INTERNATIONAL STANDARD

ISO 6243

First edition
1997-07-01

Climatic data for building design — Proposed system of symbols

Données climatiques pour la conception des bâtiments — Système de symboles proposé

Reference number
ISO 6243:1997(E)

Contents

		Page
1	Scope	1
2	Air temperature	1
3	Solar radiation (thermal)	2
4	Solar radiation (light)	3
5	Long-wave radiation	3
6	Total radiation	3
7	Radiation balance	3
8	Atmospheric humidity	3
9	Wind	4
10	Rain	4
11	Snow	5

Annexes

A	Letter symbols to represent climatological descriptions	6
B	Bibliography	17

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

Printed in Switzerland

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.

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.

International Standard ISO 6243 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 3, *Functional/user requirements and performance in building construction.*

Annexes A and B of this International Standard are for information only.

Introduction

Many types of climatological data are used to define the nature and severity of external conditions with a view to establishing building performance. This International Standard gives precise definitions, gives guidance on methods and units of measurement, and proposes letter symbols for a series of meteorological parameters used for building design, in most cases by reference to the "World Meterological Organization Guide" (WMO). It also defines a number of parameters in current usage. The different values of climatological parameters may be used in different aspects of design. The data defined in this International Standard are linked to a series of applications such as heating and ventilation design, the calculation of energy consumption, structural design, rainwater drainage and the durability of materials. This International Standard is limited to relatively simple measurements and excludes derived values such as the distributions of frequency, except when discussing illuminance.

Annex A gives letter symbols to represent climatological descriptions. This provides a system, independent of language, to express statistical quantities concisely.

Once this system has been understood and assimilated, it will provide precise designations, irrespective of the language used, and should therefore facilitate the international exchange and use of climatological data. It is proposed that the symbols be used in databases in conjunction with written descriptions in the language for the country of origin of the data. This should be of particular assistance for data that are not presented in one of the international languages. However, the usefulness of this system may only be assessed by putting it into practice.

Climatic data for building design — Proposed system of symbols

1 Scope

This International Standard defines a range of climatological data required for building design, gives guidance on methods of measurement and proposes symbols to designate them. It does not deal with suffixes or concepts combining several types of data, or values derived from basic data such as degree-days or characteristic wind speed.

The definitions and symbols given in this International Standard aim to harmonize the expression of climatological data which may be drawn on when drafting regulatory and standard documents and when definitions and symbols are required for building design and construction.

2 Air temperature

2.1 Method of measurement, unit and symbol

Air temperature should be measured in accordance with WMO Guide No. 8. It is expressed in degrees Celsius, rounded to the nearest 0,1 °C and is denoted by the symbol t.

2.2 Climatological parameters

2.2.1 The absolute maximum and minimum temperatures are the extremes recorded over a given period. They should be given with an indication of this period defined by the boundary years.

EXAMPLE

Absolute minimum temperature (1961-1990)

2.2.2 The absolute maximum and minimum for a given month are the extremes recorded for this month during a given period. They are given with an indication of the month and the period defined by the boundary years.

EXAMPLE

Absolute maximum temperature in February (1961-1990)

2.2.3 The mean annual maxima (or minima) is the mean annual maxima (or minima) calculated over 30 years.

2.2.4 The mean monthly maxima (or minima) is the mean monthly maxima (or minima) calculated over 30 years.

2.2.5 The daily mean temperature is the mean of the temperature observed at intervals of 3 h or at shorter intervals.

The approximate daily mean temperature is equal to half the sum of the maximum and minimum temperatures for the day.

Notification of the type of mean temperature (exact or approximate) should be given at the same time as the data.

2.2.6 The number of days of frost is the average number of days per year when the air temperature is below zero once or more during the day.

NOTE — The response of building materials to freezing conditions depends on both air temperatures and precipitation and is not dealt with in this International Standard.

3 Solar radiation (thermal)

3.1 Solar irradiance should be measured in accordance with WMO Guide No. 8. It is expressed in watts per square metre, the required accuracy being ± 2 W/m^2, and is designated by the symbol E_S.

3.2 Solar irradiance is the power of radiation incident upon surfaces of defined orientation and slope. It may be qualified as either direct, diffuse or total:

a) direct irradiance is that received directly from the sun;

b) diffuse irradiance is that diffused by the sky;

c) total irradiance is the sum of direct and diffuse irradiance.

3.3 Solar energy is the energy received by radiation over a well-defined period. It is expressed in joules per square metre and is designated by the symbol W_S.

Solar energy is qualified as follows:

— hourly total;

— daily total;

— monthly total;

— annual total.

For each of these, it is possible to define a specific magnitude by analogy with irradiance given in 3.2.

3.4 Averages for longer periods may be defined, for example:

— annual averages of daily totals, centred on a designated hour;

— monthly averages of daily totals, centred on a designated hour.

4 Solar radiation (light)

4.1 Natural illuminance should be measured in accordance with CIE Information No. 3. It is expressed in kilolux and designated by the symbol E_V.

