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Energy performance of buildings — Schedule and condition of building, zone and space usage for energy calculation —

Part 1: Non-residential buildings

Performance énergétique des bâtiments — Plan et conditions d'utilisation des espaces, zones et bâtiments pour le calcul d'énergie —

Partie 1: Bâtiments non résidentiels

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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.

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

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

The committee responsible for this document is ISO/TC 163, *Thermal Performance and energy use in the built environment*.

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Introduction

There is a strong need to improve the environment to make the evaluation of energy performance of buildings more reliable and practical, so that energy efficiency of buildings is improved by referring to the evaluation results. To realize such environment, one important standard on how to prescribe the ways of using buildings has been missed, even though many assumptions on the building usage have appeared in standards relevant to the energy calculation.

This document prescribes the indispensable information on the formats to express the usage of building, zone and space in energy calculation for non-residential buildings.

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Energy performance of buildings — Schedule and condition of building, zone and space usage for energy calculation —

Part 1:
Non-residential buildings

1 Scope

This document specifies the formats to present schedule and condition of building, zone and space usage, which is to be referred to as input data of energy calculations for non-residential buildings.

The schedule and condition include schedules of occupancy, operation of technical building systems, ventilation rate, hot water usage and internal heat gains due to occupancy, lighting and equipment.

This document also gives categories of building, zone and space according to differentiating schedule and condition.

Depending on necessary minuteness of the energy calculation, different levels of schedule and condition from the view point of time and space averaging are specified.

The values and categories for the schedule and condition are given in annexes for more information for the application when the users of this document do not have detailed information on the values and categories for the schedule and condition.

The schedule and condition in this document is basically different from assumptions in order to determine the size of technical building systems in the process of design, where possible largest values are to be assumed. Instead, most usual and average values, which are assumed for the building energy calculation, are dealt with in this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Space

3.1.1
space
part of a room, a room or group of adjacent rooms with assumed uniform properties for all considered types of *zones* (3.1.2)

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3.1.2
zone
part of a *building* (3.1.3) consisting of (part of) one or more spaces with assumed uniform properties related to a specific service or service component, or (in absence of a service) assumed uniform indoor environmental conditions

3.1.3
building
construction as a whole, including its envelope and all *technical building systems* (3.3.5), where energy is used to condition the indoor thermal environment and to provide domestic hot water, lighting according to visual tasks and other services related to the use of the building

3.1.4
thermally conditioned space
thermally conditioned zone
heated and/or cooled *space* (3.1.1) or *zone* (3.1.2)

3.1.5
thermally unconditioned space
thermally unconditioned zone
space (3.1.1) or *zone* (3.1.2) that is not heated nor cooled

3.2 Schedule

3.2.1
schedule
information on condition(s) of usage of *building* (3.1.3), *zone* (3.1.2) or *space* (3.1.1) throughout a cycle of period, such as day, week, month, season and year

3.2.2
daily schedule
conditions (3.3.1) of *occupancy* (3.3.2), service system operations, requirement for the functions of the service systems and internal heat gains in each time of a day

3.2.3
daily schedule with hourly conditions
set of hourly *conditions* (3.3.1) of *occupancy* (3.3.2), service system operations, requirement for the functions of the service systems and internal heat gains in a day

3.2.4
set of daily schedules
complete set of daily schedules representing usage of a category of *building* (3.1.3), *zone* (3.1.2) or *space* (3.1.1) in one year

3.2.5
daily operating hours
hours when service system is operated or the length of the hours

3.2.6
annual operating hours
total length of hours in the *standard year* (3.2.15) when *technical building system* (3.3.5) is operated

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3.2.7
annual schedule
allocation of *daily schedule(s)* (3.2.2) for one year

Note 1 to entry: Division of the year can be selected from 365 days, 53 weeks, 12 months, seasons or no division [a *set of daily schedules* (3.2.4) is uniformly applied throughout the year].

