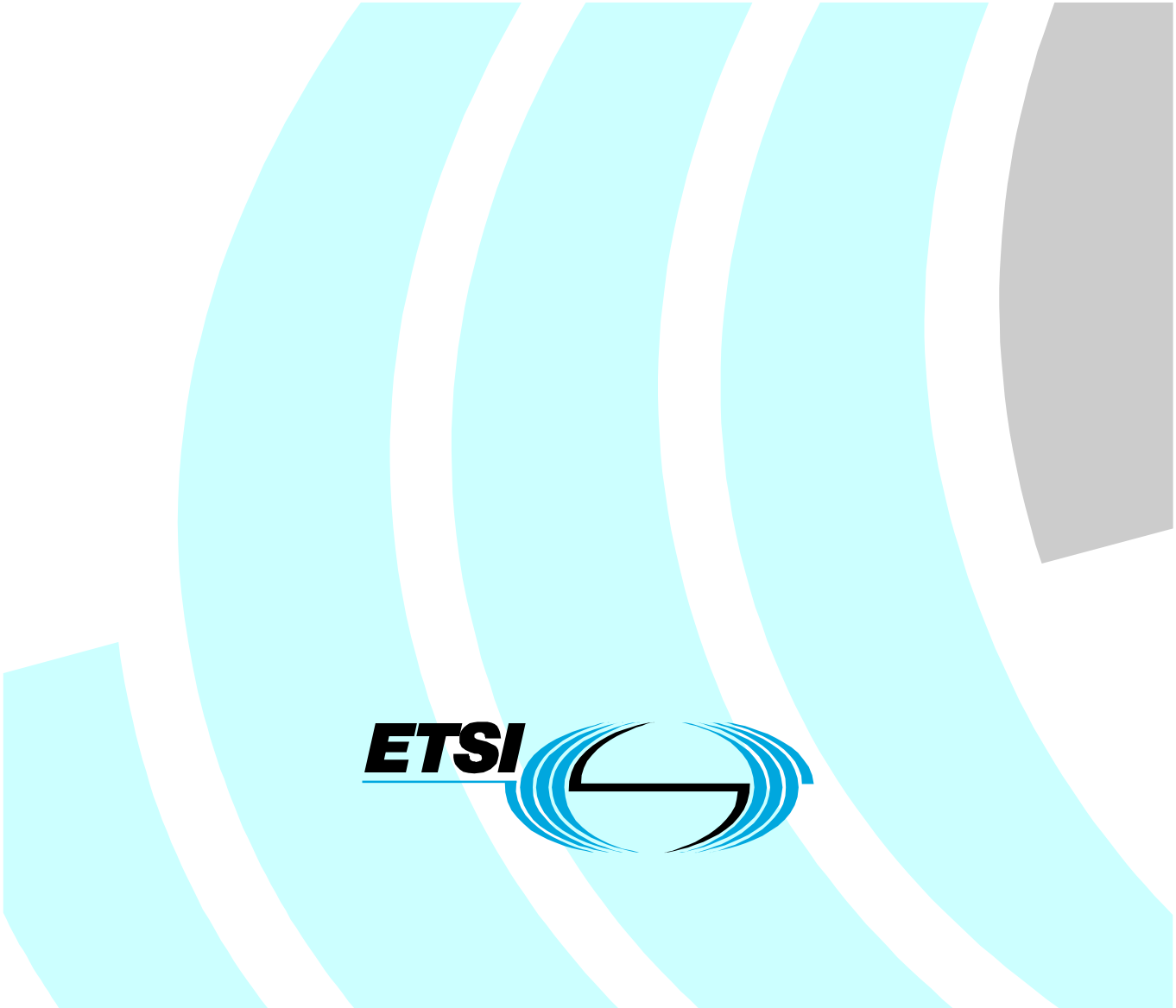
Final draft ETSI EN 300 019-1-6 V2.1.0 (2001-12)

