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**Equipment Engineering (EE);
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Part 1-4: Classification of environmental conditions
Stationary use at non-weatherprotected locations**

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Foreword

This multi-part European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This standard is concerned with environmental conditions and environmental tests for telecommunications equipment and comprises two main parts, each with subdivisions:

- ETS 300 019-1: "Classification of environmental conditions".

This part of the standard, Part 1, specifies different standardised environmental classes covering climatic and biological conditions, chemically and mechanically active substances and mechanical conditions during storage, transportation and in use.

- ETS 300 019-2: "Specification of environmental tests".

This part of the standard specifies the test requirements for the different environmental classes.

Each part of the standard is divided into sub-parts. Sub-part 1-0 will form a general overview of Part 1. This sub-part, Sub-part 1-4, deals with stationary use at non-weatherprotected locations.

This part of the standard (Part 1) was submitted to Public Enquiry as prETS 300 019 Part B. The original Part A is to be published as ETSI Technical Report ETR 035 entitled: "Equipment Engineering (EE); Environmental engineering Guidance and terminology".

Annex A to this sub-part is informative.

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1 Scope

The purpose of this sub-part is to define a class of environmental conditions and their severities to which equipment may be exposed. Only severe conditions, which may be harmful to the equipment, are included. The severities specified are those which will have a low probability of being exceeded; generally less than 1 %.

For completeness the IEC grouping of open-air climates is given in Annex A.

This sub-part applies to equipment mounted for stationary use including periods of erection work, down time, maintenance and repair at non-weatherprotected locations defined in Clause 5.

2 Normative references

This ETS contains, by dated or undated reference, provisions from other publications. For dated references, subsequent amendments to, or revisions of any of these publications apply to this document only when incorporated into it by amendment or revision. For undated references, the latest version of the publication referred to applies.

- [1] ETR 035: "Equipment Engineering (EE); Environmental engineering Guidance and terminology".
- [2] IEC Publication 721-3-4: "Stationary use at non-weatherprotected locations".
- [3] IEC Publication 721-2-4: "Solar radiation and temperature".
- [4] IEC Publication 721-2-1: "Temperature and humidity".
- [5] IEC Publication 68-2-27: "Test Ea: Shock".

3 Definitions

In this sub-part of this standard, the following definitions apply:

Stationary use: The equipment is mounted firmly on the structure, or on mounting devices, or it is permanently placed at a certain site. It is not intended for portable use - but short periods of handling during erection works, down time, maintenance and repair at the location are included.

Non-weatherprotected location: A location at which the equipment is not protected from direct weather influences.

4 Environmental class

The classes shown in parentheses, e.g. (4C3), may be selected for special applications.

4.1 Class 4.1: Non-weatherprotected locations

Class 4.1E: Non-weatherprotected locations - extended

Class 4.1 applies to many ETSI countries. Class 4.1 E covers all ETSI countries.

Class 4.1 is a combination of classes 4K2/4Z5/4Z7/4B1/4C2(4C3)/4S2/4M5 in IEC Publication 721-3-4 [2]. Class 4.1E is a combination of classes 4Z5/4Z7/4B1/4C2(4C3)/4S2/4M5 in IEC Publication 721-3-4 [2] and the climatic conditions are given in subclause 5.1.

This class applies to a non-weatherprotected location. The climatogram is shown in figure 1 in subclause 5.1.

This class applies to locations:

- which are directly exposed to an open-air climate, including solar radiation, movement of the surrounding air, precipitation and water jets;
- where mould growth, or attacks by animals but excluding termites, may occur;
- with normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic. It also applies to coastal areas;

NOTE: At locations in the immediate neighbourhood of industrial sources with chemical emissions either special precautions must be taken or a special chemical class must be chosen.

- in areas with sand or dust sources, including urban areas;
- where transmitted vibrations are experienced from machines or passing vehicles. Higher level shocks may be experienced e.g. from adjacent machines.

