

Letter of instruction

Information for users

The following document:

NR/SP/ELP/27243 Issue 1

has had changes made to it, most recently, with effect from **5 December 2011**.

Instructions for use

It is essential that you first read and understand each letter of instruction pertaining to the standard before proceeding to use the standard. You must then apply the requirements of each letter to the standard.

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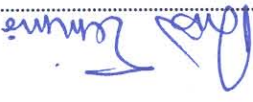
Business Process Document

Specification for signalling power supplies

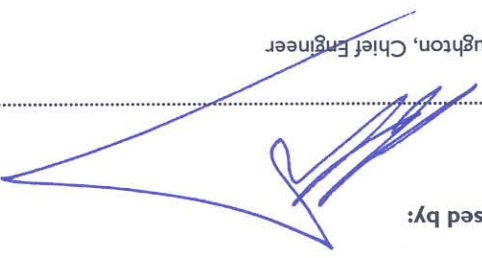
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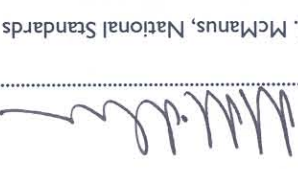

K. Lydford, Professional Head of Electrification & Plant Engineering


Andrew Simmons, Head of Signal Engineering

Authorised by:


A. McNaughton, Chief Engineer

Accepted for issue by:


M. McManus, National Standards Manager

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Issue record

Issue	Date	Comments
1	August 2006	New standard

Implementation

5 August 2006

Compliance

This Network Rail specification is mandatory and must be complied with by Network Rail and its contractors from 2 October 2006

When this specification is implemented, it is permissible for all projects, which have formally completed GRIP Level 4 to continue to comply with the Issue of any relevant Network Rail standards current when GRIP Level 4 was reached and not to comply with requirements contained herein unless the head of electrification and plant has stipulated otherwise in the accompanying briefing note.

Where the head of electrification and plant has specified that all projects will comply with the requirements, specific authority not to comply can be sought in the usual manner using the appropriate non-compliance authority processes described in Network Rail standard, [NR/SP/STP/045](#) *Managing the process for non-compliance authority* (formerly RT/LS/P/045).

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1 Purpose

This document specifies Network Rail's requirements for signalling power supply trackside distribution systems. This document focuses on the different types of distribution feeder that can be used and the applicability of BS7671. These requirements ensure that the system design complies with the Electricity at Work Regulations 1989. This specification references supporting standards where appropriate.

2 Scope

This document should be read in conjunction with GI/RT7017 – Signalling and Safety-Related Telecommunications Power Supplies and Circuits and BS7671. This document has an associated guidance note NR/GN/ELP/27244.

This Standard applies to installations that distribute power supplies from public and private sources to signalling equipment e.g. from DNO (Distribution Network Operator) or electrification, to the Functional Supply Point (FSP). Guidance on the process of design may be found within NR/GN/ELP/00015.

This standard applies to new works and modifications to signalling power supply distribution installations as defined by Railway Group Standards. The aim of this document is to define:

Design Requirements in terms of;

Trackside Power Distribution Systems

Applicability of BS7671

Selection and Erection of Equipment with particular reference to;

Cables

Transformers

Automatic Reconfiguration Devices

Applicability of BS7671

Inspection and Testing of Trackside Power Distribution Systems

The quality of supply will be defined on a location by location basis.

This standard does not apply to signalling functional circuits e.g. the 110V distribution system from the FSP transformers to signalling equipment.

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3 Reference documentation

[NR/GN/ELP/27244](#) Guidance for Signalling Power Supplies

NR/GN/ELP/00015 Guidance Note for Signalling Power Supply Design
NR/SP/ELP/21085. Specification for Design of Earthing & Bonding Systems for 25kV AC Electrified Lines

NR/SP/ELP/21032 Earthing Systems for D.C. Traction Substations, Track Paralleling Huts & Similar Equip Locations.

[BS EN 50122-1](#) Railway applications. Fixed installations. Protective provisions relating to electrical safety and earthing

[BS7671](#) Requirements for Electrical Installations.

