

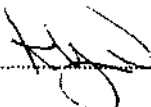
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Business Process Document

25 kV a.c. switchgear and ancillary equipment (formerly RT/SEL/2004)

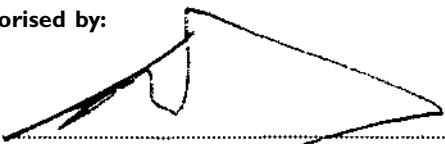
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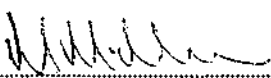
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Issue record

Issue	Date	Comments
2	October 2005	Formerly RT/SEL/2004 which has been substantively revised and re-issued as a SAF3 Business Process Document

Implementation

3 December 2005

Compliance

This Network Rail specification is mandatory and must be complied with by Network Rail and its contractors from 3 December 2005.

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 fixed plant has stipulated otherwise in the accompanying briefing note.

Where the head of electrification and fixed 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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I Introduction

I.1 Purpose

This product specification states the requirements for indoor and outdoor switchgear and ancillary equipment for 25 kV a.c. switching stations.

This document is to be read in conjunction with the relevant procurement product specification.

I.2 Scope

This specification applies to all new 25 kV a.c. switchgear installed on a.c. electrified lines, excluding OLE switchgear.

I.3 Reference documentation

Network Rail Standards

[NR/SP/ELP/21028](#) Ancillary wiring of electrical distribution equipment on a.c. and d.c, electrified lines

[NR/SP/ELP/21030](#) Prefabricated and modular steel housings for electrical distribution equipment

[NR/SP/ELP/21035](#) Protection equipment for 25 kV electrification

[NR/SP/ELP/21041](#) Battery and battery charging equipment for electrification equipment

[NR/SP/ELP/21085](#) Design of earthing and bonding systems for 25 kV a.c. electrified lines

British Standards

[BS 88](#) Part 2 Cartridge fuses for voltages up to and including 1000 V a.c. and 1500 V d.c.

[BS 5499](#) Graphical symbols and signs. Safety signs, including fire safety signs. Specification for geometric shapes, colours and layout

European Standards

[EN 50122-1](#) Protective provisions relating to safety and earthing

[EN 50124-1](#) Railway applications – Insulation coordination

Part 1 Basic requirements – Clearances and creepage distances for all electrical and electronic equipment

Part 2 Overvoltages and related protection

EN 50152	Railway applications – Fixed installations. Particular requirements for a.c. switchgear
Part 1	Single phase circuit breakers with Um above 1 kV
Part 2	Single phase disconnectors, earthing switches and switches with Um above 1 kV
Part 3	Measurement, control and protection devices for specific use in a.c. traction systems
Part 1	Application guide
Part 2	Single phase current transformers
Part 3	Single phase voltage inductive transformers
EN 50163	Railway applications – Supply voltages of traction systems
EN 60044	Instrument transformers
Part 1	Current transformers
Part 2	Inductive voltage transformers
EN 60137	Insulating bushings for alternating voltages above 1000 V
EN 60269-1	Low-voltage fuses
EN 60282-1	High-voltage fuses
EN 60298	A.C. metal enclosed switchgear and controlgear, for rated voltages above 1 kV and up to and including 52 kV
EN 60439	Low voltage switchgear and controlgear assemblies
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
EN 60617	Graphic symbols for diagrams
Part 7	Switchgear, controlgear and protective devices
EN 60694	Common product specifications for high-voltage switchgear and controlgear standards
EN 60721	Classification of environmental conditions, Section 3.4 Stationary use at non-weather protected locations
EN 60898-1	Circuit breakers for overcurrent protection for household and similar insulation. Circuit breakers for a.c. operation
EN 62271	High voltage switchgear and controlgear
Part 100	High voltage alternating current circuit breakers
Part 102	Alternating current disconnectors and earthing switches

I.4 Definitions

For the purpose of this product specification the following definitions shall apply:

British Standard	A standard published by the British Standards Institution. Its alphanumeric identity is prefixed by BS.
Disconnecter	An integral switch that is locally and remotely controlled and interlocked with its associated circuit breaker. Disconnecters may be used as a point of isolation.
Earth switch	An integral switch that is locally and remotely controlled and interlocked with its associated circuit breaker. Earth switches may be used to earth circuits through their associated circuit breaker.
Equipment	The equipment covered by this specification, including all component parts and accessories.
European Standard	A standard published by the European Committee for Standardisation or by the European Committee for Electrotechnical Standardisation. Its alphanumeric identity is prefixed by EN.
International Standard	A standard published by the International Electrotechnical Commission. Its alphanumeric identity is prefixed by IEC.
Network Rail Standard	A collective term for a Network Rail documents published by a directorate of Network Rail PLC. Its alphanumeric identity is prefixed by NR/, followed by a unique reference.
Procurement specification	Network Rail's contract specific documentation, such as, Invitation to Tender or Technical Worksopce.

