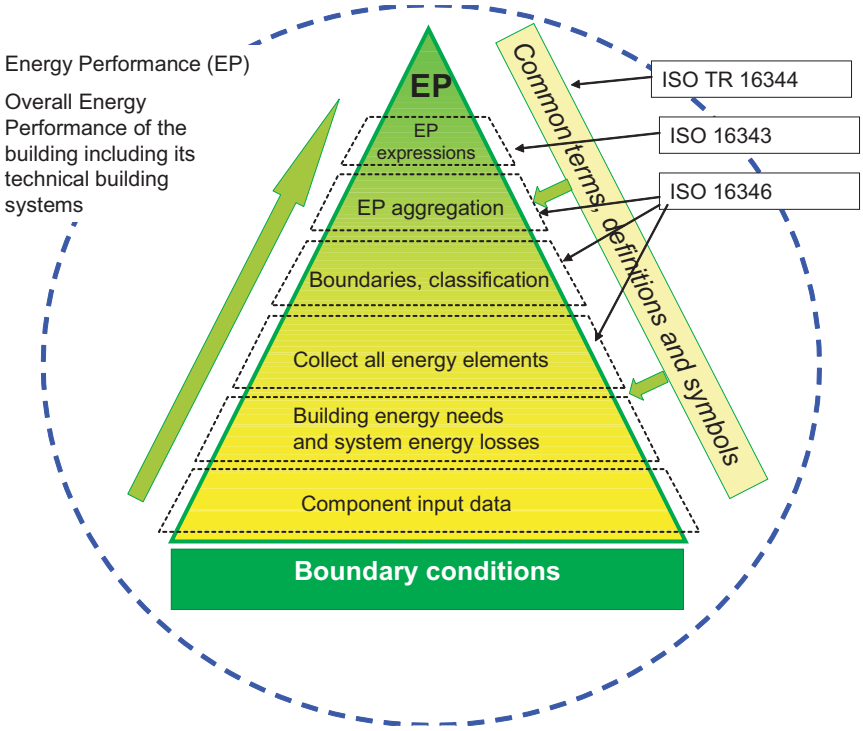

Figure 1 — Flow diagram illustrating the successive elements of the general procedures

The difference between this Technical Report and ISO 16818, *Building environment design — Energy efficiency — Terminology*, is that ISO 16818 gives terms and definitions for use in the design of energy-efficient buildings, while this Technical Report provides an unambiguous and consistent common set of terms, definitions and symbols for all elements of the assessment of the overall energy performance of buildings. The unambiguous and consistent use of terms, definitions and symbols is essential when the energy performance is assessed in the context of national or regional building regulations, e.g. to check compliance with minimum energy performance requirements and/or to produce energy performance certificates for a building.

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

1 Scope

This Technical Report provides a coherent set of terms, definitions and symbols for concepts and physical quantities related to the overall energy performance of buildings and its components, including definitions of system boundaries, to be used in all standards elaborated within ISO on energy performance of buildings.

These terms and definitions are applicable to energy calculations in accordance with this Technical Report and standards on the overall energy performance of buildings and their components, to provide input to this Technical Report or using output from this Technical Report. They are based on existing terms and definitions from standards and other documents referenced in the bibliography.

NOTE Slightly different definitions might be applicable to other situations, e.g. design of installations.

2 Terms and definitions

For the purposes of this Technical Report, the terms and definitions given in ISO 7345 and the following apply.

2.1 Terms

2.1.1
air-conditioned floor area
area equipped with air-conditioning equipment, measured at floor level from the interior surfaces of the walls

NOTE See also “gross floor area”.

2.1.2
air-conditioning system
combination of all components required to provide a form of air treatment in which maximum or minimum temperature is controlled, possibly in combination with the control of ventilation, humidity and air cleanliness

2.1.3
auxiliary energy
electrical energy used by technical building systems for heating, cooling, ventilation and/or hot domestic water to support energy transformation to satisfy energy needs

NOTE 1 This includes energy for fans, pumps, electronics, etc. Electrical energy input to a ventilation system for air transport and heat recovery is not considered as auxiliary energy, but as energy used for ventilation (see 2.1.156).

NOTE 2 In ISO 9488, the energy used for pumps and valves is called “parasitic energy”.

2.1.4
building
construction as a whole, including its envelope and all technical building systems, for which energy is used to condition the indoor climate and to provide domestic hot water and illumination and other services related to the use of the building

NOTE The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately.

2.1.5
building area
greatest horizontal area of a building above grade within the outside surface of the exterior walls or within the outside surface of the exterior wall and the centrelines of the fire walls

2.1.6
building automation and control
products, software and engineering services for automatic controls, monitoring and optimization, human intervention and management to achieve energy-efficient, economical and safe operation of building services equipment

2.1.7
building calculation model
mathematical model of the building, used to calculate its energy use

2.1.8
building energy cost
calculated annual energy cost of all purchased energy for the building

2.1.9
building heat transfer coefficient
sum of the transmission and ventilation heat transfer coefficients

2.1.10
building services
services provided by technical building systems and by appliances to provide indoor climate conditions, domestic hot water, illumination levels and other services related to the use of the building

2.1.11
building type
classification of a building by usage as given in definitions 2.1.11.1 to 2.1.11.9

2.1.11.1
assembly
building or structure for the gathering together of persons, such as auditoriums, churches, reception halls, gymnasiums, theatres, museums, passenger depots, sports facilities and public assembly halls

2.1.11.2
health and institutional
building or structure for the purpose of providing medical treatment, confinement or care, and sleeping facilities such as hospitals, sanatoriums, clinics, orphanages, nursing homes, mental institutions, reformatories, jails and prisons

2.1.11.3
hotel or motel
building or structure for transient occupancy, including not only hotels and motels but also resorts, barracks and dormitories

2.1.11.4
multifamily
building or structure containing three or more dwelling units

NOTE See also “dwelling unit”.

2.1.11.5
office
<business> building or structure for office, professional or service type transactions, such as medical offices, banks, libraries and governmental office buildings

2.1.11.6
restaurant
building or structure for the consumption of food or drink, including fast food restaurants, coffee shops, cafeterias, bars and restaurants

2.1.11.7
retail
<mercantile> building or structure for the display and sale (wholesale or retail) of merchandise, such as shopping malls, food markets, auto dealerships, department stores and specialty shops.

2.1.11.8
school
<educational> building or structure for the purpose of instruction such as schools, colleges, universities, and academies

2.1.11.9
warehouse
building or structure for storage, such as aircraft hangers, garages, warehouses, storage buildings and freight depots

2.1.12
building envelope
elements of a building that enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from unconditioned spaces

2.1.13
building envelope, exterior
elements of a building that separate conditioned spaces from the exterior

2.1.14
building envelope, semi-exterior
elements of a building that separate conditioned spaces from unconditioned spaces or that enclose semi-heated spaces through which thermal energy may be transferred to or from the exterior, or to or from unconditioned spaces, or to or from conditioned spaces

NOTE 1 Building envelope defines the surfaces that need to be insulated, or weather-stripped. The outer shell of the building is not necessarily the same as the building envelope, particularly where the building contains semi-heated or unconditioned spaces.

NOTE 2 In some cases, the designer can determine the location of the exterior building envelope by the location that they place the insulation. For instance, it is not uncommon for a stairwell to be at the outside edge of the building. If that stairwell does not have any heating or cooling supply, it could be insulated on the outside edge or the side adjacent to other heated or cooled spaces. If insulated on the outside, the stairwell becomes indirectly conditioned, and the outside wall is the exterior building envelope. If insulated on the inside, the inside wall is likely to become the exterior building envelope (unless the outside exposure is so small that it would still be indirectly conditioned space).

NOTE 3 Where a building with conditioned space also contains semi-heated spaces or unconditioned spaces, the building envelope for the conditioned space is the roofs, walls, floors, doors, fenestration, etc., that separate the conditioned space from the exterior. These elements must comply with the residential or non-residential conditioned-space requirements.

