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Safe working practices for outside equipment installed in particular environments

Recommendation ITU-T K.64

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Summary

Recommendation ITU-T K.64 describes working practices for service personnel to help them work safely in telecommunication installations in three specific environments.

The specific environments covered in this Recommendation are characterized by wet conditions or close proximity to exposed metallic parts.

The working practices apply to telecommunication plants with voltage levels higher than the limits defined for analogue PSTN circuits, such as remote feeding telecommunication current or voltage (RFT-C or RFT-V) circuits.

This version of Recommendation ITU-T K.64 includes a warning regarding contact with terminals carrying RFT circuits with small parts of the body, e.g., back of the hand. The references have been updated to include the IEC 62368 series.

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Table of Contents

		Page
1	Scope	1
2	References.....	1
3	Definitions	1
	3.1 Terms defined elsewhere	1
	3.2 Terms defined in this Recommendation.....	1
4	Abbreviations and acronyms	3
5	Conventions	3
6	Telecommunication particular workplaces.....	3
7	Voltage levels on TLC installations	4
8	Work practices on TLC plants in particular environments.....	5
	8.1 Switching off the power supply	5
	8.2 Practices to be used when working on live telecommunication circuits	6
9	Work on telecommunication installations at risk of electric shock.....	7
	9.1 Work on equipment or devices (terminal box, etc.)	7
	9.2 Work on cables	8
	Appendix I – Rationale of safe voltage limit values for workplace at major risk of electric shock.....	10
	I.1 Operating cases.....	10
	I.2 Calculation assumption	10
	I.3 Limit current calculation	12
	I.4 Voltage limit calculation	15
	Appendix II – Cross reference table of IEC 60950 and IEC 62368 terms.....	18
	Bibliography.....	23

Introduction

Network operators, in their telecommunication infrastructure, use equipment that is remotely powered by symmetrical or coaxial pair cables. The voltages and currents that power these systems differ among them and comply with the limit values defined in [IEC 60950-1], [IEC 60950-21], and [IEC 62368] series for symmetrical pair cables and in [IEC 60728-11] for coaxial cables. The limits in these standards have been defined to allow service personnel to work safely on these lines without de-energizing the circuits.

Nevertheless, there are telecommunication environments that necessitate additional precautions to enable service personnel to work safely on circuits that are usually considered safe to touch. These environments are characterized as wet conditions, sometimes associated with standing water. This Recommendation lists three practical situations where additional precautions are needed and defines how the service personnel should perform work to reduce risk associated with these situations.

Specific applications, local conditions or regulations may give rise to a need for additional safeguards or modifications to practices presented in this Recommendation.

Recommendation ITU-T K.64

Safe working practices for outside equipment installed in particular environments

1 Scope

The scope of this Recommendation is to provide working procedures for maintenance activities in specific environments for telecommunication plants with voltage levels higher than the limits defined for analogue public switched telephone network (PSTN) circuits. The specific environments covered in this Recommendation are characterized by wet conditions or close proximity to exposed metallic parts.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T K.50] Recommendation ITU-T K.50 (2018), *Safe limits for operating voltages and currents for telecommunication systems powered over the network*.
- [IEC 60479-1] IEC 60479-1 Ed. 4.0 :2018, *Effects of current on human beings and livestock – Part 1: General aspects*.
- [IEC 60728-11] IEC 60728-11: Ed. 3.0: 2016, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*.
- [IEC 60950-1] IEC 60950-1: Ed. 2.0: 2005, *Information technology equipment – Safety – Part 1: General requirements*.
- [IEC 60950-21] IEC 60950-21: Ed. 1.0: 2002, *Information technology equipment – Safety – Part 21: Remote power feeding*.
- [IEC 62368-1] IEC 62368-1: 2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*.
- [IEC 62368-3] IEC 62368-3: 2017, *Audio/video, information and communication technology equipment – Part 3: Safety aspects for DC power transfer through communication cables and ports*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 analogue public switched telephone network (PSTN) circuit: A telecommunication network voltage (TNV) circuit (see clause 3.2.9) operating at voltages less than or equal to 90 V d.c. with cadenced ringing signals complying with [IEC 60950-1].