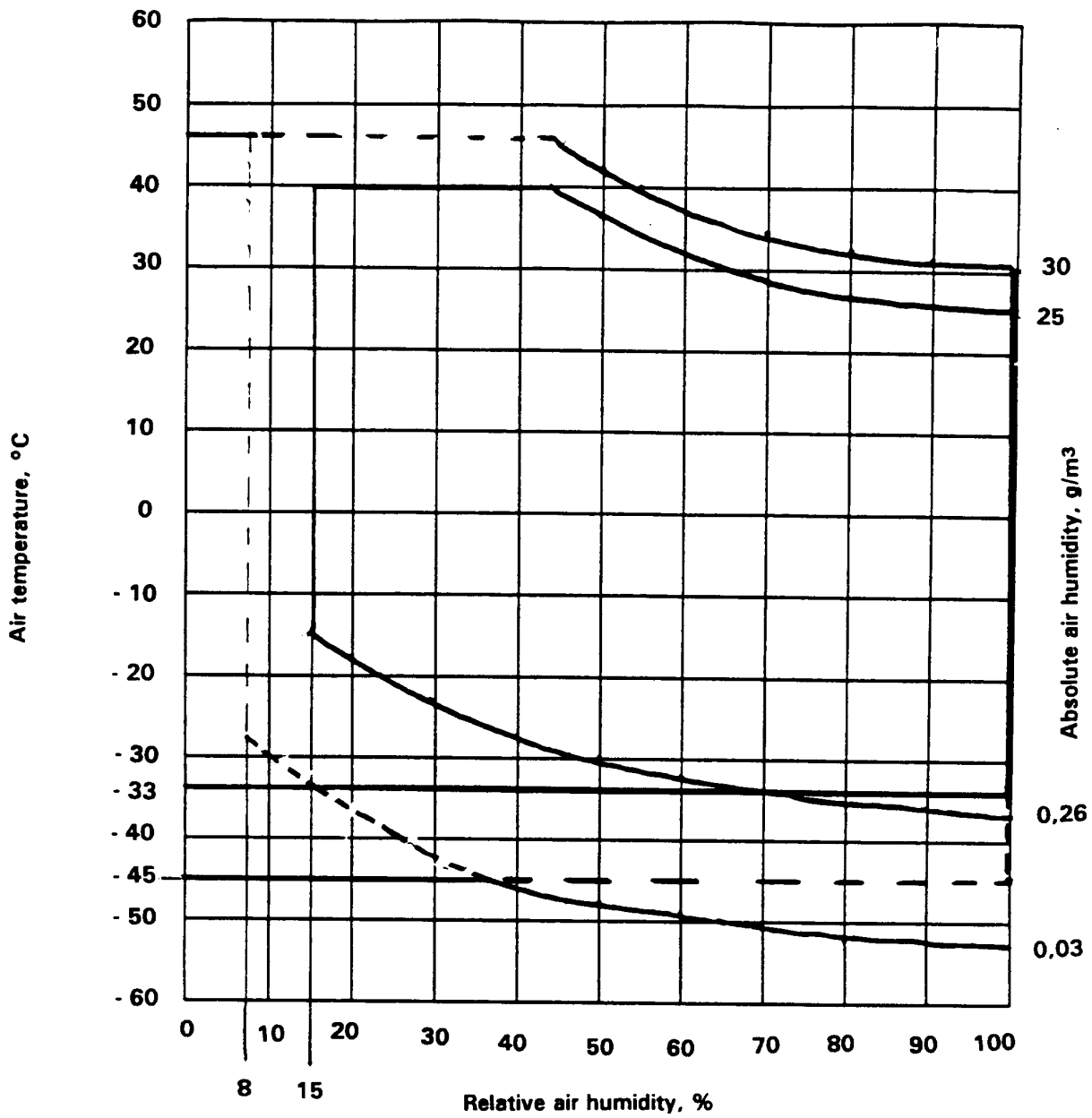
NOTE: More severe mechanical conditions are to be expected for equipment intended for public use. Special requirements should be stated for such equipment, e.g. protection against vandalism.

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climatic conditions for environmental classes 4.1 and 4.1 E

Environmental parameter	Unit	Class	
		4.1	4.1 E
a) low air temperature	°C	- 33 (NOTE 1)	- 45 (NOTE 1)
b) high air temperature	°C	40	45
c) low relative humidity	%	15	8
d) high relative humidity	%	100	100
e) low absolute humidity	g/m ³	0,26	0,03
f) high absolute humidity	g/m ³	25	30
g) rain intensity	mm/min	6	15
h) rate of change of temperature (NOTE 2)	°C/min	0,5	0,5
i) low air pressure (NOTE 3)	kPa	70	70
j) high air pressure	kPa	106	106
k) solar radiation	W/m ²	1120	1120
l) heat radiation	W/m ²	negligible	negligible
m) movement of the surrounding air	m/s	50	50
n) conditions of condensation	none	yes	yes
o) conditions of precipitation (rain, snow, hail)	none	yes	yes
p) low rain temperature (NOTE 4)	°C	5	5
q) conditions of water from sources other than rain	none	splashing water	splashing water
r) conditions of icing and frosting	none	yes	yes
<p>NOTE 1: In cloudless nights an object exposed to atmospheric radiation will radiate more heat than it receives off the surface, compared to the ambient air temperature. In practice (under extreme conditions) the surface may come down to a temperature in the order of 10 °C to 20 °C below ambient air temperature, when the ambient temperature ranges from +20 °C to -30 °C. (For further information see IEC Publication 721-2-4 [3]).</p> <p>NOTE 2: Averaged over a period of 5 minutes.</p> <p>NOTE 3: 70 kPa represent a limit value for open-air use, normally at about 3000 m.</p> <p>NOTE 4: This rain temperature should be considered together with high air temperature b) and solar radiation k). The cooling effect of the rain has to be considered in connection with the surface temperature of the equipment.</p>			