3.2.8
seasonal schedule
allocation of *daily schedule(s)* (3.2.2) to each season of the year

3.2.9
monthly schedule
allocation of *daily schedule(s)* (3.2.2) to each month of the year

3.2.10
weekly schedule
allocation of *daily schedule(s)* (3.2.2) to each week of the year

3.2.11
whole set of annual schedules
complete set of *annual schedules* (3.2.7) representing usage of all types of *building* (3.1.3), *zone* (3.1.2) and *space* (3.1.1), as objects of *energy calculation* (3.3.20)

3.2.12
whole set of seasonal schedules
complete set of *seasonal schedules* (3.2.8) representing usage of all types of *building* (3.1.3), *zone* (3.1.2) and *space* (3.1.1), as objects of *energy calculation* (3.3.20)

3.2.13
whole set of monthly schedules
complete set of *monthly schedules* (3.2.9) representing usage of all types of *building* (3.1.3), *zone* (3.1.2) and *space* (3.1.1), as objects of *energy calculation* (3.3.20)

3.2.14
number of days in one year
total number of days, which shall be 365

3.2.15
standard year
selected year, of which number of day has to be 365 and arrangement of weekdays, weekends and holidays are referred in weekly, monthly, seasonal and *annual schedules* (3.2.7)

3.3 Parameters for conditions of building, zone and space usage

3.3.1
condition
status of *occupancy* (3.3.2), operation of service systems, requirement for the functions of the *technical building systems* (3.3.5) and internal heat gains

3.3.2
occupancy
presence of users in *building* (3.1.3), *zone* (3.1.2) or *space* (3.1.1)

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3.3.3
occupancy density
number of present user in *building* (3.1.3), *zone* (3.1.2) or space per unit floor area of the *space* (3.1.1)

Note 1 to entry: Occupancy density is used mainly for the calculations for space heating/cooling and ventilation.

3.3.4
simultaneous usage ratio (of a set of spaces)
ratio of the number of *zones* (3.1.2) or *spaces* (3.1.1), which belong to a group of zones and spaces and are occupied or used at the time, to the total number of zones or spaces in the group

Note 1 to entry: This concept is applied to a group of zones or spaces of the same category, such as a group of guest rooms in hotels, a series of personal office rooms in office buildings, etc.

3.3.5
technical building system
all energy-using or energy-distributing components in a *building* (3.1.3) that are operated to support the occupant or process functions housed therein

Note 1 to entry: These include HVAC, domestic hot water, illumination, transportation, laundering or similar functions.

3.3.6
luminaire
apparatus which distributes, filters or transforms the light transmitted from one or more lamps

Note 1 to entry: Except for the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply

[SOURCE: CIE S 017/E: 2011, 17–707]

3.3.7
in operation
status of a *technical building system* (3.3.5), in which the technical building system can function to satisfy the requirement for the technical building system, such as the set-point temperature and the *maintained average illuminance* (3.3.9)

Note 1 to entry: When the requirement is satisfied without its functioning, the technical building system stands by.

3.3.8
out of operation
status of a *technical building system* (3.3.5) in which the technical building system cannot function regardless of the relevant requirement or due to inexistence of any requirement for the technical building system

3.3.9
maintained average illuminance
value below which the average illuminance over the specified surface is not allowed to fall, lux

[SOURCE: CIE S 017/E: 2011, 17–750]

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3.3.10
height of the working plane
height of the plane, on which the assumed visual task is done, from the floor

Note 1 to entry: It is expressed in metres (m).

3.3.11
demand control ventilation
ventilation, of which rate is controlled according to the necessity of the ventilation, such as to the emission rate of target pollutant

3.3.12
energy need for space heating and cooling
heat to be delivered to or extracted from a conditioned *space* (3.1.1) to maintain the intended temperature and/or humidity conditions during a given period of time

3.3.13
energy use for space heating and cooling
energy input to the heating and cooling system to satisfy the *energy need for space heating and cooling* (3.3.12)

3.3.14
energy need for ventilation for outdoor air supply
work by electric motors to convey outdoor air to satisfy ventilation requirement

3.3.15
energy use for ventilation for outdoor air supply
energy input to the ventilation system to satisfy the *energy need for ventilation for outdoor air supply* (3.3.14)