NOTE 4 For semi-heated spaces, the building envelope includes any roofs, walls, floors, doors, fenestration, etc., that separate the semi-heated space from conditioned or unconditioned spaces (as well as from the exterior). These elements must comply with the semi-heated space requirements, as must elements separating conditioned space from unconditioned space.

2.1.15
building heat transfer coefficient
sum of the transmission and ventilation heat transfer coefficients

2.1.16
calculated energy rating
energy rating based on calculations of the weighted net delivered energy used by a building for heating, cooling, ventilation, domestic hot water and lighting

NOTE National bodies can decide whether other energy uses resulting from occupants' activities, such as cooking, production, laundering, computer equipment, etc., are included or not. If included, standard input data needs to be provided for the various types of building and uses. Lighting is always included except (by decision of national bodies) for residential buildings.

2.1.17
calculation step
discrete time interval for the calculation of the energy needs and uses for heating, cooling, humidification, dehumidification and lighting

2.1.18
calculation period
period of time over which a calculation is performed

NOTE The calculation period can be divided into a number of calculation-step periods

2.1.19
CO_{2e} emission coefficient
for a given energy carrier, quantity of CO_2 emitted to the atmosphere per unit of delivered energy

NOTE The CO_{2e} emission coefficient includes the equivalent emissions of other greenhouse gases (e.g. methane).

2.1.20
cogeneration
simultaneous generation in one process of thermal energy and electrical or mechanical energy

NOTE Also known as combined heat and power (CHP).

2.1.21
cooling
removal of latent and/or sensible heat

2.1.22
commissioning
sequence of events to enable the functioning of a building and its heating, ventilation and air-conditioning (HVAC) system in accordance with the design parameters

2.1.23
conditioned space
cooled space, heated space or indirectly conditioned space as defined in definitions 2.1.23.1 to 2.1.23.3

2.1.23.1
cooled space
enclosed space within a building that is cooled by a cooling system

2.1.23.2
heated space
enclosed space within a building that is heated by a heating system whose output capacity relative to the floor area is greater than or equal to the design criteria

2.1.23.3
indirectly conditioned space
enclosed space within a building that is not a heated space or a cooled space but which is heated or cooled indirectly by being connected to adjacent space(s) provided: (a) the product of the U-factor(s) and surface area(s) of the space(s) adjacent to the connected space(s) exceeds the combined sum of the product of the U-factor(s) and surface areas(s) of the space(s) adjoining the outdoors, unconditioned spaces and semi-heated spaces (e.g. corridors), or (b) that air from heated or cooled spaces is intentionally transferred (naturally or mechanically) into the space at a rate exceeding three air changes per hour (ACH)

2.1.24
conditioned area
floor area of conditioned spaces, excluding non-habitable cellars or non-habitable parts of a space, including the floor area on all storeys if more than one

NOTE 1 Internal, overall internal or external dimensions may be used. This leads to different areas for the same building, however.

NOTE 2 Some services, such as lighting or ventilation, might be provided to areas not included in this definition (e.g. a car park).

NOTE 3 The precise definition of the conditioned area is given by national authorities.

NOTE 4 Conditioned area can be taken as the useful area unless it is otherwise defined in national regulations.

2.1.25
conditioned zone
part of a conditioned space with a given set-point temperature or set-point temperatures, throughout which there is the same occupancy pattern and the internal temperature is assumed to have negligible spatial variations, and which is controlled by a single heating system, cooling system and/or ventilation system

2.1.26
confidence interval
interval that has a high probability (e.g. 95 %) of including the actual value

2.1.27
construction
erection of a new building, or any addition to or alteration of an existing building

2.1.28
construction documents
drawings and specifications used to construct a building, building systems or portions thereof

2.1.29
daylight space
space bounded by vertical planes rising from the boundaries of the daylight area on the floor to the floor above or to the roof

2.1.30
daylight zone
types of daylight zone are as given in definitions 2.1.30.1 and 2.1.31.2

2.1.30.1
under a skylight
area under a skylight whose horizontal dimension in each direction is equal to the skylight dimension in that direction plus either the floor to ceiling height or the dimension to an opaque partition, or one-half the distance to an adjacent skylight or vertical glazing, whichever is least

2.1.30.2
adjacent to vertical glazing
area adjacent to vertical glazing which receives daylighting from the glazing

NOTE For the purposes of this definition and unless more detailed daylighting analysis is provided, the daylighting zone depth is assumed to extend into the space a distance of 45 m or to the nearest opaque partition, whichever is less. The daylighting zone width is assumed to be the width of the window plus either 6 m on each side, the distance to an opaque partition, or one-half the distance to an adjacent skylight or vertical glazing, whichever is least.

2.1.31
control
action or device to regulate the operation of equipment

2.1.32
dehumidification
process of removing water vapour from air to reduce the relative humidity

2.1.33
delivered energy
energy, expressed per energy carrier, supplied to the technical building systems through the system boundary to satisfy the uses taken into account (heating, cooling, ventilation, domestic hot water, lighting, appliances, etc.) or to produce electricity

NOTE 1 For active solar and wind energy systems, the solar radiation incident on solar panels or on solar collectors or the kinetic energy of wind is not part of the energy balance of the building. It is decided at national level whether or not renewable energy produced on site is part of the delivered energy.

NOTE 2 Delivered energy can be calculated for defined energy uses or it can be measured.

2.1.34
demand-controlled ventilation
ventilation system in which the room airflow rate is governed by an automatic control depending upon the levels of occupancy and activity within the space

NOTE Examples are the speed of fans controlled by a presence indicator such as the CO_2 level in the room air, a presence detector or a timer.

2.1.35
design conditions
specified environmental conditions, such as temperature and light intensity, required to be produced and maintained by a system and under which the system must operate

2.1.36
design criteria
set of descriptions based on a particular environmental element such as indoor air quality, thermal, acoustical and visual comfort, energy efficiency and the associated system controls to be used for assessing the design presented

2.1.37
design documentation
written description of the essential design elements of a plant

2.1.38
design energy rating
calculated energy rating using design data for a building and a standard use data set

NOTE It represents the calculated intrinsic annual energy use of a building design under standardized conditions. This is particularly relevant in order to obtain a building permit at the design stage.

2.1.39
design parameters
set values of the internal environmental conditions to be achieved regardless of the changing external environmental conditions

2.1.40
design process
course of purposive actions performed to produce a set of design drawings and specifications in which a building having the potential to provide the functionalities required is described

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 reached.

2.1.41
distribution system
conveying means, such as ducts, pipes and wires, to bring substances or energy from a source to the point of use

NOTE The distribution system includes auxiliary equipment such as fans, pumps and transformers.

2.1.42
domestic hot water heating
process of heat supply to raise the temperature of cold water to the intended delivery temperature

2.1.43
efficiency
performance at specified conditions for the assessment of the energy performance

2.1.44
efficiency of HVAC system
ratio of the useful energy output (at the point of use) to the energy input in consistent units, for a designated time period, expressed in percent

2.1.45
energy
capability for doing work; having several forms that may be transformed from one to another, such as thermal (heat), mechanical (work), electrical or chemical

2.1.46
energy carrier
substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes

[ISO 13600:1997]

NOTE The energy content of fuels is given by their gross calorific value.

2.1.47
energy certification
procedures enabling an energy certificate to be obtained

2.1.48
energy certificate
document, recognized by a member state or a legal person designated by it, which includes the energy performance of a building

NOTE The meanings of the terms “certificate” and “certification” in this Technical Report differ from those in ISO/IEC 17000:2004.

2.1.49
energy class
easy-to-understand designation system (e.g. A to G) for indicating the energy performance of a building

2.1.50
energy efficiency ratio
EER
ratio of the net capacity of (cooling or heating) equipment to the total rate of electric input under designated operating conditions

2.1.51
energy efficiency ratio for buildings
EERB
ratio of energy required (ER) and energy used (EU)

2.1.52
energy management system
control system designed to monitor the environment and the use of energy in a facility and to adjust the parameters of local control loops to conserve energy while maintaining a suitable environment

2.1.53
energy need for domestic hot water
heat to be delivered to the required amount of domestic hot water to raise its temperature from the cold network temperature to the prefixed delivery temperature at the delivery point

2.1.54
energy need for heating or cooling
heat to be delivered to or extracted from a conditioned space to maintain the intended temperature conditions during a given period of time

NOTE 1 The energy need is calculated and cannot easily be measured.