3.2.2 cable TV (CATV) circuit: An interface circuit for a cable distribution system intended for transmission of video, data and/or audio signals between separate buildings or between outdoor antennas and buildings.

NOTE – CATV circuits remotely powered, i.e., circuits on feeder between the optical node unit and the last line amplifier, are only considered in this Recommendation.

3.2.3 dry conditions: An environmental condition in which the resistance of the skin and to the body is not reduced with respect to the value defined in [IEC 60479-1].

3.2.4 environment classification: The environments considered by this Recommendation are classified as follows:

- Environment type 1: environment with the floor in wet conditions, sometimes with standing water (for example, manholes, vaults, trenches);
- Environment type 2: environment with wet walls and confined working space (for example, vaults) such that the wet wall may be in contact with the person's body and producing (in the case of hand contact with an energized part) a current path different to the hand-to-feet current path;
- Environment type 3: environment with confined working space and existing extraneous metallic parts (for example, facilities of other services); during the operations, large areas of the metallic parts (e.g., metallic tower for radio link) are in continuous contact with the body.

3.2.5 insulated tool: A tool, such as a screwdriver, scissor, or pliers, having an insulated handle that may be used by service personnel during his operations on telecommunication equipment or cable.

3.2.6 RFT-C circuit: A remote feeding telecommunication circuit that is so designed and protected that under normal operating conditions and single fault conditions, the currents in the circuit do not exceed defined values.

NOTE – The current limit values under normal operating and single fault conditions are specified in [ITU-T K.50] or [IEC 60950-21] or [IEC 62368-3].

3.2.7 RFT-V circuit: A remote feeding telecommunication circuit that is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited and the accessible area of contact is limited.

NOTE – The voltage limit values under normal operating and single fault conditions are specified in [ITU-T K.50] or [IEC 60950-21] or [IEC 62368-3].

3.2.8 service personnel: A person having appropriate technical training and experience necessary to be aware of hazards, to which that person may be exposed in performing a task, and of measures to minimize the risks to that person or other persons.

3.2.9 telecommunication network voltage (TNV) circuit: A circuit in the equipment to which the accessible area of contact is limited and that is so designed and protected that, under normal operating conditions and single fault conditions, the voltages do not exceed specified limit values.

3.2.10 user: Any person other than service personnel.

3.2.11 vault: An underground chamber (manhole, pit, exchange or high rise building cable entry) or above ground pedestal or cabinet used to accommodate communication equipment such as joint closures, housings and/or electronic equipment installed in the external plant environment.

3.2.12 wet condition: An environmental condition in which the resistance of the skin and to the body is reduced with respect to the value defined in [IEC 60479-1].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC	Alternating Current
CATV	Cable TV
CCP	Cross-Connection Point
ES	Energy Source
ES1	Energy Source class 1
ES2	Energy Source class 2
MDF	Main Distribution Frame
PSTN	Public Switched Telephone Network
RFT-C	Remote Feeding Telecommunication – Current circuit
RFT-V	Remote Feeding Telecommunication – Voltage circuit
RMS	Root Mean Square
SELV	Safety Extra Low Voltage
TLC	Telecommunication
TNV	Telecommunication Network Voltage
DC	Direct Current

5 Conventions

None.

6 Telecommunication particular workplaces

Safety standards recognize that voltage levels defined as safe to touch in normal conditions may present a hazard to service personnel in damp conditions. For example, it is recognized that even safety extra low voltage (SELV) circuit limits may present a risk of electric shock for a person when such circuits are used in a wet environment. For this reason, the voltage limit for parts touchable by a person is equal to half the value of the limit applicable in dry environments.