I.5 Abbreviations

DNO	Distribution Network Operator
OLE	Overhead Line Equipment
SCADA	Supervisory Control And Data Acquisition
SMOS	Structure Mounted Outdoor Switchgear

2 General clauses

2.1 Safety

At all times the equipment shall be safe. Measures shall be taken to ensure the safety of persons concerned in its installation, operation, maintenance, repair and its eventual disposal. All equipment and connections for the safe and satisfactory operation, control and protection of the equipment concerned, shall be provided whether or not specifically mentioned.

The equipment shall be adequately provided with interlocking and padlocking facilities, earthed, insulated, screened, enclosed etc. Safe and appropriate access shall be provided for operation and maintenance purposes.

The supplier shall provide training in safe operation and maintenance of the equipment.

2.2 Design, manufacture and workmanship

The equipment shall be designed and manufactured in accordance with best practice, taking cognisance of the system in which it will operate. All material shall be of the quality and of the type most suitable for working under the conditions specified for the full service life of the equipment.

2.3 Spare parts and consumables

The supplier shall make recommendations to the purchaser for holdings of spare parts and consumables based on estimated replacement rates and delivery periods to ensure that the equipment complies with this product specification throughout its specified service life. The supplier shall indicate the extent of commonality with equipment previously supplied.

2.4 Drawings

Drawings of the equipment covering each of the following aspects shall be submitted to the purchaser for scrutiny:

- a) General arrangement (internal and external)
- b) Static and dynamic loadings and foundation and fixing requirements
- c) Schematic/circuit diagrams
- d) Interlocking logic diagrams
- e) Protection logic diagrams
- f) Diagram and rating plates
- g) Details of cable entries and terminations
- h) Detailed wiring diagram or schedules

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All diagrams shall be legible and of good quality. Where symbols are used, they shall be in accordance to [EN 60617](#).

Unless otherwise stated in the procurement specification, four copies of each drawing shall be provided.

Where it is essential for clear understanding of the circuits, block or circuit diagrams shall include details of existing components or components not being provided by the supplier. Wiring diagrams shall include any unused wires, contacts, plugs, sockets, terminals and the like.

As an alternative to separate circuit and wiring diagrams, combined diagrams may be provided. In this case, the position of each wire termination shall be indicated either on the drawing or by means of a schedule of terminations.

Circuit diagrams and wiring diagrams should be kept to a minimum. Generic diagrams are encouraged where appropriate to keep the quantity of diagrams to a minimum.

A short description of each revision shall be provided under consecutive revision letters or numbers together with the date.

Wherever feasible, some means shall be used to identify the location of the most recent revision, for instance by circling the locations.

All drawings shall be brought up to date as necessary, to provide a permanent as-fitted record and shall be supplied in the software format specified in the procurement specification.

2.5 Instruction manual

The supplier shall produce a comprehensive and specific instruction manual covering all aspects of installation, operation and maintenance and eventual disposal, and shall supply the number of copies specified. The manual shall provide guidance to enable all work to be carried out safely and efficiently. The manual shall contain only relevant information and shall include:

- a) A description of the construction, installation, functioning and rating of the equipment.
- b) Operating instructions, including safety and isolation procedure.
- c) Procedures with periodicities for routine maintenance including any special precautions, fault finding and major overhauls.
- d) A list of all consumable items with part numbers or references.
- e) Full details of recommended adjustments and settings for the equipment and its protective devices where appropriate.
- f) Instructions for eventual disposal including safety and handling precautions and recommendations.

- g) Drawings, illustrations and data enabling all component parts to be readily identified and to allow procurement for replacement purposes.
- h) The drawings listed in clause 2.4 entitled 'Drawings'.
- i) A list of locations and associated serial numbers.

The manual shall be of loose leaf design with at least four retaining rings and with oil resistant hard covers. It shall be of A4 size and include drawings reduced to A3 or A4 size. Drawings reduced in size shall remain clearly legible. The purchaser may accept drawings larger than A3 subject to suitable, clearly labelled protective drawing storage folders being provided for inclusion in the manual.