NOTE 2 The energy need can include additional heat transfer resulting from non-uniform temperature distribution and non-ideal temperature control, if these factors are taken into account by increasing (decreasing) the effective temperature for heating (cooling) and not included in the heat transfer due to the heating (cooling) system.

2.1.55
energy need for humidification or dehumidification
latent heat in the water vapour to be delivered to or extracted from a conditioned space by a technical building system to maintain a specified minimum or maximum humidity within the space

2.1.56
energy inspection
examination of heating and/or air-conditioning systems in a building

2.1.57
energy performance indicator
energy rating divided by conditioned area

2.1.58
energy performance of a building
calculated or measured amount of weighted net delivered energy actually used or estimated to meet different needs associated with a standardized use of a building, which might include, *inter alia*, energy used for heating, cooling, ventilation, domestic hot water and lighting

2.1.59
energy rating
evaluation of the energy performance of a building based on the weighted sum of the calculated or measured use of energy carriers

2.1.60
energy required (ER)
energy demand
total energy required to achieve the building performance and comfort over a given period of time, including HVAC, lighting, occupancy and domestic hot water

2.1.61
energy used (EU)
final energy
total purchased energy (fossil, electric) excluding renewables consumed to achieve the required building performance and comfort over a given period of time

2.1.62
energy source
source from which useful energy can be extracted or recovered either directly or by means of a conversion or transformation process

NOTE Examples include oil or gas fields, coal mines, the sun and forests.

2.1.63
energy use for lighting
energy consumed by a lighting installation to meet the lighting requirements, which depends on the installed loading, the hours of use and the control regime

NOTE Energy targets, in kW·h per year per unit area or length, should be set to encourage energy efficiency.

2.1.64
energy use for other services
electrical energy input to appliances providing other services

NOTE This refers to services other than heating, cooling, domestic hot water, ventilation and lighting.

2.1.65
energy use for space heating or cooling or domestic hot water
energy input to the heating, cooling or hot water system to satisfy the energy need for heating, cooling (including dehumidification) or hot water, respectively

NOTE If the technical building system serves several purposes (e.g. heating and domestic hot water), it can be difficult to split the energy use into that used for each purpose. It can be indicated as a combined quantity (e.g. energy need for both space heating and domestic hot water).

2.1.66
energy use for ventilation
electrical energy input to a ventilation system for air conveyance and heat recovery (not including the energy input for preheating the air) and energy input to the humidification systems to satisfy the need for humidification

2.1.67
equipment
devices for comfort conditioning, electric power, lighting, transportation, or service water heating including, but not limited to, furnaces, boilers, air conditioners, heat pumps, chillers, water heaters, lamps, luminaires, ballasts, elevators, escalators and control devices or installations

2.1.68
equivalent internal temperature
constant minimum internal temperature, assumed for the calculation of the energy for heating, or maximum internal temperature, assumed for the calculation of the energy for cooling, leading to approximately the same average heat transfer as would apply with intermittent heating or cooling, and with inaccuracy of room temperature control

2.1.69
external dimension
dimension measured on the exterior of a building

2.1.70
external temperature
temperature of the external air

NOTE 1 For transmission heat transfer calculations, the radiant temperature of the external environment is assumed to be equal to the external air temperature; long-wave transmission to the sky is calculated separately.

NOTE 2 The measurement of external air temperature is given in ISO 15927-1.

2.1.71
existing building

<for calculated energy rating> building that has been erected

<for measured energy rating> building for which actual data necessary to assess the energy use are known or can be measured

2.1.72
exported energy
energy, expressed per energy carrier, delivered by the technical building systems through the system boundary and used outside the system boundary

NOTE 1 It can be specified by generation types (e.g. combined heat and power, photovoltaic) in order to apply different weighting factors.

NOTE 2 Exported energy can be calculated or it can be measured.

2.1.73
fossil fuel
organic material, other than biomass, used as a fuel

2.1.74
fuel
material that can be used to produce heat or generate power by combustion

2.1.75
gain utilization factor
factor reducing the total monthly or seasonal heat gains to obtain the resulting reduction of the energy need for heating

2.1.76
grid electricity
energy delivered to the building from a public electricity network

2.1.77
gross building envelope floor area
gross floor area of the building envelope, but excluding slab-on-grade floors

2.1.78
gross calorific value
quantity of heat released by a unit quantity of fuel when it is burned completely with oxygen at a constant pressure equal to 101 320 Pa and when the products of combustion are returned to ambient temperature

NOTE 1 This quantity includes the latent heat of condensation of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel.

NOTE 2 According to ISO 13602-2, the gross calorific value is preferred to the net calorific value.

NOTE 3 The net calorific value does not take account of the latent heat.

2.1.79
gross floor area
sum of the floor areas of the conditioned spaces within the building, including basements, mezzanine and intermediate floor tiers, and penthouses, of headroom height 2,2 m or as specified in national or regional codes and standards

NOTE It is measured from the exterior faces of the exterior walls or from the centrelines of the walls separating buildings, but excluding covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

2.1.80
gross floor area over outside or unconditioned spaces
gross area of a floor assembly separating a conditioned space from the outdoors or from unconditioned spaces, as measured from the exterior faces of exterior walls or from the centrelines of walls separating buildings

NOTE The floor assembly is considered to include all floor components through which heat might flow between indoor and outdoor or unconditioned environments.

2.1.81
gross lighted area
GLA
sum of the total lighted areas of a building, measured from the inside of the perimeter walls for each floor of the building

2.1.82
gross lighted floor area
gross floor area of lighted spaces

2.1.83
gross semi-heated floor area
gross floor area of semi-heated spaces

NOTE The gross building envelope floor area will usually be only one floor on the bottom, whereas the gross conditioned floor area might include multiple floors in a building.

2.1.84
heat balance ratio
monthly or seasonal heat gains divided by the monthly or seasonal heat transfer

2.1.85
heat gains
heat generated within or entering into the conditioned space from heat sources other than energy intentionally utilized for heating, cooling or domestic hot water preparation

NOTE 1 These include internal heat gains and solar heat gains. Sinks that extract heat from the building are included as gains, with a negative sign. In contrast, with heat transfer, for a heat source (or sink) the difference between the temperature of the space considered and the temperature of the source is not the driving force for the heat flow.

NOTE 2 For summer conditions, heat gains with a positive sign constitute an extra heat load on the space.

2.1.86
heat recovery
heat generated by a technical building system or linked to a building use (e.g. domestic hot water), which is utilized directly in a related system to lower the heat input and which would otherwise be wasted (e.g. preheating of combustion air by a flue gas heat exchanger)

2.1.87
heat transfer coefficient
heat flow rate divided by the temperature difference between two environments

NOTE It is specifically used for the coefficient of heat transfer by transmission or ventilation.

2.1.88
heated space
room or enclosure which, for the purposes of a calculation, is assumed to be heated to a given set-point temperature or set-point temperatures

2.1.89
heating or cooling season
period of the year during which a significant amount of energy for heating or cooling is needed

NOTE The season lengths are used to determine the period of operation of technical systems.

2.1.90
humidification
process of adding water vapour to air to increase the relative humidity

2.1.91
inspector
person having appropriate training or practical experience in energy inspection of heating and/or air-conditioning systems and in associated regulations for energy

2.1.92
intermittent heating or cooling
heating or cooling pattern where normal heating or cooling periods alternate with periods of reduced or no heating or cooling

2.1.93
internal heat gains
heat provided within the building by the occupants (sensible metabolic heat) and by appliances such as lighting, domestic appliances, office equipment, other than energy intentionally provided for heating, cooling or hot water preparation

NOTE This includes recoverable system thermal losses, if the holistic approach for the calculation of the recovered system losses is chosen.

2.1.94
internal dimension
dimension measured from wall to wall and floor to ceiling inside a room of a building

2.1.95
internal temperature
arithmetic average of the air temperature and the mean radiant temperature at the centre of the occupied zone

NOTE This is the approximate operative temperature according to ISO 7726.