European Standard (Telecommunications series)

Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-6: Classification of environmental conditions; Ship environments



Reference
REN/EE-01027-1-6

Keywords
equipment practice, environment, maritime, mobility, testing

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document is part 1, sub-part 6 of a multi-part deliverable covering the classification of environmental conditions and environmental tests for telecommunications equipment, as identified below:

Part 1: "Classification of environmental conditions";

Sub-part 0: "Introduction";

Sub-part 1: "Storage";

Sub-part 2: "Transportation";

Sub-part 3: "Stationary use at weatherprotected locations";

Sub-part 4: "Stationary use at non-weatherprotected locations";

Sub-part 5: "Ground vehicle installations";

Sub-part 6:"Ship environments";

Sub-part 7: "Portable and non-stationary use";

Sub-part 8: "Stationary use at underground locations";

Part 2: "Specification of environmental tests".

Part 1 specifies different standardized environmental classes covering climatic and biological conditions, chemically and mechanically active substances and mechanical conditions during storage, transportation and in use.

Part 1-0 forms a general overview of part 1.

Part 2 specifies the recommended test severities and test methods for the different environmental classes.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

The present document defines classes of environmental conditions and their severities to which telecommunication equipment may be exposed. The severities specified are those which will have a low probability of being exceeded; generally less than 1 %.

The present document applies to equipment designed principally for maritime use. Conditions of use vary significantly in relation to the size of the vessel and the function for which it was designed. The reader should ensure that the relevant classes are chosen to suit this particular application.

The present document covers the following types of vessel:

- vessel propelled by mechanical means, including offshore units;
- vessel not propelled by mechanical means, including sailing boats and life rafts.

The classes defined apply to all sizes of vessel from pleasure craft to trawlers, ferry boats, icebreakers and cargo ships including tankers.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI ETR 035: "Equipment Engineering (EE); Environmental engineering Guidance and terminology".

[2] IEC 60721-3-6: "Classification of environmental conditions. Part 3: Classification of groups of environmental parameters and their severities. Section 6: Ship environment".

[3] IEC 60721-2-1: "Classification of environmental conditions. Part 2: Environmental conditions appearing in nature. Temperature and humidity".

[4] IEC 60068-2-27: "Environmental testing. Part 2: Tests: Test Ea and guidance: Shock".

[5] IEC 60092-502: "Electrical installations in ships. Part 502: Tankers - Special features".

[6] ISO 2041: "Vibration and shock - Vocabulary".

3 Definitions

For the purposes of the present document, the following terms and definitions apply:

absolute humidity: mass of water vapour in grammes which is associated with one cubic metre of dry air in an air/water vapour mixture

non-weatherprotected location: location at which the equipment is not protected from direct weather influences

NOTE 1: Partly weatherprotected location: direct weather influences are not completely excluded.

NOTE 2: Totally weatherprotected location: direct weather influences are totally excluded.

relative humidity: ratio of the partial pressure of the water vapour in moist air at a given temperature, to the partial pressure of the water vapour in saturated air at the same temperature

4 Environmental classes

4.1 Class 6.1: totally weatherprotected locations

This class is a combination of classes 6K1/6B1/6C1/6S1/6M3 in IEC 60721-3-6 [2].

This class applies to equipment installed in totally weatherprotected, heated and ventilated locations following warm-up on board engine-powered vessels but excluding refrigerated cargo spaces, machinery spaces and locations containing equipment dissipating considerable amounts of heat. This class does not cover Warm Damp and Warm Damp Equable climates.

NOTE: Climatic conditions for different areas are defined in IEC 60721-2-1 [3].

This class applies to:

- equipment which is not exposed to heat radiation from adjacent equipment, heating elements or to solar radiation through glass or transparent materials;
- installations on board vessels operating in areas without particular risk of attack by flora or fauna. It also covers other vessels where the installations are located in compartments of such construction that mould growth and attacks by animals are unlikely;
- totally weatherprotected installations which are not subjected to salt mist, engine exhausts or emissions from nearby industrial sources;
- installations protected from sand, dust and ingress of soot;
- installations on board engine-powered vessels of all sizes.

