



Technical Report

**Environmental Engineering (EE);
Recommendation for the applicability of
environmental classes in outdoor cabinet environment**

Reference

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Environmental Engineering (EE).

Introduction

The present document defines Recommendation for the applicability of environmental classes in outdoor cabinet environment.

1 Scope

The present document describes the Recommendations for the applicability of environmental classes in outdoor cabinet environment. The present document applies for the powering of all equipment of the access network (copper, fibre or radio networks) located outside telecommunications centres.

The present document is intended to be applicable to empty cabinets which can be equipped for installation in an outdoor location. The recommendations for outdoor equipment also apply, where relevant, to empty outdoor enclosures supplied for housing Information technology equipment to be installed in an outdoor location.

The recommendations for humidity, vibration, shock, biologic conditions, chemical active substances and mechanically active substances (sand, dust, etc.) and mechanical conditions including earthquake contained within relevant standards of intended use according to EN 300 019 series [i.2] to [i.7].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI EN 302 099: "Environmental Engineering (EE); Powering of equipment in access network".
- [i.2] ETSI EN 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [i.3] ETSI EN 300 019-1-1: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-1: Classification of environmental conditions; Storage".
- [i.4] ETSI EN 300 019-1-2: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-2: Classification of environmental conditions; Transportation".
- [i.5] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations".
- [i.6] ETSI EN 300 019-1-4: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations".

- [i.7] ETSI EN 300 019-1-8: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-8: Classification of environmental conditions; Stationary use at underground locations".
- [i.8] IEC 60950-22: "Information technology equipment - Safety - Part 22: Equipment installed outdoors".
- [i.9] IEC 60068-2-1: "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [i.10] IEC 60068-2-2: "Environmental testing - Part 2-2: Tests - Test B: Dry heat".
- [i.11] IEC 60068-2-14: "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".
- [i.12] IEC 60068-2-56: "Environmental testing - Part 2-56: Tests - Test Cb: Damp heat, steady state, primarily for equipment".
- [i.13] IEC 60068-2-30: "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)".

3 Definitions and abbreviations

3.1 Definitions

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

access network: part of a telecommunications network between the customer terminal installation and the first switching unit

outdoor enclosure: part of outdoor equipment that is exposed to the adverse conditions in an outdoor location and that is intended to protect the interior of the equipment from those conditions

NOTE 1: An outdoor enclosure can also perform the functions of one or more of the following:

- a fire enclosure;
- an electrical enclosure;
- a mechanical enclosure.

NOTE 2: A separate cabinet or housing into which the equipment is placed can provide the function of an outdoor enclosure.

outdoor equipment: equipment specified by the manufacturer to be installed where exposed wholly or partly to the conditions in an outdoor location

NOTE: Transportable equipment, for example, a laptop or notebook computer, or a telephone, is not outdoor equipment unless specified by the manufacturer for continuous use in an outdoor location.

outdoor location: location for equipment where protection from the weather and other outdoor influences provided by a building or other structure is limited or non-existent

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|--------|--|
| CH | Customer's Home |
| DSLAM | Digital Subscriber Line Access Multiplexer |
| FTTB | Fibre To The Building |
| FTTC | Fibre To The Curb |
| FTTCab | Fibre To The Cabinet |
| FTTH | Fibre To The Home |

| | |
|-----|----------------------------|
| OLT | Optical Line Termination |
| PCM | Pulse Code Multiplex |
| RCD | Residual Current Device |
| SDH | Synchron Digital Hierarchy |
| TC | Telecommunication's Centre |

4 Housing configurations

The main characteristic feature of the different housing architectures of access network equipment is the location of the following three functions:

- the point of connection to the mains and the transmission equipment; and
- the place of power back-up; or
- the enclosure with transmission equipment powered remotely from a telecommunications centre (centralized powering) or from a power supply node (cluster powering).

The total network can be divided in three main parts:

- 1) the Telecommunication Centre (TC);
- 2) the field (the undefined area - access area - between the Telecom Centre and the Customer's Home);
- 3) the Customer's Home (CH).

Housing architectures

Equipment of access network can be located:

- separately in a enclosure (weather- or non-weather protected or underground location);
- in an enclosure in the connection to FTTB, FTTC, FTTCab or FTTH or wireless access.

The equipment in the enclosure can be for example:

- unit mains connection;
- unit with lightning protection, RCD and circuit breaker;
- a power supply unit;
- control - and monitoring management unit;
- different subracks - transmission equipment, or radio unit;
- distribution racks;
- fan;
- heat exchanger;
- battery charger;
- batteries.