Obviously, it is not possible to reduce the voltages usually present on a telecommunication line in order to have the same safe conditions within a wet environment when contacted by service personnel. In such cases, recognizing the presence of potentially harmful energy sources, the behaviour of service personnel becomes an effective means to prevent injury. Therefore, there is the need to follow safe working practices when equipment maintenance is necessary and a dry environment is not possible. This approach is possible because the service personnel are skilled and trained.

An example of such work is the maintenance activities inside a manhole or, in general, in a vault where the presence of water at the bottom is as likely as that of infiltration water on the internal walls. Sometimes, the confined space of the workplace hinders the maintenance of the equipment and increases the likelihood that the current path through the person's body will differ from the hand-to-feet current path. Lastly, service personnel may accidentally make an adverse, large-area contact with energized conductors. This could happen, for instance, if one hand holds a tool fastened to the energized conductor while the other hand, or another body part, is in full contact with an earthed conductor.

Summarizing, there are three particular environments that may present safety hazards to the service personnel that operates a telecommunication (TLC) plant:

- 1) Environment type 1: wet conditions (see clause 3.2.4);
- 2) Environment type 2: confined working space in wet conditions (see clause 3.2.4);
- 3) Environment type 3: confined working space contacting extraneous metallic parts (see clause 3.2.4).

To reduce the risk of electric shock associated with the maintenance activities performed in such an environment, service personnel shall follow simple and effective working practices, as described in clause 8.

7 Voltage levels on TLC installations

[IEC 60950-1] allows voltage levels, not higher than 70.7 V (peak) or 120 V d.c., on symmetrical pair cables of telecommunication networks type TNV-2 and TNV-3. These TNV circuits, accessible to skilled personnel only, are safe for an ordinary environment (dry conditions) but in wet conditions the contact with TNV circuits at voltages greater than analogue PSTN voltages (see clause 3.2.1) may be dangerous for service personnel due to a reduction of the contact impedance.

[IEC 62368-1] has energy sources (ESs) with maximum DC operating voltages equivalent to TNV levels. ES1 limits are DC 60 V at DC 2 mA and 70 V rms at 0.5 mA rms. ES2 limits are DC 120 V at DC 25 mA and 140 V rms at 5 mA rms.

The voltage levels used in a coaxial cable distribution network are defined in [IEC 60728-11]. Voltage levels between the inner and outer conductor of up to 65 V rms, 120 V d.c. are allowed. It must be considered that such voltage levels shall be completely inaccessible to the user and service personnel may access these voltages only after removing, with a tool, the equipment cover.

[IEC 60950-21] has introduced remote feeding telecommunication circuits limited in current (RFT-C) or in voltage (RFT-V). Both circuits are suitable for barehanded contact by service personnel in powered state, in line with [ITU-T K.50]. [IEC 62368-3] also incorporates RFT-V and RFT-C limits.

Table 1 summarizes the voltage levels that may be present on a telecommunication line under normal conditions for different types of circuits in the network [IEC 60950-1], [ITU-T K.50], [IEC 60728-11], [IEC 60950-21], [IEC 62368-1] and [IEC 62368-3]. These voltage levels are based on the assumption that the surface contact area is not greater than 1 cm² in order to limit body impedance in the hand-to-feet path to more than 5 kΩ.

Table 1 – Voltages on TLC lines in normal conditions for different types of circuits in the equipment powering the network

Type of circuit	V d.c. max [V]	V a.c. max [V]
TNV	120 (ES2)	70.7 (peak value)
RFT-C	±400 (Note 1)	N.A.
RFT-V	±140 (Note 2)	N.A.
CATV	120	65 (rms)
NOTE 1 – This value applies if the voltage rating of the wiring of the telecommunication network is not specified. If it is specified, the supply voltage shall be limited to this value or to a maximum value of 1500 V (see [ITU-T K.50]).		
NOTE 2 – Or ±200 V if the short circuit current is limited to 10 mA d.c. (see [ITU-T K.50]).		