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

**Part 2:  
Residential buildings**

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

ISO 18523-2:2018

*Partie 2: Bâtiments 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](http://www.iso.org/directives)).

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

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A list of all parts in the ISO 18523 series can be found on the ISO website.

## 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. There have been no international standards prescribing building use in this area. This document prescribes the indispensable information on the conditions for zone and space usage in energy calculations for residential buildings.

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

## Part 2: Residential buildings

### 1 Scope

This document specifies the formats to present the schedule and conditions of zone and space usage (referred to as input data of energy calculations) for residential buildings.

The schedule and conditions include schedules of occupancy, operation of technical building systems, ventilation rates, hot water usage, usage of appliances and internal heat gains due to occupancy, lighting and appliances. The schedule and conditions for lighting are applicable to fixed installed lighting fixtures.

This document also gives categories of residential building, zone and space according to differentiating schedule and condition. For residential buildings or its housing units which contain any category of space or zone of non-residential buildings, ISO 18523-1 applies.

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 included informatively.

**NOTE** 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 or smallest values are assumed. Instead, most usual and average values, which are assumed for the building energy calculation, are dealt with in this document.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18523-1, *Energy performance of buildings — Schedule and condition of building, zone and space usage for energy calculation — Part 1: Non-residential buildings*

### 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

##### **apartment block**

*building* (3.1.2), which contains multiple *housing units* (3.1.8)

#### 3.1.2

##### **building**

construction as a whole, including its envelope and all *technical building systems* (3.3.13), where energy is used to condition the indoor environment, to provide domestic hot water and illumination and other services related to the use of the building

#### 3.1.3

##### **building zone**

##### **zone**

part of a building 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

#### 3.1.4

##### **common space**

<apartment block>indoor or outdoor space, which is commonly used by residents

#### 3.1.5

##### **thermally conditioned space**

##### **thermally conditioned zone**

heated and/or cooled space (zone)

#### 3.1.6

##### **elementary space**

##### **space**

part of a room, a room or group of adjacent rooms with assumed uniform properties for all considered types of zones

#### 3.1.7

##### **habitable room**

room that is continuously used for living, working, meeting, amusement and other purposes similar thereto

Note 1 to entry: Spaces such as bathroom, washroom, toilet, entrance hall or corridor are excluded.

#### 3.1.8

##### **housing unit**

*single-family house* (3.1.9) or apartment (flat or maisonette) of *apartment blocks* (3.1.1)

#### 3.1.9

##### **single-family house**

##### **detached house**

independent residential building, where a family lives

#### 3.1.10

##### **thermally unconditioned space**

##### **thermally unconditioned zone**

space (zone) that is not heated nor cooled

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## 3.2 Schedule

### 3.2.1

#### annual operation hours

##### operation hours

total length of hours in a *standard year* (3.2.11) when a *technical building system* (3.3.13) can be operated depending on necessity

### 3.2.2

#### annual schedule

allocation of *daily schedule(s)* (3.2.4) 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 is uniformly applied throughout the year).

### 3.2.3

#### daily operating hours

hours when a service system is operated, or the length of the hours

### 3.2.4

#### daily schedule

conditions of occupancy, service system operations, requirement for the functions of the service systems and internal heat gains at each time of a day

### 3.2.5

#### daily schedule with hourly conditions

set of hourly conditions of occupancy, service system operations, requirement for the functions of the service systems and internal heat gains in a day

### 3.2.6

#### monthly schedule

allocation of *daily schedule(s)* (3.2.4) for each month of the year

### 3.2.7

#### seasonal schedule

allocation of *daily schedule(s)* (3.2.4) to each season of the year

### 3.2.8

#### schedule

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

### 3.2.9

#### set of daily schedules

complete set of daily schedules representing usage of a category of building, zone or space in one year

### 3.2.10

#### standard year

selected year, of which the number of days has to be 365 and arrangement of weekdays, weekends and holidays are referred in weekly, monthly, seasonal and annual schedules

### 3.2.11

#### weekly schedule

allocation of *daily schedule(s)* (3.2.4) to each week of the year

### 3.2.12

#### whole set of annual schedules

complete set of *annual schedules* (3.2.2) representing usage of all types of building, zone and space, as objects of energy calculation

3.2.13

**whole set of seasonal schedules**

complete set of *seasonal schedules* (3.2.7) representing usage of all types of building, zone and space, as objects of energy calculation

3.2.14

**whole set of monthly schedules**

complete set of *monthly schedules* (3.2.6) representing usage of all types of building, zone and space, as objects of energy calculation

3.3 Parameters for conditions of building, zone and space usage

3.3.1

**appliances**

consumer electronics and machines for housekeeping

3.3.2

**condition**

status of *occupancy* (3.3.9), operation of service systems, requirement for the functions of the *technical building systems* (3.3.13) and internal heat gains

3.3.3

**demand control ventilation**

ventilation with a rate controlled according to the necessity of the ventilation, such as the emission rate of target pollutant

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3.3.4

**local exhaust ventilation**

mechanical exhaust ventilation for eliminating contaminants, such as odour, combustion gases, water vapour and oil mist, from nearby sources

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3.3.5

**height of the working plane**

height of the plane on which the assumed visual task is carried out, from the floor

Note 1 to entry: Height of the working plane is expressed in metres, m.

3.3.6

**height of the specified surface**

height of the plane on which the requirement for the ambient lighting is assumed, from the floor

Note 1 to entry: Height of the specified surface is expressed in metres, m.