[IEC 60502-1](#) Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) .

Part 1: Cables for rated voltages of 1 kV ($U_m = 1,2$ kV) and 3 kV ($U_m = 3,6$ kV)

[BR924A](#) Air Cooled Power Transformer for Railway Signalling
[GI/RT7017](#) Signalling and Safety Related Telecommunications Power Supplies and Circuits

[G5/4-1](#) Engineering Recommendation G5/4-1

Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Equipment to Transmission Systems and Distribution Networks in the United Kingdom

ETR 122 An application guide to G5/4

4 Abbreviations and Definitions

CPC	Circuit protective conductor.
DNO	Distribution Network Operator.
ECR	Electrical Control Room
FLC	Full Load Current - the highest demand experienced during the normal operation of the load. This is NOT the sum of the power rating of all downstream equipment.
FSP	Functional Supply Point – point that the power supply distribution system connects with an item of supplied equipment.
PSP	Principal Supply Point – point of common connection for all sources of electricity from which power may be distributed.
Railway	A Standard which focuses on the requirements for equipment installed in the Railway environment, e.g. Railway Group Standards or Network

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Standards	Rail Company Standards.
Sub circuits	Signalling Power distribution circuits derived from the distribution main feeder i.e. any circuits between the distribution main and the FSP.
UPS	Uninterruptible Power Supply

5 Application of Requirements for Electrical Installations (BS7671)

Where the requirements of BS7671 can be applied to signalling power supply distribution system designs or are modified, these are listed in Appendix A of this standard. Where the Regulations do not apply these can be found in Appendix B.

Clarification on modification to the regulations within BS7671 are also defined within Appendix A.

6 Requirements for Signalling Power Distribution Systems

6.1 Fundamental Design Requirements

The reliability and availability of the DNO/source shall be determined.

The reliability and availability requirements for the signalling power distribution system shall be consistent with the reliability and availability requirements for the signalling system.

The PSP, trackside distribution cabling and switchgear shall be designed and rated to permit a load growth of 20% of the FLC at each FSP.

The trackside cabling shall be designed to ensure that the nominal FSP voltage shall not exceed +/-10% of the nominal voltage under normal operation.

The power supply shall be designed to ensure that the FSP frequency shall not exceed +/-1% of the nominal frequency under normal operation.

The power supply shall be designed to ensure that the harmonic content does not exceed the requirements of ENA Engineering Recommendation G5/4-1.

Each of these requirements may be further constrained by the load at the particular location.

A clear and consistent method of identifying cables and equipment shall be used. The method of identification shall be in accordance with NR/GN/SIG/11210 Appendix 1M05.

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6.2 Modifications to Existing Installations

When a modification to existing signalling power supply installation is being planned which requires an increase or change of the load, e.g. installation of a transformer or battery charger at an FSP, the suitability of the upstream protective device shall be assessed.

When a modification to existing signalling power supply installation is being planned which requires adjustment of the protection, e.g. increasing the fuse size at a FSP or installation of a transformer in the main feeder, a protection co-ordination study shall be performed.

6.3 Protection for Safety

The signalling power supply design shall include a protection co-ordination study. The system design shall include:

- Provision for protection against indirect contact. The methodology employed to determine that touch potentials are within permissible levels shall be stated.
- Discrimination between protective devices.
- Determination of the insulation resistance settings where earth fault monitoring is provided.

Each system shall be designed so that all faults, except for the first earth fault on an IT system, are cleared within five seconds.

6.3.1 Feeder and Sub-Circuit Protection

Protection shall be provided for each sub-circuit fed off a main distribution feeder. The sub-circuit protection shall discriminate with the main feeder protection. Circuits shall be arranged, so that the isolation of a faulty segment or equipment will minimise the impact on the supply to other equipment.

6.3.2 IT 'Unearthed' Distribution Systems

IT Systems shall be provided with earth insulation monitoring equipment. The equipment shall incorporate means of feeding back a low insulation alarm to a manned control centre e.g. Signal Box or ECR.

Insulation monitoring shall be capable of identifying the failure of a particular main feeder.