2.1.96
life cycle cost
total cost of a building or its parts throughout its life, including the costs of planning, design, acquisition, operation, maintenance and disposal, less any residual value

2.1.97
lighting
process of supplying the necessary illumination

2.1.98
lighting system
group of luminaires circuited or controlled to perform a specific function

2.1.99
loss utilization factor
factor reducing the total monthly heat transfer to obtain the resulting reduction of the energy need for cooling

2.1.100
measured energy indicator
measured energy rating divided by the conditioned area

2.1.101
measured energy rating
energy rating based on the measured amounts of delivered and exported energy

NOTE 1 The measured rating is the weighted sum of all energy carriers used by the building, as measured by meters or other means. It is a measure of the in-use performance of the building. This is particularly relevant to certification of actual energy performance.

NOTE 2 Also known as "operational rating".

2.1.102
net delivered energy
delivered energy minus exported energy, both expressed per energy carrier

NOTE 1 A balance of the delivered and exported energy per energy carrier can be performed only if the same primary energy factors and/or CO_2 coefficients apply to the delivered and exported amounts of that energy carrier.

NOTE 2 The term "net" can also be applied to quantities derived from net delivered energy, e.g. primary energy or CO_2 emissions.

2.1.103
net thermal efficiency
ratio between the heat or cooling demand of the distribution system and the fuel heat input energy requirements for heating or cooling, i.e. the energy to be delivered to the heating or cooling system to satisfy the heat demand of the building

2.1.104
new building

<for calculated energy rating> building at the design stage or under construction

<for measured energy rating> building too recently constructed to have reliable records of energy use

2.1.105
non-renewable energy
energy taken from a source which is depleted by extraction (e.g. fossil fuels)

2.1.106
non-renewable primary energy factor
for a given energy carrier, non-renewable primary energy divided by delivered energy, where the non-renewable energy is that required to supply one unit of delivered energy, taking account of the non-renewable energy required for extraction, processing, storage, transport, generation, transformation, transmission, distribution and any other operations necessary for delivery to the building in which the delivered energy will be used

NOTE The non-renewable primary energy factor can be less than unity if renewable energy has been used.

2.1.107
occupied zone
that part of a conditioned zone in which persons normally reside and where requirements as to the internal environment are to be satisfied

NOTE The definition of the occupied zone depends on the geometry and the use of the room and is specified case by case. Usually the term "occupied zone" is used only for areas designed for human occupancy and is defined as a volume of air that is confined by specified horizontal and vertical planes. The vertical planes are usually parallel with the walls of the room. Usually, there is also a limit placed on the height of the occupied zone.

2.1.108
other building services
services supplied by energy-consuming appliances

2.1.109
overall internal dimension
dimension measured on the interior of a building, ignoring internal partitions

2.1.110
part-load operation
operational state of a technical system (e.g. heat pump), where the actual load is below the actual output capacity of the device

2.1.111
performance indicator
particular quantified aspect of a building

2.1.112
primary energy
energy that has not been subjected to any conversion or transformation process

NOTE 1 Primary energy includes non-renewable energy and renewable energy. If both are taken into account, it can be called total primary energy.

NOTE 2 For a building, it is the energy used to produce the energy delivered to the building. It is calculated from the delivered and exported amounts of energy carriers, using conversion factors.

2.1.113
process energy
energy consumed in support of a manufacturing, industrial or commercial process other than for conditioning spaces and maintaining comfort and amenities for the occupants of a building

2.1.114
qualified person
one familiar with the construction and operation of the equipment and the hazards involved

2.1.115
reasonable cost
cost that is accepted by all parties to reach a given end

NOTE 1 This cost, or a method to assess this cost, should be given at the national level.

NOTE 2 This cost strongly depends on the purpose of the effort. For example, the cost of a rating could be relatively large if it is to provide an official certificate to put the building on the market or for displaying the building performance to the public, but reduced if it is simply for statistical purposes.

2.1.116
reasonably possible cost
cost considered reasonably likely to be possible

2.1.117
recoverable system thermal loss
part of a system thermal loss which can be recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE This depends on the calculation approach chosen to calculate the recovered gains and losses (holistic or simplified approach).

2.1.118
recoverable energy
part of the energy losses, from the space and domestic hot water system or lighting, which can be recovered to lower the energy required

2.1.119
recovered energy
that part of the recoverable energy consisting of energy from an energy utilization system which would otherwise be wasted (not contributing to a desired end use)

NOTE Recovered energy may contribute to reducing the energy required (ER).

2.1.120
recovered system thermal loss
that part of the recoverable system thermal loss which has been recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE This depends on the calculation approach chosen to calculate the recovered gains and losses (holistic or simplified approach).

2.1.121
reference building
specific building design that is of the same type and has the same form, orientation and basic systems as the proposed design and meets all the criteria of the prescriptive compliance method

2.1.122
reference value
standard legal or calculated value against which an energy indicator is compared

2.1.123
renewable energy
energy from a source that is not depleted by extraction, such as solar energy (thermal and photovoltaic), wind power, water power and renewed biomass

NOTE In ISO 13602-1:2002, a renewable resource is defined as a “natural resource for which the ratio of the creation of the natural resource to the output of that resource from nature to the technosphere is equal to or greater than one”.

2.1.124
renewable energy produced on the building site
energy produced by technical building systems directly connected to the building, using renewable energy sources

2.1.125
requirements
important but revisable items required by the client as well as the circumstances of a project, such as budget, physical dimensions, performance and general sustainability issues, that the designer should take into account throughout the design process

2.1.126
room-conditioning system
system capable of maintaining comfort conditions in a room within a defined range

NOTE Such systems comprise air-conditioning and surface-based radiative systems.

2.1.127
room-conditioning system control
measures taken to enable operation of a system in accordance with the design criteria

NOTE It can be a part of the building automation and control system.

2.1.128
set-back temperature
minimum internal temperature to be maintained during reduced-heating periods, or maximum internal temperature to be maintained during reduced-cooling periods

2.1.129
set-point temperature of a conditioned zone
internal (minimum intended) temperature, as fixed by the control system in the normal heating mode, or internal (maximum intended) temperature, as fixed by the control system in the normal cooling mode

2.1.130
site-recovered energy
waste energy recovered at the building site that is used to offset consumption of purchased fuel or electrical energy supplies

2.1.131
site-solar energy
thermal, chemical or electrical energy derived from direct conversion of incident solar radiation at the building site and used to offset consumption of purchased fuel or electrical energy supplies

NOTE For the purposes of applying this Technical Report, site-solar energy does not include passive heat gain through fenestration systems.

2.1.132
solar energy source
source of thermal, chemical or electrical energy derived from direct conversion of incident solar radiation at the building site

2.1.133
solar heat gain
heat provided by solar radiation entering, directly or indirectly (after absorption in building elements), into the building through windows, opaque walls and roofs, or passive solar devices such as sunspaces, transparent insulation and solar walls

NOTE Active solar devices such as solar collectors are considered as part of the technical building system.

2.1.134
solar irradiation
incident solar heat per area over a given period

2.1.135
space
enclosed space within a building

NOTE The classifications of spaces are as follows for the purpose of determining building envelope requirements: conditioned space, adjacent space, etc.

2.1.136
space cooling
process of heat extraction for thermal comfort

2.1.137
space heating
process of heat supply for thermal comfort

2.1.138
standard energy indicator
standard energy rating divided by the conditioned area

2.1.139
standard energy rating
calculated energy rating using actual data for a building and a standard use data set

NOTE 1 It represents the intrinsic annual energy use of a building under standardized conditions. This is particularly relevant to certification of standard energy performance.

NOTE 2 It can also be termed “asset energy rating”.

2.1.140
standard use data set
standard input data for internal and external climates, use and occupancy

NOTE 1 This data set can also include information on the surroundings (such as shading or sheltering by adjacent buildings).

NOTE 2 Such data sets are defined at national level.