"———": Climatic limits for class 4.1
"-----": Climatic limits for class 4.1 E

Figure 1: Climatogram for class 4.1 and 4.1 E: Non-weatherprotected locations

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 4.1 and 4.1 E

Environmental parameters	Unit	Classes 4.1, 4.1 E
a) Flora	--	Presence of mould, fungus etc.
b) Fauna	--	Presence of rodents and other animals harmful to products but excluding termites

5.3 Chemically active substances

Table 3: Chemically active substances for environmental classes 4.1 and 4.1 E (NOTE 1)

Environmental parameter	Unit (NOTE 2)	Classes 4.1, 4.1 E		Special (4C3) (NOTE 5)	
		mean value (NOTE 3)	max. value (NOTE 4)	mean value (NOTE 3)	max. value (NOTE 4)
a) Salt mist		sea salts, road salts			
b) sulphur dioxide	mg/m ³ cm ³ /m ³	0,3 0,11	1,0 0,37	5,0 1,85	10 3,7
c) hydrogen sulphide	mg/m ³ cm ³ /m ³	0,1 0,071	0,5 0,36	3,0 2,1	10 7,1
d) chlorine	mg/m ³ cm ³ /m ³	0,1 0,034	0,3 0,1	0,3 0,1	1,0 0,34
e) hydrochloric acid	mg/m ³ cm ³ /m ³	0,1 0,066	0,5 0,33	1,0 0,66	5,0 3,3
f) hydrofluoric acid	mg/m ³ cm ³ /m ³	0,01 0,012	0,03 0,036	0,1 0,12	2,0 2,4
g) ammonia	mg/m ³ cm ³ /m ³	1,0 1,4	3,0 4,2	10 14	35 49
Environmental parameter	Unit (NOTE 2)	Classes 4.1, 4.1 E		Special (4C3) (NOTE 5)	
		mean value (NOTE 3)	max. value (NOTE 4)	mean value (NOTE 3)	max. value (NOTE 4)
h) ozone	mg/m ³ cm ³ /m ³	0,05 0,025	0,1 0,05	0,1 0,05	0,3 0,15
i) nitrogen oxides (NOTE 6)	mg/m ³ cm ³ /m ³	0,5 0,26	1,0 0,52	3,0 1,56	9,0 4,68

NOTE 1: This table shows the 99 %-values. Some areas of Europe may have significantly lower values of chemically active substances as shown in class 4C1 of IEC Publication 721-3-4 [2].

NOTE 2: The values given in cm³/m³ have been calculated from the values given in mg/m³ and refer to 20 °C. This table uses rounded values.

NOTE 3: Mean values are the average values (long term values) to be expected.

NOTE 4: Maximum values are limit or peak values, occurring over a period of not more than 30 minutes per day.

NOTE 5: It is not mandatory to consider the special class as a requirement for the combined effect of all parameters stated. If applicable, values of single parameters may be selected from these classes. In this case the severities of class 4.1 are valid for all parameters not especially named.

NOTE 6: Expressed in the equivalent values of nitrogen dioxide.