4.2 Class 6.2: partly weatherprotected locations

This class is a combination of classes 6K4/6B2/6C3/6S2/6M3 or 6M4 in IEC 60721-3-6 [2].

This class applies, depending on the mechanical class chosen, to equipment installed in any location on board engine-powered vessels - excluding refrigerated cargo spaces. The class applies in all climates with the exception of Cold climates and areas with abnormal rain intensities and hurricanes. The equipment may occasionally be subjected to heavy seas. (See the note to clause 4.1).

This class applies to:

- equipment which is subjected to direct solar radiation, to considerable heat dissipation from boilers, engines etc., to rain and water jets. The equipment may be connected to wet surfaces;
- non-protected installations on board vessels operating in areas where mould growth and attacks by animals may occur;
- non-weatherprotected installations on board vessels operating close to industrial areas with considerable air pollution emissions. Salt mist and exposure to engine exhausts are included;
- all installations where sweeping of dusty decks may take place. It also covers locations subject to emissions from boiler exhausts (e.g. soot, acid, etc.). Non-weatherprotected installations on board vessels operating close to sand deserts are not covered;
- class 6M3: installations on board engine-powered vessels of all sizes but excluding equipment connected directly to reciprocating types of machinery. Equipment connected directly to loading systems, container guides, cranes and installations in dredgers are included;

- class 6M4: all installations on board engine-powered vessels of all sizes including equipment connected directly to reciprocating types of machinery.

NOTE: The proper mechanical IEC class 6M3 or 6M4 shall be chosen according to the expected installations and use of the equipment.

4.3 Class 6.3: non-weatherprotected locations

This class is a combination of classes 6K5/6B2/6C3/6S2/6M3 or 6M4 in IEC 60721-3-6 [2].

This class applies, depending on the mechanical class chosen, to equipment installed in any location on board engine-powered vessels, including refrigerated cargo spaces. This class applies in all climates including areas with abnormal rain intensities and hurricanes. The equipment may also be subjected to heavy seas. (See the note to clause 4.1).

This class applies to:

- equipment which is subjected to direct solar radiation, to considerable heat dissipation from boilers, engines etc., to abnormal rain, heavy seas and water jets. The equipment may be connected to wet surfaces;

- non-weatherprotected installations on board vessels operating in areas where mould growth and attacks by animals may occur;

- non-weatherprotected installations on board vessels operating close to industrial areas with considerable air pollution emissions. Salt mist and exposure to engine exhausts are included;

- all installations where sweeping of dusty decks may take place. It also covers locations subject to emissions from boiler exhausts (e.g. soot, acid, etc.). Non-weatherprotected installations on board vessels operating close to sand deserts are not covered;

- class 6M3: installations on board engine-powered vessels of all sizes but excluding equipment connected directly to reciprocating types of machinery. Equipment connected directly to loading systems, container guides, cranes and installations in dredgers are included;

- class 6M4: all installations on board engine-powered vessels of all sizes including equipment connected directly to reciprocating types of machinery (see note in clause 4.2).

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climatic conditions for environmental classes 6.1 to 6.3