2.1.141
statistical tolerance interval
interval determined from a random sample in such a way that one may have a specified level of confidence that the interval covers at least a specified proportion of the sampled population

NOTE The confidence level in this context is the long-run proportion of intervals constructed in this manner that will include at least the specified proportion of the sampled population.

2.1.142
system boundary
boundary that includes within it all areas associated with a building (both inside and outside the building) where energy is consumed or produced

NOTE Inside the system boundary, the system losses are taken into account explicitly, whereas outside the system boundary they are taken into account in the conversion factor.

2.1.143
system thermal loss
thermal loss from a technical building system for heating, cooling, domestic hot water, humidification, dehumidification, ventilation or lighting that does not contribute to the useful output of the system

NOTE 1 A system loss can become an internal heat gain for the building if it is recoverable.

NOTE 2 Thermal energy recovered directly in a sub-system is not considered as a system thermal loss but as heat recovery and directly treated in the related system standard.

NOTE 3 Heat dissipated by the lighting system or by other services (e.g. appliances of computer equipment) is not part of the system thermal losses, but part of the internal heat gains.

2.1.144
tailored energy rating
calculated energy rating using actual data for a building and actual climate and occupancy data

2.1.145
technical building sub-system
that part of a technical building system that performs a specific function (e.g. heat generation, heat distribution, heat emission)

2.1.146
technical building system
technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production

NOTE 1 A technical building system can refer to one or to several building services (e.g. heating system, heating and domestic hot water system).

NOTE 2 A technical building system is composed of different sub-systems.

NOTE 3 Electricity production can include cogeneration and photovoltaic systems.

2.1.147
thermal envelope area
total of the area of all elements of a building that enclose conditioned spaces through which thermal energy is transferred to or from the external environment or to or from unconditioned spaces

NOTE The area of a thermal element depends on whether internal, overall internal or external dimensions are being used.

2.1.148
thermal zone
that part of the (controlled) space with a given set-point temperature, throughout which the internal temperature is assumed to have negligible spatial variation

2.1.149
total primary energy factor
for a given energy carrier, non-renewable and renewable primary energy divided by the delivered energy, where the primary energy is that required to supply one unit of delivered energy, taking account of the energy required for extraction, processing, storage, transport, generation, transformation, transmission, distribution and any other operations necessary for delivery to the building in which the delivered energy will be used

NOTE The total primary energy factor always exceeds unity.

2.1.150
transmission heat transfer coefficient
heat flow rate due to thermal transmission through the fabric of a building, divided by the difference between the environment temperatures on either side of the construction

NOTE By convention, if the heat is transferred between a conditioned space and the external environment, the sign is positive if the heat flow is from the space to outside (heat loss).

2.1.151
unconditioned space
room or enclosure which is not part of a conditioned space

2.1.152
useful heat gains
that proportion of the internal and solar heat gains that contributes to reducing the energy need for heating

2.1.153
validated building data set
data used as input to a building calculation model in which one or more items of input data have been adjusted on the basis of actual data so that the results from a calculation using the model do not significantly differ from the measured reality

NOTE The quality of the validated data set is a balance between reasonable costs for gathering data and reasonable accuracy.

2.1.154
ventilation
process of supplying or removing air by natural or mechanical means to or from a space

NOTE Such air is not required to have been conditioned.

2.1.155
ventilation heat transfer coefficient
heat flow rate due to air entering a conditioned space either by infiltration or ventilation, divided by the difference between the internal air temperature and the supply air temperature

2.1.156
ventilation heat recovery
sensible and/or latent heat recovered from the exhaust air to reduce the energy need

2.1.157
zone
space or group of spaces within a building with any combination of heating, cooling or lighting requirements sufficiently similar so that desired conditions can be maintained throughout by a single controlling device

2.2 Proposed groupings of terms

2.2.1 General

The terms in this Technical Report cover a wide range of specific areas. The following groupings help to obtain an overview of each cluster.

NOTE Adding hyperlinks (e.g. in software or databases) will help the user jump from alphabetic to grouped presentations and back.

2.2.2 "Type of building" terms group

— building

— building area

— new building

— existing building

— building energy cost

— building type

— assembly

— health and institutional

— hotel or motel

— multifamily

— restaurant

— retail

— school

— warehouse

2.2.3 Design terms group

— design criteria
— design parameters
— design conditions
— design process
— technical building system
— technical building sub-system
— building services
— construction
— construction documents
— requirements
— performance indicator
— reference building

2.2.4 Technical building terms group

— building envelope
— building envelope, exterior
— building envelope, semi-exterior
— daylight space
— daylight zone
— under skylights
— adjacent to vertical glazing
— space heating
— space cooling
— domestic hot water heating
— dehumidification
— humidification
— ventilation
— lighting
— other services
— building automation and control
— air-conditioned floor area
— gross floor area
— gross building envelope floor area
— gross conditioned floor area

— gross lighted floor area
— gross semi-heated floor area
— gross floor area over outside or unconditioned spaces
— gross lighted area (GLA)
— internal dimension
— overall internal dimension
— external dimension
— thermal envelope area
— space
— conditioned space
— unconditioned space
— cooled space
— heated space
— indirectly conditioned space
— conditioned area
— conditioned zone
— occupied zone
— thermal zone
— zone

2.2.5 Energy terms group

— auxiliary energy
— cogeneration
— control
— air-conditioning system
— room-conditioning system
— demand-controlled ventilation
— generation systems
— distribution system
— emission systems
— efficiency of HVAC system
— energy management system
— equipment
— heat recovery

— lighting system
— ventilation
— ventilation heat recovery
— part-load operation
— system thermal loss
— recoverable system thermal loss
— recovered system thermal loss

2.2.6 Energy inspection terms group

— energy inspection
— inspector
— room-conditioning system control
— commissioning
— design documentation
— qualified person

2.2.7 Energy terms group

— energy
— energy source
— energy carrier
— fuel
— fossil fuel
— system boundary
— delivered energy
— exported energy
— net delivered energy
— non-renewable energy
— renewable energy
— renewable energy produced on the building site
— solar energy source
— primary energy
— total primary energy factor
— non-renewable primary energy factor
— recovered energy
— recoverable energy

— CO_2 emission coefficient
— energy need for heating or cooling
— energy need for humidification or dehumidification
— energy need for domestic hot water
— energy use for space heating or cooling or domestic hot water
— energy use for ventilation
— energy use for lighting
— energy use for other services
— process energy
— site-recovered energy
— site-solar energy
— efficiency
— energy required (ER) or energy demand
— energy used (EU) or final energy
— energy efficiency ratio (EER)
— energy efficiency ratio for buildings (EERB)
— net thermal efficiency
— grid electricity
— gross calorific value

2.2.8 Energy rating terms group

— energy performance of a building
— energy rating
— calculated energy rating
— standard energy rating
— design energy rating
— tailored energy rating
— standard use data set
— measured energy rating
— confidence interval
— statistical tolerance interval
— energy certification
— energy performance indicator
— standard energy indicator

— measured energy indicator
— energy certificate
— energy class
— reference value

2.2.9 Cost terms group

— reasonably possible cost
— reasonable cost
— life cycle cost

2.2.10 Building calculation terms group

— building calculation model
— validated building data set
— calculation step
— calculation period
— cooling
— dehumidification
— heating or cooling season
— external temperature
— internal temperature
— set-point temperature of a conditioned zone
— equivalent internal temperature
— set-back temperature
— heat transfer coefficient
— transmission heat transfer coefficient
— ventilation heat transfer coefficient
— building heat transfer coefficient
— intermittent heating or cooling
— heat gains
— internal heat gains
— solar irradiation
— solar heat gain
— useful heat gains
— gain utilization factor
— loss utilization factor

— heat balance ratio

3 Symbols and abbreviations

3.1 General

The International Standards dealing with energy performance of buildings introduce a large number of quantities and their associated symbols.

To facilitate the use of these International Standards, a common set of symbols and subscripts have been defined, as given in Tables 1 to 4. The symbols follow established International Standards on nomenclature, such as ISO 7345, and other symbols are introduced that are common to the set of International Standards needed to assess the energy performance of buildings, in particular a set of subscripts to distinguish between different energy uses, different energy carriers, etc.

