Electricity Distribution

nationalgrid

Company Directive

STANDARD TECHNIQUE: TP21AC

Earthing Design Fundamentals
Part C
Limits For Telecommunication Equipment

Summary

This Standard Technique defines the limits for impressed or induced voltages on telecommunication equipment when designing earthing systems which are to be owned or adopted by Western Power Distribution.

Author: **Graham Brewster**

Implementation Date: **December 2020**

Approved By:

Carl Ketley-Lowe
Engineering Policy Manager

Date: **9th December 2020**

Target Staff Group	**Network Services Teams & ICPs**
Impact of Change	**AMBER - The changes have an impact of current working practices that are not safety critical – Communication at next team meeting or as part of a retraining programme**
Planned Assurance checks	**None**

All references to Western Power Distribution or WPD must be read as National Grid Electricity Distribution or NGED

IMPLEMENTATION PLAN

Introduction

This Standard Technique defines the limits for impressed or induced voltages on telecommunication equipment when designing earthing systems which are to be owned or adopted by Western Power Distribution.

Main Changes

This document is a new ST.

Impact of Changes

This Standard Technique is relevant to employees, Contractors and Independent Connection Providers involved with the design / assessment of earthing systems.

Implementation Actions

Managers should notify relevant staff that this Standard Technique has been published.

There are no retrospective actions.

Implementation Timetable

This ST shall be implemented with immediate effect.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
December 2020	• Initial issue	Graham Brewster

Contents

1.0 INTRODUCTION

This Standard Technique defines the limits for impressed or induced voltages on telecommunication equipment when designing earthing systems which are to be owned or adopted by Western Power Distribution.

2.0 DEFINITIONS

For the purpose of this document the following definitions are employed:

TERM	DEFINITION
ITU	International Telecommunication Union. The UN specialised agency for information and communication technologies which is responsible for the technical standards that ensure networks and technologies seamlessly interconnect
Transfer Voltage	The potential transferred by means of a conductor between an area with a significant earth potential rise and an area with little or no earth potential rise, and results in a potential difference between the conductor and earth in both locations.

3.0 REFERENCES

This document makes reference to, or should be read in conjunction with, the documents listed below. The issue and date of the documents listed below shall be those applicable at the date of issue of this document, unless stated otherwise.

3.1 International Telecommunication Union

NUMBER	TITLE
ITU-T	Directives concerning the protection of telecommunication lines against harmful effects from electric power and electrified railway lines - Volume VI: Danger, Damage and disturbance (2008).

3.2 **Energy Networks Association**

NUMBER	TITLE
TS 41-24	Guidelines for the design, installation, testing and maintenance of main earthing systems in substations
EREC S36	Identification and recording of 'hot sites' – joint procedure for electricity industry and communications network providers
EREC S37	Code of practice for the safe working on pilot, auxiliary and communication cables
EREP 128	Risk assessment for communication network operatives working in a ROEP zone
EREP 129	ROEP risk assessment for third parties using equipment connected to communications network provider lines

4.0 REQUIREMENTS

4.1 Schedule 4 Of The Electricity Act 1989

Schedule 4 of the Electricity Act 1989 requires Network Operators and Public Telecommunications Operators to avoid interference between electrical plant and telecommunications apparatus.

Clause 5(1) requires a Network Operator who installs or alters or changes the mode of operation of any electric line or electrical plant to take all reasonable precautions to ensure that the operation of that line or plant does not interfere with the operation of any telecommunication apparatus which is under the control of a Public Telecommunication Operator.

4.2 ITU Classification

The ITU-T directives (concerning the protection of telecommunication lines against harmful effects from electric power and electrified railway lines) describes the danger to telecommunication workers and users, damage to equipment, and interference to the transmission of information that may occur as a result of the proximity of telecommunication installations to electric power and electrified railway installations.

The directive prescribes limits for induced or impressed voltages derived from HV supply networks. An elevated limit is permitted for substations defended with fast acting, high reliability protection which limits the fault duration to 200ms or less.

These limits are used to classify a substation as either 'hot' and 'cold' i.e. an earth potential rise less than or equal to the limit and the substation is 'cold', and an earth potential rise above the limit and the substation is 'hot'. This classification is required for telecommunication operators.

Note that these limits are not directly relevant to the safety of persons, which is determined by the touch, step and transfer voltage limits prescribed in Standard Technique TP21A-A and TP21A-B.

4.3 **ENA Engineering Report 129**

ENA Engineering Report 129 considers third party premises which are located close enough to substations as to be affected by earth potential rise as a consequence of earth faults on the electricity network. Hazards arise due to potential differences (as a result of the earth potential rise) between the third party premises and the communications network provider lines serving them. The engineering report adopts the principles established in the ITU-T directives and also considers the insulation levels in telecommunication equipment.

The report prescribes limits for earth potential rise at nearby third party premises. An elevated limit is permitted where earth faults are disconnected by fast acting, high reliability protection which limits the fault duration to 200ms or less.

Earth potential rise above the limit requires mitigation measures to be considered.

4.4 **Transfer Voltage Limits**

4.4.1 Between A Substation And The Telecommunication Lines Serving It

Where the earth potential rise does not exceed the limits prescribed in the following table, a conductive path is permitted between the substation and the telecommunication lines serving it.

Substation Voltage	Transfer Voltage Limit	Comments
132kV, 66kV & 33kV	650V	Substations where the overall fault clearance time is normally 200ms or less and is realised using 'unit' or 'distance zone 1' protection.
	430V	Substations where the overall fault clearance time is normally greater than 200ms and is realised using 'distance zone 2' or overcurrent & earth fault protection.
11kV & 6.6kV	430V	All substations

4.4.2 Between A Third-Party Premises Affected By Earth Potential Rise And The Telecommunication Lines Serving It

Where the earth potential rise at the third-party premises does not exceed the limits prescribed in the following table, a conductive path is permitted between the premises and the telecommunication lines serving it.

Transfer Voltage Limit	Comments
1700V	Premises affected by earth potential rise where the overall fault clearance time is normally 200ms or less and is realised using 'unit' or 'distance zone 1' protection.
1150V	Premises affected by earth potential rise where the where the overall fault clearance time is normally greater than 200ms and is realised using 'distance zone 2' or overcurrent & earth fault protection.

APPENDIX A

SUPERSEDED DOCUMENTATION

This is a new document and no document is superseded by its issue.

APPENDIX B

RECORD OF COMMENT DURING CONSULTATION

No comments received.

APPENDIX C

ASSOCIATED DOCUMENTATION

POL: TP21 Fixed Earthing Systems

APPENDIX D

KEY WORDS

Earthing; Telecommunication; ITU; Limit; Hot; Cold; Transfer; Voltage; Potential;