4.2 The mean illuminance for a given hour on a given day of the year is the mean illuminance recorded over 1 h, centred on a designated hour and averaged over a period of at least 20 years.

The time is given in true solar time. The mean may also be stated for a particular hour during a given 10-day period or a given month.

4.3 The number of hours per year when the illuminance exceeds the given level refers to standardized levels for which the standard values are 1 klx, 2,5 klx, 5 klx, 10 klx, 25 klx and 100 klx. The number of days per year when, at a particular hour, the illuminance exceeds a given level refers to the same levels.

4.4 The mean values of illuminance at different times of the day may be expressed on a graph in which the abscissa shows months of the year, and ordinate shows the hours of the day, and on which curves are drawn for the following illuminances: 5 klx, 10 klx, 25 klx, 50 klx and 100 klx.

5 Long-wave radiation

5.1 Long-wave radiation is radiation for which the wavelengths lie between 4 µm and 100 µm and which is measured in accordance with WMO Guide No. 8. It is expressed in watts per square metre, and it is denoted by the symbol E_l.

5.2 The net long-wave radiation across a horizontal surface is considered negative in the direction from the earth to space.

5.3 The daily long-wave radiation energy is the energy brought by the radiation imparted during 1 day. It is expressed in joules per square metre and is considered negative in the direction from the earth to space.

6 Total radiation

The total radiation is the arithmetic sum of global solar irradiance and long-wave radiation.

7 Radiation balance

Radiation balance is the sum of all incoming and outgoing radiation at the earth's surface, measured on a horizontal plane.

8 Atmospheric humidity

8.1 The concept of humidity is in accordance with WMO Guide No. 8. It is generally expressed as relative humidity; i.e. the ratio of actual water vapour content to the content at saturation at the same temperature, expressed as a percentage. The required accuracy is ± 1 %.

Humidity may also be expressed as the water vapour pressure, expressed as kilopascals, and as water vapour content of the air, expressed in grams of water per kilogram of dry air.

8.2 Maximum, minimum and mean magnitudes are defined in the same way as for air temperature, and are designated by replacing the symbol t with the symbol q for humidity and g for the water vapour content.

9 Wind

9.1 Wind speed should be measured as far as possible in accordance with WMO Guide No. 8, at a height of 10 m above open, level ground. If it is measured in other types of terrain (such as towns), the height of measurement needs to be adjusted to give an effective height of 10 m.

NOTE — Where necessary, wind speed data may need to be adjusted to take account of differences in ground roughness around the measurement site.

Mean wind speed is designated by the following symbols:

$U_{h,10m}$ when the effective height of the anemometer is 10 m;

$U_{h,60m}$ when the effective height of the anemometer is 60 m;

$U_{h,nm}$ when the effective height of the anemometer is n m.

9.2 Mean speeds over different periods are considered: a mean speed over 3 s, known as the gust speed[1] (its measurement has up to now depended on the nature of the measuring and recording instrument used), the mean speed over 10 min (or 600 s) and over 1 h (or 3 600 s).

The speed at an effective height of 10 m over 3 s is designated by:

$U_{10m/3s}$ or $U_{60m/3s}$

The speed at an effective height of 10 m over 10 min is designated by:

$U_{10m/600s}$ or U_{600s} or $U_{60m/600s}$

The speed at an effective height of 10 m over 1 h is designated by:

$U_{10m/3600s}$ or $U_{60m/3600s}$

9.3 The direction of the wind should be recorded in accordance with WMO Guide, No. 8, at 10 m above the ground, and is designated and expressed by the azimuth in degrees of arc. (The direction of the wind is that from which it blows.)

The direction of the wind is determined either for a 3-s period (the instantaneous direction) or by averaging over 600 s over 3 600 s.

9.4 The absolute maximum speed is the highest gust speed recorded over a given time interval. The speed is given together with its direction.

9.5 The return period of a stated speed for a determined type of speed is the number of years which elapse, on average, between two occurrences when the speed is exceeded. The period of observation on which the return period was based may also be indicated.

10 Rain

10.1 Rainfall should be measured in accordance with WMO Guide No. 8. It is denoted as h_r and is expressed in millimetres relating to a stated period. Accuracy shall be no less than ± 0,2 mm for amounts of less than 10 mm, and ± 2 % above that.

---

1) The gust speed is sometimes called the instantaneous speed.

10.2 The following magnitudes are considered:

— average annual rainfall over 30 years;

— average rainfall during the month in question over 30 years;

— absolute maximum rainfall over a period of 10 min;

— absolute maximum rainfall over a period of 1 h;

— absolute maximum rainfall over a period of 24 h;

— absolute maximum rainfall over a period of 5 days.

10.3 The number of days and periods of days of rain where rainfall has exceeded a given total may also be considered.

10.4 The return period of a given rainfall intensity may also be considered.

11 Snow

11.1 Snow depth should be measured in accordance with WMO Guide No. 8. It is expressed in centimetres and denoted by the symbol S_h.