3.3.7

**luminaire**

apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except 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

3.3.8

**maintained average illuminance**

value below which the average illuminance over the specified surface is not allowed to fall

Note 1 to entry: Maintained average illuminance is expressed in lux.

3.3.9

**occupancy**

presence of users in building, zone or space

**3.3.10****occupancy density**

number of present users in building, zone or room per unit floor area of the space

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

**3.3.11****overall ventilation**

ventilation for supplying outdoor air into indoor spaces to dilute general contaminants, such as formaldehyde, CO<sub>2</sub> and water vapour

**3.3.12****simultaneous usage ratio**

<set of spaces>ratio of the number of zones or spaces 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.

**3.3.13****technical building system**

all energy-using or -distributing components in a building that are operated to support the occupant or process functions housed therein (including HVAC, domestic hot water, illumination, transportation, laundering or similar functions)

**3.3.14****movable fitting**

movable part of openings, which is used for the purposes of, for example, solar shading, adding insulation, ventilation and security

**3.4 Descriptions for daily schedule****3.4.1****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 is calculated. This shall be calculated in accordance with ISO 18523-1.

**3.4.2****reference domestic hot water usage**

maximum hourly service hot water usage by users of the space or zone

Note 1 to entry: Measured in volume flow rate per person, in volume flow rate per unit floor area or in volume flow rate per bed.

Note 2 to entry: The volume flow rate is calculated with the assumption on hot water temperature.

**3.4.3****reference heat gain due to appliances**

maximum hourly total (sensible and latent) heat gain due to appliances inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, heat gain due to appliances at the time can be calculated.

**3.4.4****reference heat gain due to person**

maximum hourly total (sensible and latent) heat gain due to person inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratio, heat gain due to person at the time can be calculated.

### 3.4.5

#### **reference heat gain due to lighting**

maximum hourly sensible heat gain due to lighting inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, heat gain due to lighting at the time can be calculated.

### 3.4.6

#### **reference latent heat gain due to appliances**

maximum hourly latent heat gain due to appliances inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, latent heat gain due to appliances 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

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, latent heat gain due to person at the time can be calculated.

### 3.4.8

#### **reference occupancy density**

maximum hourly occupancy density of the space or zone

Note 1 to entry: Measured in person per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, occupancy density at the time can be calculated.

### 3.4.9

#### **reference sensible heat gain due to appliances**

maximum hourly sensible heat gain due to appliances inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratios, sensible heat gain due to appliances at the time can be calculated.

### 3.4.10

#### **reference sensible heat gain due to person**

maximum hourly sensible heat gain due to person inside the room or zone

Note 1 to entry: Measured in watt per unit floor area.

Note 2 to entry: To be multiplied by hourly ratio, sensible heat gain due to person at the time can be calculated.

### 3.4.11

#### **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 or zone

### 3.4.12

#### **total daily usage of domestic hot water**

total volume of service hot water usage in one day

Note 1 to entry: Measured in volume per person, in volume per unit floor area, in volume per bed or in volume per household (housing unit).

Note 2 to entry: The volume is calculated with the assumption of hot water temperature.

## 4 Framework of the schedule and condition for building energy calculation

### 4.1 Indispensable schedules

The energy calculations for residential buildings 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, status 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 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 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 workday and the number of the workdays is given to each month for each type of zone and space. Monthly means of outdoor air condition (for example, temperature) and solar irradiance for different orientations and inclinations are given for the calculation. The expression of the daily schedule varies from detailed expression with hourly values to simplified expression such as daily mean values and the like. Additional schedule for holiday can be given in a simplified way such as only with daily mean values.

Similarly, in so called "seasonal standard", one daily schedule for workday and the number of the workdays for each season are given to each season for each type of zone and room, and the calculation is done with seasonal mean values for climatic condition.

For the calculation of more steady phenomena, so called "annual calculation" can work if seasonal change of solar condition is integrated throughout the year and condensed in specific coefficients. Nevertheless, one daily schedule for a workday and the number of annual workdays are necessary. Additional daily schedules for holiday can be given.

For the calculation of lighting, monthly or yearly calculation is mainly used, even though unsteady aspects of lighting still have to be dealt with. In the calculation for lighting, when input parameters such as operating hours with and without daylight are prescribed, a daily schedule as described in column (2) of [Table 1](#) and annual schedule by monthly allocation of daily schedules ([Table 5](#)) or annual schedule without division of the year ([Table 7](#)) should be explicitly given, so that the operating hours for light are well harmonized with those for other technical systems.

Therefore, for each category of zone and space, a necessary number of daily schedules (e.g., two daily schedules for workday and holiday), and one of annual, seasonal, monthly and weekly schedules shall be given in order that the daily schedules are allocated for the year.

### 4.2 Daily schedule

The daily schedule shall contain hourly values of conditions for one day, or shall contain condensed or simplified information on conditions for the day. With some assumptions, the hourly detailed values can be generated from the condensed or simplified information and used even for detailed calculation. If necessary, multiple daily schedules representing different daily patterns of usage should be given such as for workdays, holidays and going-out days. The number of daily schedules depends on minuteness of the schedule and conditions as well as on the category of zone and space under consideration.

The conditions described in the daily schedule are grouped into five categories:

- a) General information on occupancy and usage of zone and space;
- b) Operation of technical building systems and requirement for their services;
- c) Usage of appliances;