The symbols given in this clause concern only data passed from one International Standard (or part of a multi-part International Standard) to another. Additional symbols and units may be used locally within each International Standard, but it is strongly recommended that the common symbols, subscripts and order be used.

NOTE The symbols and subscripts are based on those in CEN/TR 15615:2008, Annex D, with only editorial changes, except where mentioned otherwise. See also Annex B.

3.2 Principal symbols

Table 1 — Principal symbols in alphabetical order

Symbol	Quantity	Unit
A	area	m^2
b	temperature reduction factor	—
C	heat capacity	J/K·a
c	specific heat capacity	J/(kg·K) [a]
c	coefficient [d]	various
d	thickness	m
D	diameter	m
E	energy in general, including primary energy, energy carriers (except heat, auxiliary electricity and work)	kg, m^3, J [a, b]
EP	energy performance indicator	J/(m^2·a) [a], kg/(m^2·a), €/(m^2·a) [c]
f	factor [d]	-
H	heat transfer coefficient	W/K
h	surface coefficient of heat transfer	W/(m^2·K)
I	solar irradiance	W/m^2
L	length	m
m	mass (e.g. quantity of CO_2 emissions)	kg

[a] Hours (h) may be used as the unit of time instead of seconds for all quantities involving time (i.e. for time periods as well as for air change rates), but in that case the unit of energy is W·h instead of J.

[b] The unit depends on the type of energy carrier and the way the amount is expressed.

[c] The unit depends on the indicator chosen (see EN 15217:2007, Clause 5).

[d] Coefficients have dimensions; factors are dimensionless.

Table 1 *(continued)*

Symbol	Quantity	Unit
n	air exchange rate	l/h
N	number of items (integer only)	—
p	pressure	Pa
P	power in general including electrical power	W
Q	quantity of heat	J [a]
q	volumetric airflow rate	m^3/s
q	heat flow density	W/m^2
R	thermal resistance	$m^2 \cdot K/W$
T	thermodynamic temperature	K
t	time; period of time	S [a]
U	thermal transmittance	$W/(m^2 \cdot K)$
Ψ	linear thermal transmittance	$W/(m \cdot K)$
χ	point thermal transmittance	W/K
v	wind velocity	m/s
V	volume	m^3
W	(electrical) auxiliary energy	J [a]
x	relative humidity	%
X	volume fraction	%
Δ	delta (difference) prefix, to be combined with symbols	various
η	efficiency factor	—
θ	Celsius temperature	°C
Φ	heat flow rate, thermal power	W
ρ	density	kg/m^3
τ	time constant	s [a]

[a] Hours (h) may be used as the unit of time instead of seconds for all quantities involving time (i.e. for time periods as well as for air change rates), but in that case the unit of energy is W·h instead of J.

[b] The unit depends on the type of energy carrier and the way the amount is expressed.

[c] The unit depends on the indicator chosen (see EN 15217:2007, Clause 5).

[d] Coefficients have dimensions; factors are dimensionless.

3.3 Subscripts

Table 2 — Subscripts in alphabetical order

Subscript	Meaning
0	base; reference
a	air
A	other appliances
an	annual
aux	auxiliary
avg	time-average
B	building

Table 2 *(continued)*

Subscript	Meaning
bin	bin
bm	biomass
C	cooling
calc	calculated
CO_2	CO_2 emission
ctr	control
CW	cooling and domestic hot water
day	daily
del	delivered
dc	district cooling
dh	district heat
dhum	dehumidification (system)
dis	distribution
e	external; envelope
el	electricity
em	emission
est	estimated
exp	exported
f	floor
gas	gas
gen	generation
gn	gains
h	hourly
H	heating
HC	heating and cooling
HCW	heating, cooling and domestic hot water
ht	heat transfer
hum	humidification (system)
HW	heating and domestic hot water
in	input
int	internal
L	lighting
lat	latent
lf	liquid fuel
ls	losses
m	monthly
max	maximum
meas	measured
min	minimum
mn	mean (time or space)
nd	need

Table 2 *(continued)*

Subscript	Meaning
ntdel	net delivered
nrbl	non-recoverable
nrvd	not recovered
nren	non-renewable
nut	non-utilized
off	off
oil	oil
on	on
out	output
P	primary energy
pk	peak
Pnren	non-renewable primary energy
pr	produced
Ptot	total primary energy
pv	solar electricity (photovoltaic)
rbl	recoverable
red	reduced
ren	renewable energy
rvd	recovered
seas	seasonal
sens	sensible
sf	solid fuel
sol	solar
sp	space
st	storage
sys	system
T	thermal
Tot	total
tr	transmission heat transfer
us	Use
ut	utilized
V	ventilation
ve	ventilation heat transfer
w	wind
W	domestic hot water (DHW)
wd	wood
wk	weekly
Z	building zone

In some contexts, other subscripts might be needed. The categories are as given in Table 3.

NOTE Within any given context, the need for more than one extra level of subscript will be very rare.

Table 3 — Further subscripts

Spatial coverage		Time period		How acquired		Statistical	
B	building	wk	weekly	calc	calculated	avg	time-average
Z	building zone	day	daily	meas	measured	mn	mean (time or space) [a]
sp	space	h	hourly	est	estimated	max	maximum
		m	monthly			min	minimum
		seas	seasonal			pk	peak
		bin	bin				
		an	annual				

[a] The mean is used fora time and a spatial average (to be ascertained from the context).

3.4 More details and examples

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

Annex A
(normative)

Symbols and abbreviations — Further details and examples

A.1 General

This annex provides more details, in addition to those given in Clause 3, on the practical use of the symbols and subscripts given in Clause 3, including a consistent procedure for the order of the subscripts, plus a number of examples of their use.

NOTE Detailed rules are necessary in order to ensure transparency and consistency within and between related International Standards.

A.2 Order of subscripts

The subscripts are categorized into different levels, which are placed in the following order:

— 1st position: level 1 (if applicable);

— 2nd position: level 2 (if applicable);

— etc.

At each level, there might be different sets of subscripts, for different contexts.

NOTE In certain contexts, a distinction is required between the type of energy use (heating versus cooling versus ventilation, etc.), while in other contexts a distinction is needed between the energy carrier (gas versus oil versus electricity). But a distinction is never required between energy use for heating versus gas as the energy carrier.

The levels are hierarchical, to harmonize the order of the subscripts used in different International Standards.

EXAMPLE Recoverable ventilation system losses: $Q_{V,sys,ls,rbl}$ and not $Q_{ls,V,rbl}$.

Rule for omitting a level if not applicable

When the subscripts at a given level describe a subdivision which is not applicable, the subscript for that level is omitted.

Rule for omitting a level if obvious from context

Within an International Standard, if the quantity is not passed to other International Standards, one or more of the subscripts may be omitted, provided that the meaning is clear from the context (otherwise the full list of subscripts shall be used).

NOTE This rule is applied to avoid a long list of subscripts when a subscript is always the same in the given context.

EXAMPLE The subscript "calc" may be omitted from $Q_{V,sys,ls,rcb,calc}$ (so that it is written $Q_{V,sys,ls,rcb}$) within a clause dealing only with calculated quantities.

A.3 Terms for subscripts

The first three or four levels for heat and energy quantities are shown in Table A.1.

These may be followed by extra subscripts to indicate the spatial and/or time span (see Table A.2).

The list of subscripts was prepared using the following principles:

— There is a need for a balance between short subscripts and understandable subscripts. If a subscript is short but easily misunderstood, it is worse than a slightly longer subscript.

— Widely used subscripts should not be changed if there is no conflict with other subscripts, such as "int", "ext" and "out".

— "non-xxx" has same symbol as "xxx" but preceded by an "n".

EXAMPLE "ut" for "utilized" becomes "nut" for "non-utilized".