5.4 Mechanically active substances

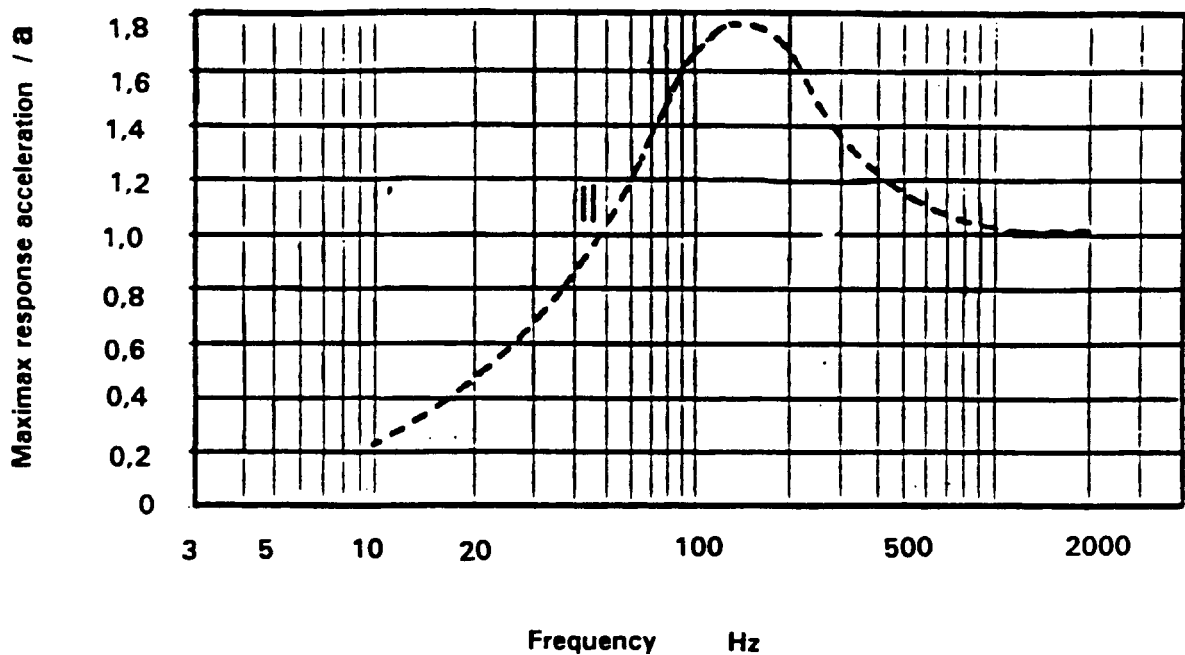
Table 4: Mechanically active substances for environmental classes 4.1 and 4.1 E

Environmental parameters	Unit	Classes 4.1, 4.1 E
a) Sand	mg/m ³	300
b) Dust (suspension)	mg/m ³	5,0
c) Dust (sedimentation)	mg/(m ² h)	20

5.5 Mechanical conditions

Table 5: Mechanical conditions for environmental classes 4.1 and 4.1 E

Environmental parameter	Unit	Class 4.1, 4.1 E
a) Stationary vibration, sinusoidal (NOTE 1) displacement amplitude acceleration amplitude frequency range	 mm m/s ² Hz	 3,0 10 2-9 9-200
b) non-stationary vibration, including shock (NOTE 2) shock response spectrum type II (<i>f</i>) peak acceleration	 m/s ²	 250
NOTE 1: Units are peak displacement amplitude (mm) and peak acceleration amplitude (m/s ²)		
NOTE 2: See figure 2.		



Spectrum type II: Duration: 6 ms

Figure 2: Model Shock Response Spectra (First Order Maximax Shock Response Spectra, see IEC Publication 721-3-4 [2]). For definition of Maximax see IEC Publication 68-2-27 [5].

Annex A (informative):

When stating environmental classes, the severity of the parameters involved are usually given by the 1 % (99 %) fractile, which means that the occurrence of the parameter is 1 % or less. The upper and the lower temperatures in IEC Publication 721-3-4 [2] are statistically known. The temperature values chosen are the mean values of the annual extreme values given in IEC Publication 721-2-1 [4] indicating 0,1 % fractiles for the low temperature and 0,05 % fractiles for the high temperature.

The ETSI countries cover five different climatic zones: Cold, Cold Temperate, Warm Temperate, Warm Dry and Mild Warm Dry Climates.

In IEC Publication 721-2-1 [4] the following extreme temperatures are given:

Table A.1

Climate	Statistical occurrence			
	low temperature		high temperature	
	0,1 %	absolute extreme	0,05 %	absolute extreme
	°C (NOTE 1)	°C	°C (NOTE 1)	°C
Cold	-50	-60	32	40
Cold Temperate	-33	-45	34	40
Warm Temperate	-20	-30	35	40
Warm Dry	-20	-30	35	40
Mild Warm Dry	-5	-15	40	45
NOTE 1: Mean value of the annual extreme value.				

In order to define a non-weatherprotected class covering all ETSI countries, the mean value of the annual extreme values - 45 °C is chosen as the low temperature and + 45 °C as the high temperature for the class.

History

Document history	
February 1992	First Edition
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