5 Environmental conditions

EN 300 019-1-0 [i.2] defines the classification of the environmental conditions. EN 300 019-1-3 [i.5] specifies the classification of environmental conditions in Stationary use at weather protected locations, EN 300 019-1-4 [i.6] specifies the classification of environmental conditions in Stationary use at non-weather protected locations and EN 300 019-1-8 [i.7] specifies the requirements for stationary use at underground locations. The classification of environmental conditions for Storage defined in EN 300 019-1-1 [i.3] and for Transportation EN 300 019-1-2 [i.4]. Table 1 [i.1] gives the ETSI environmental classes applicable to three main locations for information.

Table 1: Examples for housing equipment locations (informative) [i.1], [i.8]

| Housing Equipment Location | Weather protected locations | | | | | Class 4.1 Non-Weather-protected Locations | Class 8.1 Under-ground locations |
|--|---|--|---|-----------------------------------|----------------------------------|--|-------------------------------------|
| | Class 3.1 Temperature Controlled Locations | Class 3.2 Partly Temperature controlled locations | Class 3.3 Not Temperature controlled locations | Class 3.4 Sites with Heat-trap | Class 3.5 Sheltered locations | | |
| Outside plant | - | - | ○ | ● | ● | ● | ● |
| Inside a building | ● | ● | ● | ○ | - | - | - |
| Customer home | ● | ○ | - | - | - | - | - |
| ● Suitable for most cases. ○ Suitable for some cases. - Not suitable for most cases. | | | | | | | |

Equipment in outdoor location should be classified as follows:

- Fully integrated equipment.
- Not fully integrated equipment.

Fully integrated equipment is a product specifically designed for outdoor use. This category covers small access equipment (e.g. SDH, PCM, OLT, DSLAM or similar wireline or wireless products). The environmental class applicable to this class of equipment should be at least class 4.1 defined in EN 300 019-1-4 [i.6]; in this case the environmental class is applied at the combination outdoor cabinet within containing the equipment.

The outdoor enclosure that has to host the equipment has to be designed in order to ensure the internal climatic conditions are in line with the environmental class of the equipment that will be incorporated. The equipment for free air cooled outdoor enclosures should be able to operate in the temperature range of the climate class 3.3: -25 °C till +55 °C.

For exceptional climatic limits conditions (e. g. duration of cooling failure, loss of Fan function or Heat exhauster or extreme outside temperature) the maximum internal temperature of an outdoor enclosure can reach +65 °C. Equipment functionality may be degraded but no damage should be experienced and normal service should be restored when returning to the normal temperature range.

Not fully integrated equipment is a product not specifically designed for outdoor use. This category covers equipment installed in a outdoor cabinet. The environmental class 4.1 defined in EN 300 019-1-4 [i.6] should be applied for the outdoor cabinet ; the equipment inside the cabinet should be compliant to environmental class ensured by the internal conditions of the cabinet. The cabinet should be designed in such a way that the delta T between external temperature " T_{ambient} " and the internal equipment temperature " T_{inlet} " is at least 10°K (see figure 1).

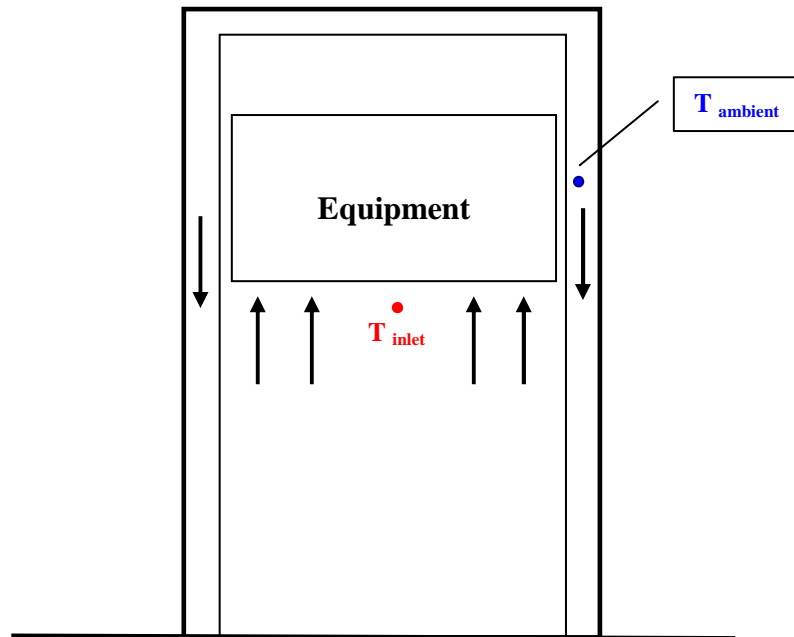


Figure 1: Double-wall Outdoor Cabinet - $T_{ambient}$ / T_{Inlet}

In fully air conditioned or temperature controlled outdoor enclosures (e.g. shelter allowing personnel to enter) the equipment should be compliant to class 3.1 according EN 300 019-1-3 [i.5] inside.