NOTE — ISO 3898 gives either S or S_n for the snow load. The symbol S_h for a snow depth has been adopted by analogy. However, in principle, it would be better to retain the symbol h for depth (as in rainfall) since this is the physical magnitude measured.

ISO 3898 also defines the symbol Q for loads in general so that an alternative for S_n and S_h could be Q_{sn} and Q_{sh}.

Snow mass is expressed in kilograms per square metre, with an accuracy of ±10 %, and is denoted by the symbol S_n (see note).

In the absence of direct measurements, snow mass is deduced from snow depth and density.

11.2 The absolute maxima and the average annual and average monthly maxima of S_h and S_n are considered.

Annex A
(informative)

Letter symbols to represent climatological descriptions

A.1 Proposed system of symbols

A.1.1 General

As stated in the introduction, this annex presents a system of symbols intended to make the domination of climatological magnitudes more concise, and to allow the same denomination to be used in all languages.

The result is, for example, to translate the expression "the 30 year average of the monthly mean of the daily maximum temperature for February", as:

t_{XD}/ML02/MP30Y

Read letter by letter it gives:

Mean (M) over a period (P) of 30 years (30Y) of (/) the mean (M) monthly (L) value of the daily maximum temperature (t_{XD}) for February (02)

The usefulness of the system may only be assessed by putting it into practice. The choice of symbols has presented one difficulty, which is the need to use symbols which are used in other fields to denote other meanings. It is clearly impossible only to use letters that are not used in other fields to denote other magnitudes. The system proposed uses combinations of symbols and abbreviations to define the physical nature of each climatogical magnitude and the statistical characteristic in question. It is a more detailed system than any previously incorporated in an international standard. The letter symbols given in different parts of ISO 71 and ISO 3898 have been incorporated into the system where applicable, as well as certain symbols used in WMO Guide No. 8. As far as the other symbols are concerned, they have been chosen so as to avoid any contradiction with ISO 31 and ISO 3898. Table A.1 lists the proposed symbols, suffixes and abbreviations.

Table A.1 — List of symbols, suffixes and abbreviations

Letter	Usage category	Meaning	Clause
a	abbreviation	approximate	2.2.5
B	symbol	radiation balance	6
b	abbreviation	based on	
D	1) abbreviation	day	2.2.6 and generally
	2) suffix	day	2.2.5 and generally
d	symbol	direction	9.3
df	suffix	diffuse	3.2, 3.3, 4.1
dr	suffix	direct	3.2, 3.3, 4.1
E_l	symbol	radiation (long-wave)	5.1, 5.2
E_s	symbol	solar radiation (energy)	3.1, 3.2
E_v	symbol	solar radiation (light)	4.1, 4.2, 4.3
(E)	suffix	east	3.2, 3.3, 4.1
e	symbol	vapour pressure	for information only
f	symbol	frequency	9.7

Letter	Usage category	Meaning	Clause
G	symbol	any climatological magnitude	
g	symbol	water vapour content	for information only
gl	suffix	global	3.2, 3.3, 4.1
H	1) abbreviation	hour	4.3
	2) suffix	hour	4.2
h	symbol	height	10.2, 10.3
hor	suffix	horizontal	3.2, 3.3, 4.1
I	symbol	intensity (with suffixes r or turb)	9.1
J	symbol	number of days	10.3
L	1) abbreviation	month	2.2.2 and generally
	2) suffix	month	2.2.4 and generally
l	suffix	long-wave	5.1, 5.2
M	1) abbreviation	mean	2.2.4 and generally
	2) suffix	mean	2.2.5 and generally
N	1) abbreviation	minimum	2.2.4 and generally
	2) suffix	minimum	2.2.2 and generally
(N)	suffix	north	3.2, 3.3, 4.1
n	symbol	any number	2.2.6 and generally
P	abbreviation	period	2.2.2 and generally
P'	symbol	return period	9.5
perp	abbreviation	perpendicular	3.2, 3.3, 4.1
q	symbol	relative humidity	for information only
r	suffix	rain	10.2, 10.3, 10.4
(S)	suffix	south	3.2, 3.3, 4.1
s	suffix	solar	3.1 to 3.4
S_h	symbol	height of snow	11.2
smr	abbreviation	summer	2.2.6
S_n	symbol	snow load	11.2
styp	abbreviation	typical sequence	2.2.7
T	abbreviation	total	3.3
t	symbol	temperature	2.1 to 2.2.6
turb	suffix	turbulence	9.1
typ	abbreviation	typical	2.2.6
U	symbol	wind speed	9.1 to 9.5
v	suffix	light	4.1 to 4.3
W	symbol	energy imparted by radiation	3.3, 3.4, 5.3
(W)	suffix	west	3.2, 3.3, 4.1
wtr	abbreviation	winter	2.2.6
X	1) abbreviation	maximum	2.2.4 and generally
	2) suffix	maximum	2.2.5 and generally
Y	1) abbreviation	year	2.2.4 and generally
	2) suffix	year	2.2.5 and generally