Table A.1 — The first four levels of subscripts

Level 1		**Level 2**		**Level 3**		**Level 4**	
Type of energy use		**Building without technical systems**		**Utilized or non-utilized**			
H	heating	nd	need	ut	utilized		
C	cooling	ht	heat transfer	nut	non-utilized		
W	DHW	tr	transmission heat transfer				
T	thermal	ve	ventilation heat transfer				
L	lighting	gn	gains				
V	ventilation	sol	solar				
A	appliances	int	internal				
XY	combination of H, C and W	sens	sensible				
Tot	total	lat	latent				
		Technical building system		**Balance item**		**Balance item**	
		us	use	ls	losses	rbl	recoverable
		sys	system	aux	auxiliary	rvd	recovered
		em	emission	in	input	nrbl	non-recoverable
		dis	distribution	out	output	nrvd	non-recovered
		st	storage				
		ctr	control				
		gen	generation				
		hum	humidification [a]				
		dhum	dehumidification [a]				
		Energy carrier		**Qualifier (where used)**		**Qualifier (which type)**	
		gas	gas	del	delivered	nren	non-renewable
		oil	oil	exp	exported	ren	renewable
		el	electricity	pr	produced		
		wd	wood	ntdel	net delivered		
		dh	district heating			**Aggregated quantity**	
		dc	district cooling				
		sf	solid fuel			P	primary energy

[a] Only at "need" level. Energy use for humidification is included in energy use for ventilation; energy use for dehumidification is included in energy use for cooling.

Table A.1 *(continued)*

Level 1		Level 2		Level 3		Level 4	
Type of energy use		Building without technical systems		Utilized or non-utilized			
		lf	liquid fuel			Ptot	total primary energy
		bm	biomass			Pnren	non-renewable primary fraction
		sol	solar heat			CO_2	CO_2 emission
		pv	solar electricity				

[a] Only at "need" level. Energy use for humidification is included in energy use for ventilation; energy use for dehumidification is included in energy use for cooling.

A.4 Further levels of subscripts

In some contexts, other subscripts might be needed. These are given in Table 3. The hierarchy is as given in Table A.2.

NOTE Within any given context, the need for more than one extra level will be very rare.

Table A.2 — Further subscripts

Level n + 1 Spatial coverage		Level n + 2 Time period		Level n + 3 How acquired		Level n + 4 Statistical	
B	building	wk	weekly	calc	calculated	avg	time-average
Z	building zone	day	daily	meas	measured	mn	mean (time or space) [a]
sp	space	h	hourly	est	estimated	max	maximum
		m	monthly			min	minimum
		seas	seasonal			pk	peak
		bin	bin				
		an	annual				

[a] The mean is used for a time and a spatial average (to be ascertained from the context).

A.5 Examples and comments

A.5.1 Heat quantities in a building

The first subscript (H, C or W) is normally only relevant if the second subscript is "need". Nevertheless, it could be relevant to make an explicit distinction between e.g. ventilation heat transfer in the heating mode and in the cooling mode.

EXAMPLE Normally Q_{ve} but exceptionally $Q_{\mathrm{C,ve}}$

No subscripts are specified for energy use for humidification and dehumidification because humidification and dehumidification are only used as an energy need. For the energy use, humidification is included in ventilation and dehumidification is included in cooling.

EXAMPLE Energy need for dehumidification: Q_{dhum}

The first subscript T (thermal) is only relevant in a context where the second subscript might be interpreted as not being about the thermal balance.

EXAMPLE Normally Q_{ve} but exceptionally $Q_{\mathrm{T,ve}}$

Needs are only defined for thermal energies (heating, cooling, DHW), but not for ventilation and lighting.

EXAMPLES Energy need for heating: $Q_{H,nd}$

Transmission and ventilation heat transfer: Q_{ht}

Transmission heat transfer: Q_{tr}

Ventilation heat transfer: Q_{ve}

Total gains: Q_{gn}

Internal gains: Q_{int}

Solar gains: Q_{sol}

Total gains can be utilized or non-utilized. This can be specified at the third level.

EXAMPLE Utilized gains: $Q_{gn,ut}$

Non-utilized gains in zone 1: $Q_{gn,nut,Z1}$

A.5.2 Heat (Q) or energy (E) quantities in a technical building system

For each sub-system, subscripts are needed for input, output, losses and auxiliary energy.

When there are two generators for one use, e.g. solar and conventional for domestic hot water, or CHP and boiler for heating, this is indicated by numbers added to the subscript.

Subscripts at the first level are combined when there are generation systems or distribution systems or emission systems which are common to different uses.

EXAMPLES Q_{HC}, Q_{HW}, Q_{CW}, Q_{HCW}

The input to a boiler (a heat generator) is oil or gas and not heat, and for a heat pump it is electricity. Therefore the symbol for input to a generator is E not Q. The generator generates heat using an energy carrier as input.

EXAMPLES Energy input to a heat generator: $E_{H,gen,in}$

Energy input to heat generator 1 (part of energy use for heating in case of more than one generator): $E_{H,gen,in,1}$

Auxiliary energy use for a heating system: $W_{H,sys,aux}$

Heat output of a heat generator: $Q_{H,gen,out}$

Energy input to a common generator for heat and DHW: $E_{HW,gen,in}$

Heat input into the common distribution system 1 for heat and DHW: $Q_{HW,dis,in,1}$

Heat output of heat distribution system 1: $Q_{H,dis,out,1}$

Heat output of solar water heater if renewable energy produced on site is part of the delivered energy: $Q_{W,sol,del}$

Heat output of solar water heater if renewable energy produced on site is not part of the delivered energy: $Q_{W,sol,out}$

Heat input into DHW distribution system: $Q_{W,dis,in}$

Energy (electricity) input to lighting system: $E_{L,sys}$

Energy (electrical) input to ventilation system: E_V

For thermal system losses, the subscript "sys" refers to the whole system for the use indicated. "gen", "dis", etc., refer to the generation system, the distribution system, etc., for the use indicated.

EXAMPLES Thermal losses of the common generator for space heating and hot water: $Q_{HW,gen,ls}$

Total thermal losses of the heating system (generation, distribution, control, etc.): $Q_{H,sys,ls}$

Recoverable part of the thermal system losses of the heating system: $Q_{H,sys,ls,rbl}$

A.5.3 Energy outside a building

Energy use can be distinguished by the service concerned.

EXAMPLES E_H, E_C, E_W, E_V, E_L, E_A

E_L, and E_V are always electricity, for which a second subscript is not usually needed.

The thermal uses E_H, E_C and E_W can be satisfied by several energy carriers, and a second subscript might be needed.

EXAMPLES For E_H, this could be $E_{H,oil}$, $E_{H,gas}$, $E_{H,el}$, $E_{H,wd}$ or $E_{H,dh}$.

Renewable energy is distinguished from non-renewable energy by an additional subscript.

EXAMPLES Renewable part of the exported thermal energy: $E_{T,exp,ren}$

Non-renewable part of the exported thermal energy: $E_{T,exp,nren}$

NOTE The use or service (H, C, W, ...) is not relevant when the energy is exported. It is, however, relevant that it is thermal energy.

A.5.4 Primary energy

It might be necessary to distinguish primary energy by energy carrier.

EXAMPLE Primary energy for gas: $E_{gas,P}$

A subscript is added to distinguish between primary energy including renewable energy, and non-renewable primary energy.

EXAMPLES Primary energy for wood with the total primary energy factor: $E_{wd,Ptot}$

Non-renewable primary energy for wood: $E_{wd,Pnren}$

A subscript is added to distinguish between exported and delivered primary energy.

EXAMPLE $E_{el,exp,Ptot}$ and $E_{el,del,Ptot}$

A.5.5 Extra levels

Subscript B (for building) may be used to distinguish between quantities for the whole building and quantities for a conditioned zone. In the general case, the subscript B is not necessary.

EXAMPLE Ventilation heat transfer at the zone level: $Q_{ve,z}$

Numbering of zones, generators, distribution systems, etc., is done by adding a number to the appropriate subscript.