Environmental parameter		Unit	Class		
			6.1	6.2	6.3
a)	Low temperature	°C	+5	-25	-40 (see note 1)
b)	Low temperature, water	°C	Freezing-point of water (see note 2)		
c)	High temperature, air	°C	+40	+70	+70
d)	High temperature, surfaces (see note 3)	°C	none	+70	+70
e)	High temperature, water	°C	+30	+35	+35
f)	Gradual change of temperature, air, air	°C °C/minute	none	-25/+40 3	-25/+40 3
g)	Change of temperature, air/water	°C	none	+40/+5	+40/+5
h)	Humidity, not combined with rapid temperature changes	% °C	95 +30	95 +45	95 +45
i)	Humidity, combined with rapid temperature changes, air/air at high relative humidities	% °C	none	95 -25/+35	95 -25/+35
j)	Humidity combined with rapid temperature changes, air/air at high water content (see note 4)	g/m^3 °C	none	60 +70/+15	60 +70/+15
k)	Low relative humidity	% °C	10 +30	10 +30	10 +30
l)	Movement of the surrounding medium, air	m/s	negligible	30	50
m)	Precipitation, rain	mm/min	none	6	15
n)	Solar radiation	W/m^2	negligible	1 120	1 120
o)	Heat radiation	W/m^2	negligible	1 200	1 200
p)	Water from sources other than rain	m/s	none	3	10
q)	Wetness	none	no	wet surfaces	

NOTE 1: Vessels will normally not navigate when air temperatures are below -40°C. Equipment may, however, be left unprotected on board vessels which are temporarily laid-up in harbour during the coldest period of the year. In such instances equipment, in the non-operational state, may have to withstand temperatures down to -55°C. In exceptional circumstances in inland waterways vessels may also navigate when temperatures are below -40°C.

NOTE 2: The freezing-point may be lower than 0°C due to presence of salt or pollution, etc.

NOTE 3: Surface temperatures refer to hot parts to which the equipment may be attached. More extreme surface temperatures can exist, for instance on machines, and may have to be considered.

NOTE 4: The equipment is assumed to be subjected to a rapid decrease of temperature only (no rapid increase). The figure for water content applies to temperatures down to the dew-point. At lower temperatures the relative humidity is assumed to be approximately 100 %.

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 6.1 to 6.3

Environmental parameter		Unit	Classes	
			6.1	6.2 and 6.3
a)	Flora	none	Negligible	Presence of mould, fungus, etc.
b)	Fauna	none	Negligible	Presence of rodents and other animals harmful to equipment.

5.3 Chemically active substances

Table 3: Chemically active substances for environmental classes 6.1 to 6.3

Environmental parameter		Unit	Class (see note 1)	
			6.1	6.2 and 6.3
Substances in air:				
a)	Salts (see notes 2 and 3)	none	no	yes (see note 4)
b)	Sulphur dioxide	mg/m^3 cm^3/m^3	0,1 0,037	1,0 0,37
c)	Hydrogen sulphide	mg/m^3 cm^3/m^3	0,01 0,0071	0,5 0,36
d)	Nitrogen oxides (expressed as the equivalent values of nitrogen dioxide)	mg/m^3 cm^3/m^3	0,1 0,052	1,0 0,52
e)	Ozone	mg/m^3 cm^3/m^3	0,01 0,005	0,1 0,05
f)	Hydrogen chloride	mg/m^3 cm^3/m^3	0,1 0,066	0,5 0,33
g)	Hydrogen fluoride	mg/m^3 cm^3/m^3	0,003 0,0036	0,03 0,036
h)	Ammonia	mg/m^3 cm^3/m^3	0,3 0,42	3,0 4,2
Substances in water: (see note 5)				
i)	Sea salts	kg/m^3	negligible	30

NOTE 1: The values given are maximum values.
NOTE 2: Other substances and severities may occur due to a specific cargo carried. For tankers, reference is made to IEC 60092-502 [5].
NOTE 3: Explosive atmospheres are outside the scope of the present document and therefore not included.
NOTE 4: No value at present.
NOTE 5: Substances in water, other than sea salts, are not included. These substances are considered to have a negligible effect on telecommunications equipment which is already protected from the effect of sea salts.