Unless otherwise stated in the procurement specification, two paper copies of the final version of the manual shall be submitted to the purchaser prior to delivery of the equipment. In addition, two electronic copies of the manual shall be supplied to the purchaser.

Before the purchaser takes over full responsibility for the equipment, for example, at the expiry of the warranty period, any necessary modifications shall be made and sufficient paper copies provided to the purchaser for incorporating into the full quantity of manuals supplied. In addition, two electronic copies of the modified manual shall be supplied to the purchaser.

2.6 Delivery

The equipment shall be suitably prepared to withstand, without damage or deterioration, transport to intended site, craneage, storage, weathering and positioning prior to final erection and commissioning.

Any factor that may affect the onward delivery to a final site (e.g. dimensions and weight limits) shall be subject to agreement between the supplier and the purchaser.

3 Compliance with standards

3.1 Network Rail Company Standards, European, International and British Standards

The equipment shall comply with relevant Network Rail standards and European Standards EN's whether or not reference is made to them.

The English language versions of EN's are British Standards referred to as BS EN's.

In the absence of European Standards, International Standards or British Standards, best practice having currency within the European Community shall apply subject to the prior agreement of the purchaser.

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The editions of standards current at the date of tender shall apply. Where superseded standards are referenced, the replacement standard will apply.

3.2 Specific equipment standards

The standards listed in clause 1.3 entitled 'Reference documentation', shall be adhered to when specified in this specification and as appropriate.

Unless otherwise specified, EN 50152 shall take precedence over other EN standards for switchgear where there are conflicts. Where EN 50152 refers to HD 348 S6:1995, the corresponding requirements in EN 62271-100 shall apply as EN 62271-100 supersedes HD 348 S7:1998.

Where superseded standards are referenced and there is a direct replacement, the replacement standard shall apply.

Where there are conflicts between standards that may affect the design and equipment supplied which are not resolved within this standard or in the procurement specification, the purchaser shall be informed in writing with a proposed solution.

4 General performance and technical requirements

4.1 General

The switchgear and ancillary equipment shall be fully functional, complete and in accordance to this specification. A disconnecter and earth switch shall be provided with each circuit breaker unless otherwise specified in the procurement specification. For retro-fit circuit breaker replacements or for SMOS installations the procurement specification may specify that a circuit breaker does not require an integral disconnecter or earth switch.

The switchgear shall be suitable for use on a 25 kV, 50 Hz single-phase electrification system or on a 25-0-25 kV, 50 Hz autotransformer electrification system as specified in the procurement specification.

Circuit breakers shall be in accordance with [EN 50152-1](#). Disconnectors and earth switches shall be in accordance with [EN 50152-2](#). The supplier shall refer to clause 1.4 entitled 'Definitions' for the definition of 'disconnecter' and 'earth switch' as used in this specification.

The equipment shall be fit for its intended purpose when connected to Network Rail's electrification system.

4.2 New and existing buildings and switchgear enclosures

The switchgear and ancillary equipment shall be enclosed in a weatherproof housing that is either an integral part of the switchgear enclosure or fixed within a modular or prefabricated housing to Network Rail specification [NR/SP/ELP/21030](#). If installed as part of a refurbishment or renewal, the switchgear may be placed in an existing building as specified in the procurement specification.

For structure mounted switchgear, as described in clause 6 entitled 'Technical and construction requirements for structure mounted outdoor switchgear (SMOS)', that is not installed in a weatherproof housing shall be fully protected against all external environmental conditions including those specified in clause 4.3 entitled 'Environmental conditions'.

The switchgear shall be assembled as specified in this specification and the procurement specification and will comprise from of the following:

- Metal enclosed cubicle switchgear suitable for installation in a weatherproof modular or prefabricated housing.
- Metalclad switchgear suitable for installation in a building or in a weatherproof modular or prefabricated housing.
- Switchgear suitable for installation outdoors as surface or structure mounted installations.

Enclosures shall be of robust construction and where applicable comply with [EN 60439](#).

The degree of ingress protection shall be suited to the application and the requirements of the equipment contained therein. Except where the European, International or British Standard requires a higher degree of protection, enclosures shall afford the following minimum ingress protection as defined by [EN 60529](#).

Indoor	General	IP 30
	Horizontal surfaces below a height of 2 m from floor level (to prevent small items falling into enclosure)	IP 40
	Dust sensitive equipment	IP 50
Outdoor	General	IP 45
	Dust sensitive equipment	IP 55

Facilities shall be provided for wiring/cables to be securely supported and sealed at the point of entry into enclosures to ensure that the specified degree of protection is achieved.