EXAMPLE Ventilation heat transfer in zone Z*j*: $Q_{\mathrm{ve,Z}j}$

Annex B
(informative)

Translation of symbols and subscripts into French and German

B.1 Symbols

Table B.1 — Principal symbols in alphabetical order

Symbol	Quantity	French term	German term
A	area	aire, surface	Fläche
b	temperature reduction factor	facteur de réduction de température	Temperatur-Reduktionsfaktor
C	heat capacity	capacité thermique	Wärmespeicherfähigkeit
c	specific heat capacity	chaleur spécifique	spezifische Wärmekapazität
c	coefficient	coefficient	Koeffizient
d	thickness	épaisseur	Dicke
D	diameter	diamètre	Durchmesser
E	energy in general, including primary energy and energy carriers (except heat, auxiliary electricity and work)	énergie en général, y.c. énergie primaire, agents énergétiques (à part la chaleur, l'électricité auxiliaire et le travail)	Energie (generell), inkl. Primärenergie, Energieträger (ausser Wärme, elektrische Hilfsenergie und Arbeit)
EP	energy performance indicator	indice de performance énergétique; indice énergétique	Energiekennzahl
f	factor	facteur	Faktor
H	heat transfer coefficient	coefficient de transfert de chaleur	Wärmetransferkoeffizient
h	surface coefficient of heat transfer	coefficient de transfert de chaleur superficiel	Wärmeübergangskoeffizient
I	solar irradiance	irradiance	solare Strahlungsintensität
L	length	longueur	Länge
m	mass (e.g. quantity of CO_2 emissions)	masse (par ex. quantité d'émission de CO2)	Masse (z.B. Menge der CO_2-Emissionen)
n	air exchange rate	taux de renouvellement d'air	Luftwechselrate
N	number of items (integer only)	nombre (entier seulement)	Anzahl (ganzzahlig)
p	pressure	pression	Druck
P	power in general, including electrical power	puissance en général, y.c. puissance électrique	Leistung generell, inkl. elektrische Leistung
Q	quantity of heat	quantité de chaleur	Wärmemenge
q	volumetric airflow rate	débit volumique d'air	Luftvolumenstrom
q	heat flow density	densité de flux de chaleur	Wärmestromdichte
R	thermal resistance	résistance thermique	Wärmedurchlasswiderstand
T	thermodynamic temperature	température thermodynamique	thermodynamische Temperatur

Table B.1 *(continued)*

Symbol	Quantity	French term	German term
t	time; period of time	temps; intervalle de temps	Zeit; Zeitintervall
U	thermal transmittance	coefficient de transmission thermique	Wärmedurchgangskoeffizient
Ψ	linear thermal transmittance	coefficient linéique de transmission thermique	längenbezogener Wärmedurchgangskoeffizient
χ	point thermal transmittance	coefficient ponctuel de transmission thermique	punktbezogener Wärmedurchgangskoeffizient
V	volume	volume	Volumen
W	(electrical) auxiliary energy	énergie auxiliaire (électrique)	Hilfsenergie (elektrisch)
x	relative humidity	humidité relative	relative Luftfeuchtigkeit
X	volume fraction	fraction en volume	Volumenanteil
Δ	delta (difference) prefix, to be combined with symbols	préfixe combiné avec un symbole pour noter une différence	Differenz (Vorsatz vor einem Symbol)
η	efficiency factor	rendement	Wirkungsgrad
θ	Celsius temperature	température Celsius	Celsius-Temperatur
Φ	heat flow rate, thermal power	flux de chaleur, puissance thermique	Wärmestrom. Wärmeleistung
ρ	density	masse volumique	Dichte
τ	time constant	constante de temps	Zeitkonstante

B.2 Subscripts

Table B.2 — Subscripts in alphabetical order

Subscript	English	French	German
0	base; reference	base; référence	Basis; Referenz
a	air	air	Luft
A	other appliances	appareils; équipement	Geräte; Betriebseinrichtungen
an	annual	annuel	jährlich
aux	auxiliary	auxiliaire	Hilfs-
avg	time-average	moyenne temporelle	zeitlicher Durchschnitt
B	building	bâtiment	Gebäude
bin	Bin	boîte	Kasten
bm	biomass	biomasse	Biomasse
C	cooling	refroidissement	Kühlung
calc	calculated	calculé	berechnet
CO_2	CO_2 emission	émission de CO_2	CO_2-Emission
ctr	control	contrôle	Regelung
CW	cooling and DHW	refroidissement et eau chaude	Kühlung und Wassererwärmung
day	daily	journalier	täglich
del	delivered	livré	geliefert

Table B.2 *(continued)*

Subscript	English	French	German
dc	district cooling	refroidissement urbain	Fernkälte
dh	district heat	chauffage urbain	Fernwärme
dhum	dehumidification (system)	déshumidification (système)	Entfeuchtung (System)
dis	distribution	distribution	Verteilung
e	external; envelope	extérieur; enveloppe	aussen; Gebäudehülle
el	electricity	électricité	Elektrizität
em	emission	émission	Wärmeabgabe
est	estimated	estimé	geschätzt
exp	exported	exporté	zurückgeliefert
f	floor	plancher	Boden
gas	gas	gaz	Gas
gen	generation	génération	Erzeugung
gn	gains	gains	Gewinne
h	hourly	horaire	stündlich
H	heating	chauffage	Heizung
HC	heating and cooling	chauffage et refroidissement	Heizung und Kühlung
HCW	heating, cooling and DHW	chauffage, refroidissement et eau chaude	Heizung, Kühlung und Wassererwärmung
ht	heat transfer	transfert de chaleur	Wärmedurchgang
hum	humidification (system)	humidification (système)	Befeuchtung
HW	heating and DHW	chauffage et eau chaude	Heizung und Wassererwärmung
in	input	donnée; entrée	Input
int	internal	interne	intern; innen
L	lighting	éclairage	Beleuchtung
lat	latent	latent	latent
lf	liquid fuel	combustible liquide	flüssiger Brennstoff
ls	losses	pertes; déperditions	Verluste
m	monthly	mensuel	monatlich
max	maximum	maximum	Maximum
meas	measured	mesuré	gemessen
min	minimum	minimum	Minimum
mn	mean (time or space)	moyenne (temporelle ou spatiale)	Durchschnitt (zeitlich und räumlich)
nd	need	besoins	Nutzenergiebedarf
ntdel	net delivered	livré net	netto geliefert
nrbl	non-recoverable	non récupérable	nicht rückgewinnbar
nrvd	not recovered	non récupéré	nicht rückgewonnen
nren	non-renewable	non renouvelable	nicht erneuerbar
nut	non-utilized	non utilisé	nicht genutzt
off	off	déclenché	aus
oil	oil	fioul, mazout	Oel

Table B.2 *(continued)*

Subscript	English	French	German
on	on	enclenché	an
out	output	sortie	Output
P	primary energy	énergie primaire	Primärenergie
pk	peak	pic	Spitze
Pnren	non-renewable primary energy	énergie primaire, non renouvelable	nicht erneuerbare Primärenergie
pr	produced	produit	produziert
Ptot	total primary energy	énergie primaire totale	gesamte Primärenergie
pv	solar electricity (photovoltaic)	photovoltaïque	Photovoltaik
rbl	recoverable	récupérable	rückgewinnbar
red	reduced	réduit	reduziert
ren	renewable energy	énergie renouvelable	erneuerbar
rvd	recovered	récupéré	rückgewonnen
seas	seasonal	saisonnier	saisonal
sens	sensible	sensible	sensibel
sf	solid fuel	combustible solide	fester Brennstoff
sol	solar	solaire	solar
sp	space	espace	Raum
st	storage	accumulation, stockage	Speicherung
sys	system	système	System
T	thermal	thermique	thermisch
Tot	total	total	total
tr	transmission heat transfer	transmission de chaleur	Transmission
us	use	utilisation	Energiebedarf (berechnet); Energieverbrauch (gemessen)
ut	utilized	utilisé	genutzt
V	ventilation	ventilation	Lüftung
ve	ventilation heat transfer	transfert de chaleur par ventilation	Wärmetransfer durch Lüftung (Konvektion)
W	domestic hot water (DHW)	eau chaude sanitaire	Wassererwärmung
wd	wood	bois	Holz
wk	weekly	hebdomadaire	wöchentlich
Z	building zone	zone dans le bâtiment	Gebäudezone

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