5.4 Mechanically active substances

Table 4: Mechanical active substances for environmental classes 6.1 to 6.3

Environmental parameter		Unit	Class (see note 1)	
			6.1	6.2 and 6.3
a)	Sand in air (see note 2)	mg/m^3	none	0,1 (see note 3)
b)	Dust (Sedimentation) (see note 2)	$mg/(m^2h)$	negligible	3,0
c)	Soot deposit	none	none	presence of soot

NOTE 1: Droplets of oil may be present in the air in machinery spaces. A concentration of 3 mg/m^3 air may occur. Higher concentrations of up to 20 mg/m^3 air may be present close to diesel engines or in oil separator rooms.
NOTE 2: Other severities of dust and sand may occur due to specific cargoes which may contain dusty materials and sand (including abrasive substances). The distribution of particle size and chemical composition is important as well as the quantity of the particles (no values at present).
NOTE 3: Near sand deserts the amount of sand in air may be 100 times greater.

5.5 Mechanical conditions

Table 5: Mechanical conditions for environmental classes 6.1 to 6.3

	Environmental parameter		Unit	Class (see note 1)			
				6M3		6M4	
a)	Stationary vibration, sinusoidal (see notes 2 and 3)						
	displacement amplitude		mm	1,5		1,5	
	acceleration amplitude		m/s^2		20		50
	frequency range		Hz	2 to 18	18 to 200	2 to 28	28 to 200
b)	Non-stationary vibration, including shock: (see note 3)						
	shock response spectrum type I						
	peak acceleration (â)		m/s^2	100		100	
	duration		ms	11		11	
	shock response spectrum type II						
	peak acceleration (â) (see note 4)		m/s^2	300		300	
	duration		ms	6		6	
	shock response spectrum type III						
	peak acceleration (â) (see note 4)		m/s^2	500		500	
	duration		ms	2,3		2,3	
c)	Angular deviation, static condition: (see note 5)						
	rotation around X-axis (list),	angle	degree	15		15	
	rotation around Y-axis (trim),	angle	degree	10		10	
d)	Angular motion, dynamic condition: (see note 5)						
	rotation around X-axis (roll),	angle	degree	22,5		22,5	
		frequency	Hz	0,14		0,14	
	rotation around Y-axis (pitch),	angle	degree	10		10	
		frequency	Hz	0,2		0,2	
	rotation around Z-axis (yaw),	angle	degree	4		4	
		frequency	Hz	0,05		0,05	
e)	Steady-state acceleration: (see note 5)						
	X-direction (surge)		m/s^2	5		5	
	Y-direction (sway)		m/s^2	6		6	
	Z-direction (heave)		m/s^2	10		10	

NOTE 1: The choice of class 6M3 or 6M4 depends on the installation and use.

NOTE 2: Vibration generated by conventional marine engines is mainly of a sinusoidal nature with a pronounced low frequency content. High-frequency vibration of up to 2 000 Hz and of intensities up to 50 m/s^2 will, however, be present in icebreakers. Random vibration is also present in vessels due to forces produced by contact between the hull, or the propeller, and the water. The levels are normally low and therefore random vibration has not been included.

NOTE 3: Special attention should be given to the frequency of occurrence of vibration and shock when considering the mechanical conditions for hovercraft and hydrofoils.

NOTE 4: For definition of Model Shock Response Spectra (First Order Maximax Shock Response Spectra) see IEC 60721-3-6 [2], and Maximax see IEC 60068-2-27 [4]. A reference is also made to ISO 2041 [6]. The classification is related to three model spectra:

I One spectrum typical for shocks with long duration and relatively low peak acceleration.
II One Spectrum typical for shocks with medium duration and medium peak acceleration.
III One spectrum typical for shocks with short duration and high peak acceleration.

NOTE 5: The three orthogonal axes related to the vessel are:

- X - fore and aft;
- Y - athwart;
- Z - vertical.

History

Document history		
Edition 1	February 1992	Publication as ETS 300 019-1-6
V2.1.0	December 2001	One-step Approval Procedure OAP 20020419: 2001-12-19 to 2002-04-19