5.1 Specification T 3.3: Partly temperature-controlled locations (according to EN 300 019-1-3)

This specification applies to enclosed locations having neither temperature nor humidity control, but where heating may be used to avoid low temperatures. The building construction avoids extremely high temperatures. See tables 2 and 3.

Table 2: Test specification T 3.3: Partly temperature controlled locations - climatic tests

| Environmental parameter | | | Environmental Class 3.3 | | | | |
|-------------------------|------------------|--------------------------|-------------------------|-------------------|------------------------------------|-----------------------|-----------------------------------|
| Type | Parameter | Detail parameter | Characteristic severity | Test severity | Duration | Reference | Method |
| Air temperature | Low | (°C) | -25 | -25 | 16 h | IEC 60068-2-1 [i.9] | Ab/Ad: Cold |
| | High | (°C) | +55 | +55 | 16 h | IEC 60068-2-2 [i.10] | Bb/Bd: Dry heat |
| | Change | (°C) (°C/min) | 0,5 | +25/+55 0,5 | half cycle t ₁ = 3 h | IEC 60068-2-14 [i.11] | Nb: Change of temperature |
| Humidity | Relative | low (%) | 10 | None | | | |
| | | high (%) | 100 | 100 | 4 d steady state | IEC 60068-2-56 [i.12] | Cb: Damp heat |
| | | condensation (°C) (%) | yes | +30° 90 to 100 | 1 cycle | IEC 60068-2-30 [i.13] | Db: Damp heat cyclic Variant 1 |
| | Absolute | low (g/m ³) | 0,5 | None | | | |
| | | high (g/m ³) | 29 | | | | |
| Air | Pressure | low (kPa) | 70 | None | | | |
| | | high (kPa) | 106 | None | | | |
| | Speed | (m/s) | 5,0 | None | | | |
| Water | Rain | intensity | no | | | | |
| | | low temperature | no | | | | |
| | Icing & frosting | | yes | | | | |
| Radiation | Solar | (W/m ²) | 700 | | | | |
| | Heat | (W/m ²) | 600 | | | | |

Table 3: Test specification T 3.3: Partly temperature controlled locations - chemical and mechanically tests

| Environmental parameter | | | Environmental Class 3.3 | Environmental test specification T3.3: In use, Partly temperature controlled locations | | | |
|--------------------------------|----------------------|---------------------------------------|-------------------------|--|----------|-----------|--------|
| Type | Parameter | Detail parameter | Characteristic severity | Test severity | Duration | Reference | Method |
| Chemically active substances | Sulphur | SO ₂ (mg/m ³) | 0,3/1,0 | none | | | |
| | | H ₂ S (mg/m ³) | 0,1/0,5 | none | | | |
| | Chlorine | salt mist | sea and road salt | none | | | |
| | | Cl (mg/m ³) | 0,1/0,3 | none | | | |
| | | HCl (mg/m ³) | 0,1/0,5 | none | | | |
| | Nitrogen | NO _x (mg/m ³) | 0,5/1,0 | none | | | |
| | | NH ₃ (mg/m ³) | 1,0/3,0 | none | | | |
| Hydrogen fluoride HF | (mg/m ³) | 0,01/0,03 | none | | | | |
| Ozone O ₃ | (mg/m ³) | 0,05/0,1 | none | | | | |
| Mechanically active substances | Dust | sedimentation (mg/(m ² h)) | 15 | | | | |
| | | suspension (mg/m ³) | 0,4 | | | | |
| | Sand | (mg/m ³) | 300 | | | | |
| Flora and fauna | Micro organisms | | mould, fungus, etc. | none | | | |
| | Rodents, insects | | rodents, etc. | none | | | |

NOTE 1: no = this condition does not occur in this class.
NOTE 2: none = verification is required only in special cases.
NOTE 3: n = number of note, see clause 5.

History

| Document history | | |
|-------------------------|---------------|-------------|
| V1.1.1 | December 2011 | Publication |
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