3.3.16
energy need for domestic hot water
heat to be delivered to the needed amount of domestic hot water to raise its temperature from the cold network temperature to the prefixed delivery temperature at the delivery point

3.3.17
energy use for domestic hot water
energy input to the domestic hot water system to satisfy the *energy need for domestic hot water* (3.3.16)

3.3.18
energy use for lighting
energy consumed by *luminaires* (3.3.6) and lamps

3.3.19
energy use for transportation
energy consumed by equipment for transportation, such as elevators

3.3.20
energy calculation
calculation of energy uses for *technical building systems* (3.3.5)

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3.4 Descriptions for daily schedule

3.4.1
reference ventilation requirement
most probable estimation of outdoor air supply (in volume flow rate per unit floor area or in air change per hour) to the *space* (3.1.1) or *zone* (3.1.2) in compliance with relevant regulation

3.4.2
reference domestic hot water usage
maximum hourly service hot water usage by users of the *space* (3.1.1) or *zone* (3.1.2) in volume flow rate per person, in volume flow rate per unit floor area or in volume flow rate per bed

Note 1 entry: The volume flow rate is calculated with the assumption on hot water temperature.

3.4.3
total daily usage of domestic hot water
total volume of service hot water usage in one day in volume per person, in volume per unit floor area or in volume per bed

Note 1 entry: The volume flow rate is calculated with the assumption on hot water temperature.

3.4.4
reference occupancy density
maximum hourly *occupancy density* (3.3.3) of the *space* (3.1.1) or *zone* (3.1.2) in person per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), occupancy density at the time can be calculated.

3.4.5
reference heat gain due to person
maximum hourly total (sensitive and latent) heat gain due to person inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), heat gain due to person at the time can be calculated.

3.4.6
reference sensible heat gain due to person
maximum hourly sensible heat gain due to person inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), sensible heat gain due to person at the time can be calculated.

3.4.7
reference latent heat gain due to person
maximum hourly latent heat gain due to person inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), latent heat gain due to person at the time can be calculated.

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3.4.8
reference heat gain due to lighting
maximum hourly sensible heat gain due to lighting inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by hourly ratios, heat gain due to lighting at the time can be calculated.

3.4.9
reference heat gain due to appliances
maximum hourly total (sensible and latent) heat gain due to appliances inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), heat gain due to appliances at the time can be calculated.

3.4.10
reference sensible heat gain due to appliances
maximum hourly sensible heat gain due to appliances inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), sensible heat gain due to appliances at the time can be calculated.

3.4.11
reference latent heat gain due to appliances
maximum hourly latent heat gain due to appliances inside the room or *zone* (3.1.2) in watt per unit floor area

Note 1 to entry: To be multiplied by *hourly ratios* (3.4.12), latent heat gain due to appliances at the time can be calculated.

3.4.12
hourly ratio
ratio of hourly value of parameters to their reference value

Note 1 to entry: Multiplying hourly ratios by the reference value, hourly values of the parameter can be calculated.

4 Framework of the schedule and condition for building energy calculation

4.1 Indispensable schedules

The building energy calculations are characterized by the division number of the year, the calculation period or the calculation interval. Each calculation method has its appropriate calculation interval according to characteristics of the target physical phenomenon (for example, unsteadiness) and minuteness of the calculation responding to changes of climatic condition, occupants' behaviour, behaviour of service systems and so on.

Due to the variety of calculation method, there is a variety of form of the schedule and condition of building, zone and space usage. Nevertheless, there is a fundamental unit of form, daily schedule, which shall be included in forms for the schedule and condition. The daily schedule corresponds to the minimum cycle of building, zone and space usage, and also of climatic and solar condition.

Some nations adopt so called "monthly calculation" for space heating and cooling energy needs and uses, taking monthly variation of outdoor temperature and solar irradiance into consideration. One daily schedule for business day and the number of the business days is given to each month for each type of building, zone and space. Monthly means of outdoor air condition (for example, temperature)

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